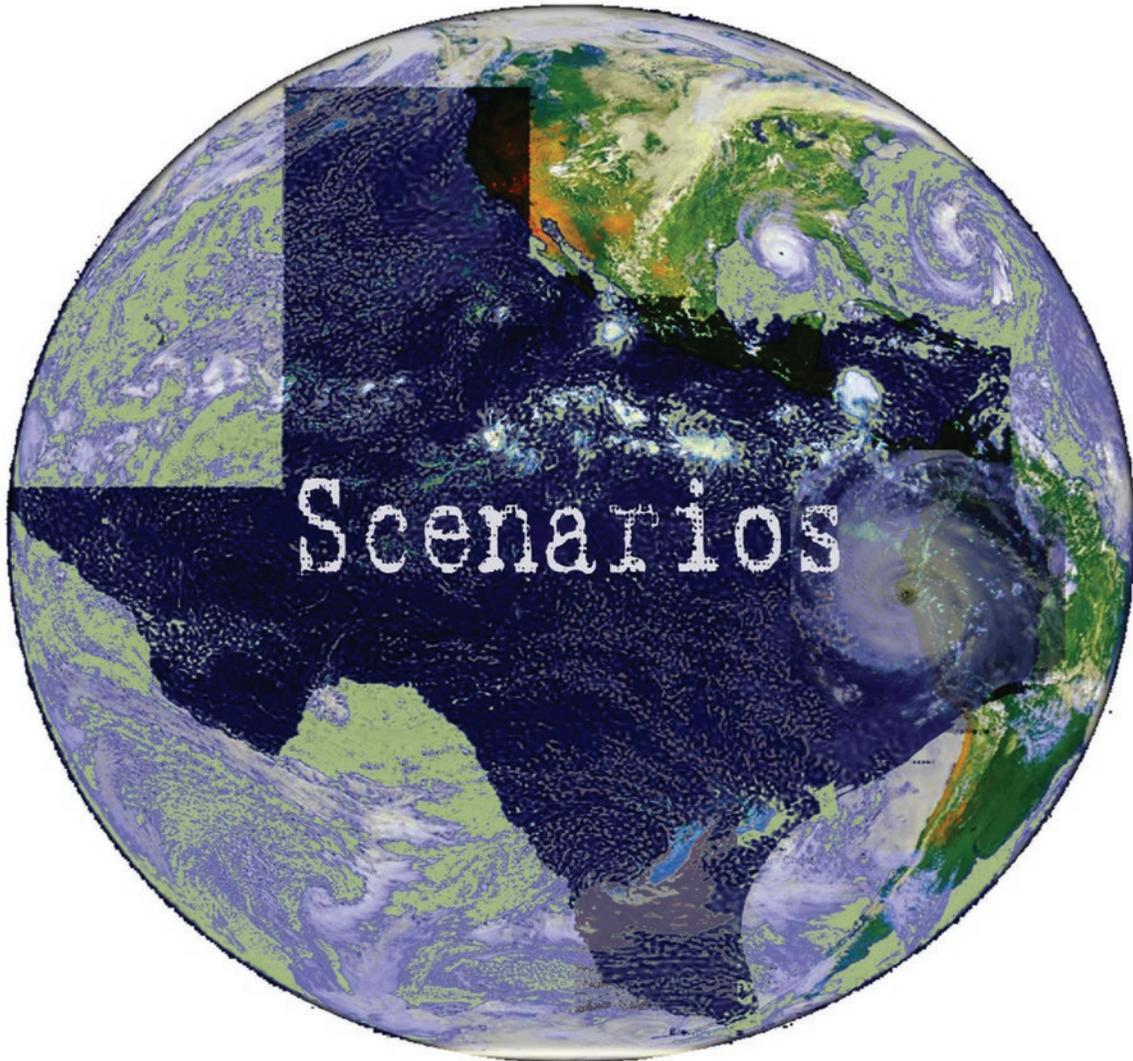


GALVESTON HURRICANE & HEALTHY NEIGHBORHOOD SCENARIOS



Workbook on Community Health, Neighborhood Resiliency & Disasters

This workshop is supported by generous grants from the National Institutes of Health as well as the SSBG health collaborative, made possible by the Texas Department of Health and Human Services and the Houston-Galveston Area Council.



In 2009, UTMB, along with six other south-eastern institutions, was funded by the National Institutes of Health to create the Gulf Coast SECURE Center, aimed at improving disaster preparedness and response with a focus on community health. Under that grant, the Center to Eliminate Health Disparities and the National Institutes of Environmental Health Sciences Center Community

Outreach and Education Core at UTMB developed an initiative called the Galveston Health in All Policies Project, an effort to integrate health considerations into recovery planning efforts in Galveston, Texas, following Hurricane Ike, which hit the barrier island September 13, 2008. The project partners UTMB with a number of local governmental and non-governmental organizations.

The workshop this workbook accompanies has been developed jointly by UTMB and the Institute for Alternative Futures as an effort to illustrate how health impact assessments can be usefully applied to strengthen community health and aid in recovery from natural or other disasters.

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Galveston Hurricane & Healthy Neighborhood Scenarios

Workbook



Developed by the
UTMB Center to Eliminate Health Disparities and
Institute for Alternative Futures

June 2010

Friends,

This scenario project is about healthy neighborhoods and hurricanes; it is also specifically about the health of neighborhoods in Galveston, both before and after a potential hurricane, and what we can do to shape the future of our community.

Hurricanes are a staple threat in Galveston; their frequency and intensity may wax and wane, but they are reliably present. The damage and disruption they cause to lives creates costs for the entire community economically and in terms of human physical and mental health. Hurricanes strike, we react, eventually rebuild, and they strike again down the road. Some people fare better than others, but few escape all effects. Families and individuals that are hit hardest rely on the resilience of those around them to support their recovery of jobs, access to basic needs, and social support, to name a few key issues.

Yet given the predictability of these unpredictable storms, and our long experience in dealing not only with hurricanes in Galveston and along the Gulf Coast but also more generally in relation to disasters around the world, there are many lessons out there on how to minimize the human health impact of disasters that are just waiting to be applied.

Further, we can take many steps to create communities that are both more resilient to disasters in terms of physical and mental well-being, and also generally healthier, with all of the physical, psychological, social, and economic benefits that come with that.

This workshop, workbook, and larger project in which they are embedded—the Galveston Health in All Policies Project—is an effort to combine these dual goals of creating healthy neighborhoods and more resilient communities by leveraging our growing knowledge about what works to create health.

Please join us in thinking about how we can inform our everyday planning decisions about community development to better support health outcomes....

...and then work together towards that vision!

With best wishes for Galveston's future,



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Workshop Agenda

8:00	Breakfast, check in
9:00	Welcome
9:45	Healthy Neighborhood Mapping in Galveston
10:10	Using Scenarios to talk about Community Health and Neighborhood Resiliency in Galveston
10:40	Tea/Coffee Break
11:00	Key topics and their evidence base
11:40	Discussion
12:00	Introduction to the small group work
12:05	Short Break to go to small groups
12:10	Small groups resume
1:00	Buffet Lunch (continue conversation)
1:30	End of small groups and Short Break
1:45	Report back
2:45	Next Steps: The Possibilities for Strengthening Healthy and Resilient Neighborhoods Now in Galveston
3:20	Closing
3:30	Meeting Adjourns

Introduction

This workbook is a companion to the Galveston Hurricane and Healthy Neighborhoods Workshop, held June 25, 2010 in Galveston, Texas. It is intended to be both an introduction to the key issues to be discussed as well as a reference after the workshop.

The workbook provides a number of ways to think about the impact of disasters on health, and what people with planning or community organizing capabilities can do both before and after a disaster to lessen the health impact of disasters. The workbook takes readers through a number of cognitive steps, beginning with stories of hypothetical experiences illustrating the health effects of hurricanes that result from different planning strategies; then discussing some of the key health issues typically faced by communities; then linking those health effects to specific decision-making; and finally explaining the evidence based these projections are based on, and how we can use that information in our own local decision-making in the here-and-now.

Historically, most hurricane disaster planning discussions have focused on the evacuation and response phases immediately prior to and following a storm, rather than the longer-term relief and recovery phases. Unlike the threat we are responding to when we evacuate, our planning and decisions in recovery generally do not involve dire threat to life. This discussion centers on the planning that happens well before a storm, and the longer-term effects on individuals, families, and neighborhoods months and even years after a disaster, during the recovery phase. Of course, such planning action depends on sustained efforts across various sectors—health care, but also education, transportation, housing, and others—with an explicit intent to make choices that improve community health.

Key to understanding why all sectors should participate in such an effort is the recognition that the means to achieving health goals often overlaps with sectors' own goals. And planning choices that prefer positive health impacts may ultimately, if not immediately, serve the higher level goals and visions for a community, such as economic development or creating safe and attractive neighborhoods.

This project is attempting to use the massive planning initiatives that often follow a natural disaster to raise awareness of the opportunity to improve community health and resiliency while rebuilding our community to achieve other goals. In doing so, we hope to both improve health, but also ease our own burdens of recovery as we anticipate the coming hurricane seasons.

Workshop Objectives

This workshop is intended to guide a process for better understanding the potential of certain tools to be used to support development of healthier and more resilient neighborhoods. The hurricane impact and recovery scenarios, and the related healthy neighborhood analysis, will be used to

- Discuss what it means for a neighborhood to be healthy and resilient to disasters, and tools for assessing healthy and resilient neighborhoods
- Present scenarios that demonstrate different health outcomes in the wake of a disaster because of different health planning strategies
- Identify pre-hurricane interventions that can make neighborhoods more resilient in terms of residents' health
- Jointly consider likely and preferable healthy neighborhood response and recovery patterns, both short- and long-term
- Identify priority indicators for health to assess in Galveston, as well as additional data / information needs, sources of information, and relationships between neighborhood / urban conditions and health and resiliency
- Collectively discuss other potential preventive actions pre-Storm
- Identify potential follow-up actions to appropriately incorporate these issues into current recovery and disaster planning, as well as issues for which further information is needed



History of Disasters in Galveston

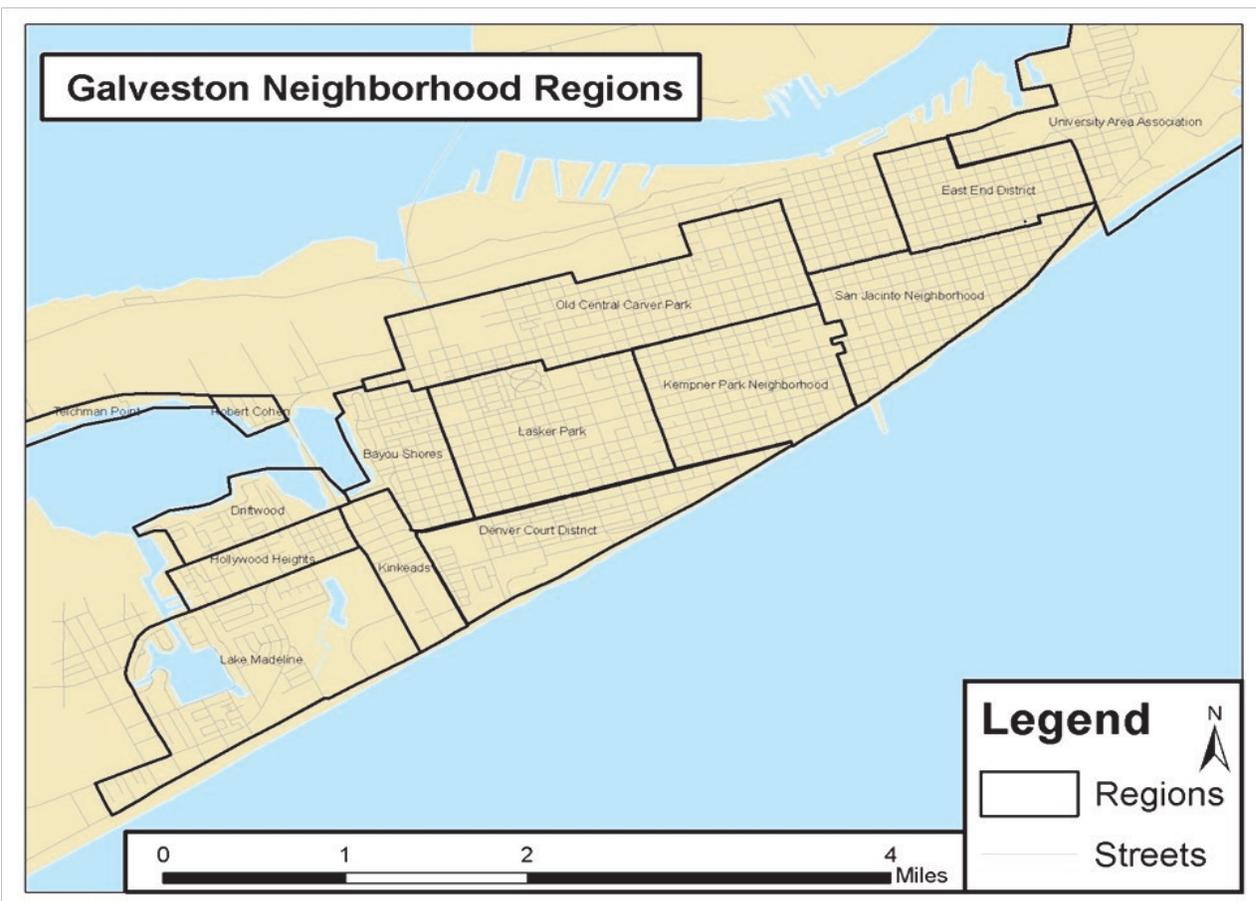
The 1900 Storm. Galveston has had its challenges with Hurricanes. On September 8, 1900, a hurricane struck Galveston. Winds estimated at 140 mph swept over the island, leaving devastation in their wake. After the storm surge of 15.7 feet subsided, Galvestonians left their shelters to find 6,000 of the city's 37,000 residents dead and more than 3,600 buildings totally destroyed. The 1900 Storm is still considered to be the deadliest natural disaster in U.S. history. After the storm, Galveston constructed a seawall and raised the grade of the island to protect it from future hurricanes.

Hurricane Ike. Unlike the 1900 storm, in 2008 thousands of people were not killed by Hurricane Ike. But the 17 foot seawall along the Gulf did not protect the parts of the island less than 8 feet above sea level when the storm surge pushed water onto the island, often with sediment containing heavy metals and other contaminants from the Galveston Ship Channel, Galveston Bay, and the Houston Ship Channel. Significant flooding and damage ensued, with over 70% of the buildings on the island damaged or destroyed. Whole neighborhoods were disrupted long after the storm, while others proved to be much more resilient for a variety of reasons. Homes were bulldozed, including blocks of public housing. The evacuation for Ike was ordered suddenly late Wednesday night as the storm took a 45 degree turn in the Gulf. For the two prior evacuations for two earlier hurricanes that year (neither of which hit Galveston) people were back on the island the next day. But after Ike, Galveston residents could not return to their homes for weeks to months—perhaps one-quarter still have not returned almost two years later, and expectations are falling that they eventually will.

Most people were not prepared in terms of the documentation and paperwork they would need to claim benefits they are normally entitled to or in relation to their losses, such as identification, documentation of enrollment in health insurance or other benefit plans, medical prescriptions; rental, residency and property ownership records; etc. Those with pre-existing health conditions often experienced worse health, and people who had previously been healthy were exposed to unhealthy and unsafe neighborhood conditions on their return—if they were lucky enough to return. And these residents suffered the stresses and disruption that contribute to ill health regardless of whether they were displaced for significant periods of time, or were able to return to the island. The overall financial cost of Ike made it the third most expensive hurricane in history, behind only Katrina and Andrew. Much of these financial losses could have been avoided with better integrated plans that would also benefit individual and community health outcomes.

Storms to come. Although some may see Hurricane Ike as an anomaly, only to be repeated every hundred years or so (it did reflect 100 year surge levels), current predictions understand such

storms to be increasingly common, and prediction models estimate 14-23 named storms this 2010 hurricane season, with 3-7 major hurricanes making their way into the Gulf of Mexico. This year's forecast for the number of named and major storms is the highest since hurricane predictions began. The warning signs are made more ominous by the current ongoing oil spill in the Gulf, which creates additional threats to human health if even only one major storm materializes. There is a more targeted source for estimates each hurricane season of the likelihood of hurricanes making landfall for any of the coastal counties along the Atlantic and Gulf Coasts. The United States Landfalling Hurricane Web Project Tropical Meteorology Research Project at Colorado State University and the GeoGraphics Laboratory at Bridgewater State College estimate that Galveston County has a 16.3% probability of a named storm, 4.1% for a hurricane, and 1.6% for an intense hurricane. This equates to about a 1 in 25 chance for a hurricane, and a 1 in 60 chance for an intense hurricane for the 2010 season. While these may seem like cause for relief, keep in mind that the chances in 2008, when Ike arrived, were identical.



If communities along the Gulf Coast are to become more adept at responding to and surviving these disasters, the health and resiliency of the communities down to the neighborhood level must become a regular and intentional part of local planning. Planning must reach beyond the

health care sector into aspects of health care systems planning, the built environment, environmental health, and social and economic policy. Independent of hurricanes, it is important to have a sense of the health of neighborhoods before a hurricane event and then consider neighborhood health in the preparation, response, relief and recovery phases. (The preparation phase refers to the day an emergency is declared to the time the disaster actually hits. Response phase is the first 30 days following the disaster. Relief phase refers to months two to five following the disaster. The recovery phase begins the sixth month following the disaster and is ongoing.)

This workbook begins with a mention of just a few of the many ways Hurricane Ike affected some particularly vulnerable neighborhoods of Galveston. The scenarios then illustrate different likely hurricane impact and recovery possibilities in the context of healthy neighborhood development. As we move through the workbook and the workshop, keep in mind the challenges experienced by the neighborhoods discussed below, and what might have been differently.

Indicators Predicting Challenges to Health: Strengthening Healthy Neighborhoods in Galveston

Some neighborhoods have a head start on being healthy. Others have major challenges. In Galveston, some neighborhoods particularly suffered not only the direct impact of Ike—flooding, property damage, etc.—but also the harms created by delayed recovery.

The description below uses examples from Galveston to illustrate how neighborhoods can experience layer upon layer of challenges to health, leaving them with few options for breaking vicious cycles and creating virtuous cycles for health development and improved resiliency. In the course of this workshop, though, we will look at ways we can organize information to identify critical issues in supporting the development of healthy and resilient neighborhoods.

Before Hurricane Ike made landfall in the fall of 2008, there were two geographic areas in the urban core of Galveston that consistently lagged behind others in neighborhood indicators of health and resiliency to a natural disaster such as the one posed by Ike. These areas are the Old Central Carver Park neighborhood north of Broadway and west of the Strand, and certain areas surrounding Offatt's Bayou, such as Bayou Shores, Hollywood Heights, and Driftwood. These areas have higher historical concentrations of minority populations than other neighborhoods in



Galveston (see map on p. 52). Further, these areas are marked with high rates of poverty and near-poverty (175% of the Federal Poverty Level and lower) within the neighborhoods (see maps on pp. 50-52), and account for a large proportion of the total population living under poverty levels within the City. There are also other pockets of similar demographics scattered across the city, including on the West End, though on a smaller geographic scale.

These neighborhoods are also burdened with businesses associated with decreased quality of life and increased disease burden. A large proportion of bars and places that sell alcohol for off-site consumption, such as convenience stores, gas stations, and liquor stores (see maps on p. 57), as well as check cashing / pay day loan vendors (see map on p. 45) are located in or within walking distance of these areas. There are very few, if any, full service F.D.I.C. insured banks or credit unions in these neighborhoods (see map on p. 44). The neighborhoods of concern have a number of vendors that accept electronic benefits transfer such as the “Lone Star Card” or food stamps (see map on p. 40). However, these are mostly convenience stores or vendors that do not provide fresh fruits, vegetables, low-fat dairy products and / or fresh meat—the basics of healthy nutrition. Hurricane Ike inflicted heavy damage on the City’s major full-service grocery stores, creating a gap along the middle of the island with no full service grocery store (see maps on pp. 38-39). These stores are also the only stores on the island that accept Women, Infants, and Children, or W.I.C., subsidies.

Concentrated public housing and larger low-income housing facilities were concentrated in these areas before Ike. The neighborhoods are serviced by local public transportation; however, the system is currently disjointed in providing service to both places of employment and places to purchase daily goods and services from these neighborhoods (see map on p. 56). Compounding this, these neighborhoods also tend to have lower rates of car ownership compared to other areas of the city (see map on p. 54). Finally, in terms of environmental health, particularly for Old Central Carver Park, the neighborhood is bounded on its northern end by primarily industrial and port and rail yard-related land use (see map on p. 32).

These neighborhoods also have some strengths. There are a large number of places of worship, social service providers, and places for engaging in social activity in close proximity to these neighborhoods (more so with Old Central Carver Park it should be noted).

The result. These factors all played a role in how these areas reacted and are recovering from Hurricane Ike. With fewer means for self-directed evacuation, such as financial resources for shelter, a car for evacuating, etc., many of these residents were evacuated using public means, limiting their ability to control their destination after evacuating as well as their means and timing of return to Galveston. These areas were among the most damaged areas on the island. The land is relatively low-lying and subject to more intense flooding (see map on page 13).

Many residential structures were not built to be as hurricane resistant as others across the island (including some that even survived the 1900 Storm). Further, several of the larger public housing units were demolished shortly after the storm, creating a gap between the demand and available supply of low-income housing on the island. Rebuilding these areas is proceeding slower than on other parts of the island. For home owners, obtaining support funds from state and federal agencies involves several steps, one of which includes a clear title on the property. Given the long history of many properties in Galveston obtained through inheritance, clear titles are not easy to come by. Further, many residents within these neighborhoods were renters, and therefore have little direct control over the rebuilding process of their former homes. After Ike, residents could visit their homes after a couple weeks and were only allow back to rebuild after that. Residents of North Side and the Bayou Shores and Hollywood Heights areas were able to return at the same time as the residents of other neighborhoods, but experienced significantly greater home damage. So while the date of their legal re-entry was the same, the average delay for re-integration into the neighborhood was much longer than for other neighborhoods.

Not all re-integration attempts were successful: many people in those neighborhoods tried to re-integrate but were forced to leave because their homes or neighborhoods were too badly damaged, and they ended up displaced



again. Consequently, a large number of residents who did return to Galveston required assistance in obtaining housing due to the disaster, so called “locally displaced.” Many of those without adequate housing who wanted to remain in Galveston were referred to the Galveston Housing Authority, which experienced a five-fold increase in demand (public housing and DHAP) following the storm. In total, over 5,300 households were referred to the Galveston Housing Authority (GHA) for obtaining housing assistance, with over 1,600 of these families receiving aid from GHA. Others still have not returned to the city. While obtaining an accurate estimate of the current population is a challenge, we know there were over 60,000 residents in Galveston before Ike, and one recent estimate put the current population of residents at 47,000.

But let’s take a step back for a moment and imagine a different future. Actually, let’s imagine three different futures.

The Galveston Hurricane Scenarios

Given the likelihood of future hurricanes, including ones that will cause significant damage, as well as the potential for prior planning to strengthen neighborhood health and resiliency for health, it is a useful exercise to develop scenarios for hurricane landfall and consider what might happen, given different planning decisions. We have developed three scenarios, focusing on the differential impact a hurricane can have on the health and resilience of a community, depending on how that community has developed and been shaped.

Although they are hypothetical, the scenarios use actual health outcomes of past hurricanes as well as evidence-based predictions of health for given planning decisions. This will become more apparent as we unpack certain issues after the discussion of the scenarios, in the section on Advancing Healthy and Resilient Neighborhoods.

While the scenarios provide a general description of the community, we have intentionally built into them attention to seven issues that flow across each, scenario. These seven issues have a significant impact on health, both generally and in a post-disaster context. They are Continuity of Health Care, Mental Health, Housing, Food Security, Environmental Health, Early Childhood Development, and Economic Development. However, these are but examples to illustrate the impact of how planning choices in many sectors, including those outside the health care sector, can significantly affect health. Of course, there are many more areas that could be addressed, such as transportation policy, parks and recreation, social cohesion, tree canopies, hardening of the Island, zoning, restaurant nutrition, smoking ordinances, living wage ordinances, and sick day policies, to cite but a few examples.

Overview of the Scenarios

Scenario 1. The first scenario takes a “Business as Usual” view, incorporating some of the critical lessons we did learn in Ike, and that are already being implemented. Of course there are probably more good lessons being addressed that we have not incorporated. The reason we call it “business as usual” is because it does not incorporate planning that is specifically focused on improving community health and neighborhood resiliency through social determinants of health.

Scenario 2. The second scenario considers what might happen if a major initiative was undertaken to build healthy neighborhoods, according to current research on what makes a difference in the health of different groups living in urban areas.

Scenario 3. The third scenario emphasizes strengthening the resiliency of neighborhoods in the wake of a disaster. It layers on top of the second scenario consideration of resiliency interventions that would support the achievements of healthy neighborhoods even after a significant disaster that threatens to undue many of the health gains realized in Scenario 2.

The scenarios build on each other, meaning that the lessons and improvements of the previous scenario are added to in the next. Consequently, the health improvements outlined in the third scenario are a result of interventions from all three scenarios.

We learned many lessons from our experience with Hurricane Ike, and we are aware that many of them are now being incorporated into planning for the next hurricane. Therefore, for the purposes of the scenarios, we have incorporated some of those improvements into Scenario 1, the “Business as Usual” Scenario. Undoubtedly there are other planning initiatives that are taking place, but that we have not incorporated into the scenarios. Therefore, we would ask for your understanding in recognizing these scenarios as illustrations, not defining statements. Over the next several months, we will be documenting specific planning changes that are being made, and their likely health impact, both in terms of ongoing community health and resiliency.

Second, these scenarios are set in the second half of this decade between 2015 and 2020. Between now and then many changes, within and outside Galveston and Texas, could affect the impact of health and resiliency depicted in these scenarios for the better or worse. For instance, a “double dip” recession – or prolonged economic downturn could create additional challenges to economic development to support healthy neighborhoods, or to support recovery and resiliency after a disaster; or remains of the 2010 BP oil spill could be pulled from the ocean floor during a hurricane, leaving an oily film on the Galveston Beaches and washing over the island with the surge. Alternatively, positive impacts might include construction technologies that allow cheaper and more resilient home and apartment construction; or the development of a regional high-speed rail system that transforms local economic development.

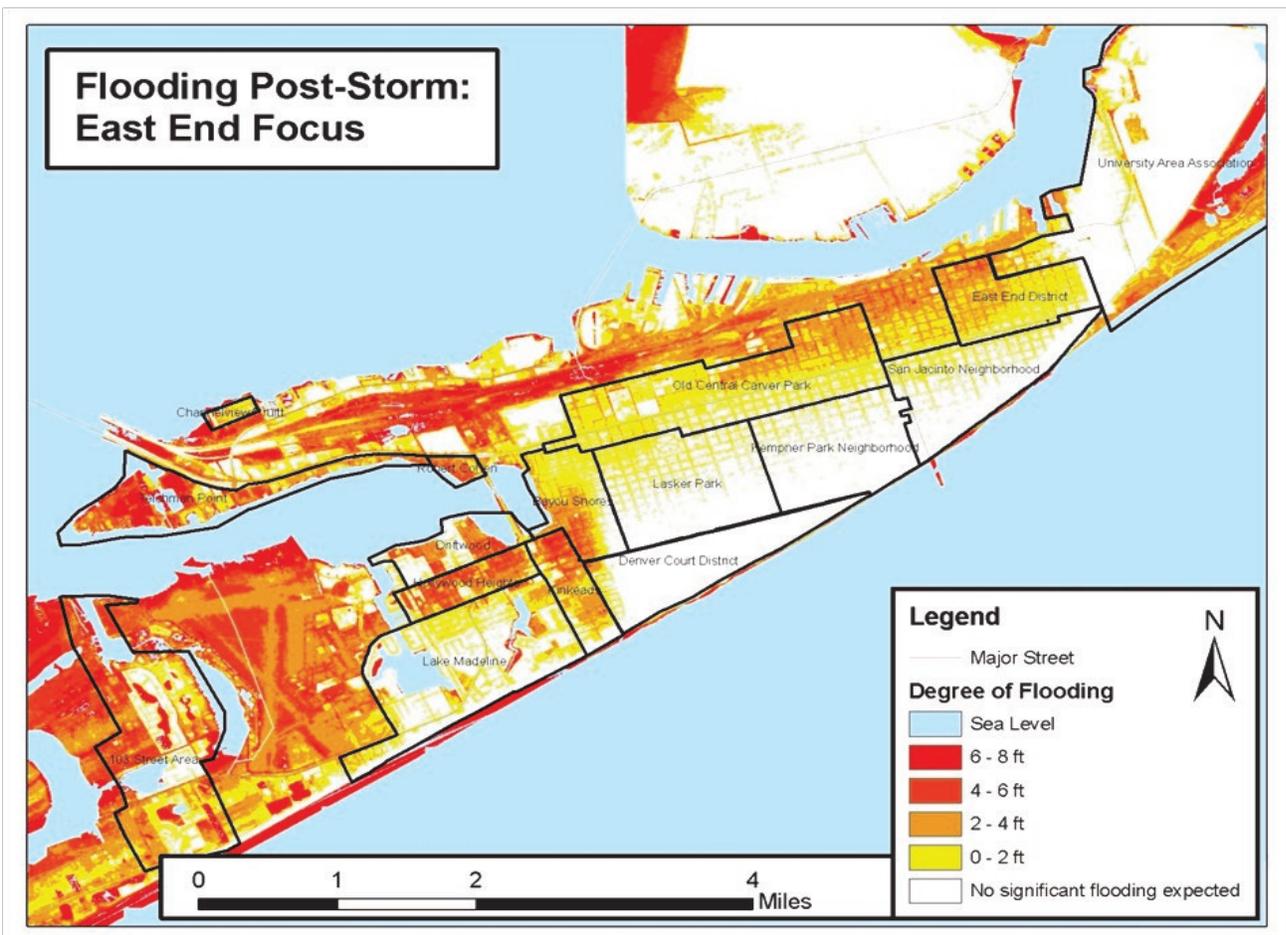
Setting the Stage: The Hypothetical Storm

The Hurricane, let’s call it Tina, is a Category 3 storm with 115 mph winds, large in size (though not as large as Ike) and a 16 foot storm surge (similar to Ike). Tina’s trajectory is slightly to the north-east of the Island, with the eye over the Ship Channel, bringing wind and water from the Bay side over the island. The Seawall again is successful in protecting some areas from flooding. However, the storm surge results in some areas flooding 8 feet or more (see map on p. 13). Tina causes wind and water damage, and, as with Ike, pulls water and sediment from the Galveston and perhaps Houston Ship Channels into the flooded neighborhoods. Additionally, the hurricane spawns a tornado, which hits the San Jacinto neighborhood between UTMB and the Seawall, causing moderate damage to many homes and businesses.

The evacuation was effectively executed, without many of the problems of Ike. According to policy, in the Preparation Stage (from Declaration of Emergency to Landfall), Galveston calls for evacuation from the island 28 hours before expected landfall for a Category 3 storm. The City was able to avoid the evacuation fatigue that undermined evacuation efforts during Ike, and time

staggered evacuations helped to avoid the massive traffic jams and other problems of previous hurricanes. Hurricane Tina's last minute change in trajectory catches some people off-guard, and although buses were available to carry people off the island, some residents missed the bus or chose not to take it for various reasons.

Damage to the island was substantial, but the water and sewer infrastructure fared well, as it was improved and significantly hardened since Ike, reducing but certainly not eliminating the incidence of infections and gastrointestinal illness. Likewise, most power generators and substations could be operated shortly after the storm, supporting return. Some roads are littered with debris, although access across the Island is not shut down entirely.



The City kept to its plans of allowing people back on the island within 72 hours after the disaster. Many homes could be occupied when residents returned. The city expedited re-entry by providing portable toilets in neighborhoods where the water and sewer were not working and by setting up emergency response centers in neighborhoods. First responders and emergency service providers were the first allowed back across the causeway. Business owners and contractors were next, followed by residents.

There are clearly other disaster possibilities, for instance, a hurricane with more wind and less water, or an altogether weaker storm with less flooding and wind damage, etc. But for our purposes in this workshop, these differences are details, and largely irrelevant to the issue at hand regarding community health.

Regardless of the specific level of damage, the physical damage and psychological and social trauma that any circumstances surrounding a disaster create takes a toll on the health of everyone in the community. Similarly, the disaster need not be a hurricane; other forms of disaster can have similar effects, if they impact a substantial part of the population. And, of course, the details of hurricane trajectories and types of disasters are largely out of our control. Therefore, we have chosen to focus on the kinds of planning choices over which we do have control, and which can effectively support healthy neighborhoods, both in a long-term sense and in the wake of disasters.

Scenario 1: Business as Usual (with some key lessons from Ike)

One of the main improvements from Ike was the in the Relief and Recovery phases of Tina, social services were better coordinated. FEMA stuck to its policy of support only for infrastructure repair, but local, regional and state relief agencies provided some immediate emergency funding for social services and community organizations aiding the returnees, and were somewhat quicker to do so than with Ike. This enabled some of those who were hard-hit to return more quickly, and also helped many others in the community. However, because this support still came several months after the hurricane, many of the most affected, either through job loss, lack of family social support, financial loss, loss of housing, mental health and stress, or other critical issues, were not able to return nor take advantage of those social services. There was a disparity in ability of people to benefit from such programs.

Low income neighborhoods were the slowest to recover and, just as after Ike, those neighborhoods lost residents for long periods after the storm. There were many reasons for this displacement. An important one was the heavy neighborhood damage suffered by low-income neighborhoods, which not only suffered the most flooding and housing damage, but also lost essential services, became less safe to walk around, and generally did not achieve the “threshold” level of recovery necessary to thrive. Basic needs such as food were more difficult to obtain. People also stayed away due to lack of communication systems to facilitate re-integration, insufficient support to the recovery social support services needed to put lives back together (e.g. daycare), loss of jobs and income, worsening health (e.g. due to chronic conditions that were not treated), depression and lack of hope to return, to name a few.

Health Care. After Hurricane Ike, UTMB had taken aggressive planning measures, moving mission-critical services on the second floor or higher, ensuring continuity of emergency, hospital and



clinical services. As a result, returning residents with health insurance have access to various levels of health care services, which has the positive effect of reducing death and illness, as well as economic and other effects of illness; and inspiring public confidence in Galveston and encouraging displaced residents, at least those with insurance, to return. Although hospitalized patients are still evacuated, most needing ongoing care are re-admitted

to UTMB within two weeks of the storm, especially those whose families have been able to re-integrate quickly. Small local health care clinics re-open within the first few months, but with limited services due to loss of equipment. The University is sufficiently intact to be able to set up field clinics, which operate during the response phase but are suspended after that. While national health insurance reform was partially implemented in 2014, many of the working poor in Galveston remain uninsured because they could not afford the mandatory insurance premiums required by the Health Reform Laws. Low-income residents with health problems and frailty have difficulty, because the level of services at UTMB for uninsured residents was dramatically reduced after Ike and is not reinstated. Many chronic care patients that are not able to return to Galveston are unprepared for extended displacement, and cancer and dialysis patients do not have referral care set up, creating increased morbidity and mortality as well as expenses that health insurers refuse to cover. Displaced 3-Share subscribers effectively lose their health care benefits as they are geographically separated from their only institutional provider, UTMB. (The Galveston County 3-Share Plan, which follows an HMO model, is a health benefits program offered to employees who work for small businesses in Galveston County, in order to improve access to care for the working uninsured while developing a model that can be replicated across the state by other communities. For more information, go to www.utmb.edu.)

Within the larger displaced population, continuity of care was disrupted by the inability of their new providers to access UTMB patients' medical records. Many of the elderly forego care and lose their caregivers as nursing homes unexpectedly release them to families who are unprepared to take them, and as home health agencies evacuate indefinitely. Children's health is neglected as busy parents try to sort out their lives, and common contagious early childhood illnesses increase in the school system and in functioning daycares in the months and year after the disaster because low immunization rates result in low herd immunity. Some older residents as well as the homeless, parolees and others with serious mental illness are not targeted for evacuation support, and a number of them experienced significant deteriorated mental and physical health in the months afterward, with some dying. Crisis mental health care needs are under supported, and little outreach is made for women's health and prevention of domestic violence, which sharply increases after disasters. Residents with severe mental illness, including most of the homeless population and many of the parolees released in Galveston County, as well as general residents of Galveston, suffer crisis episodes induced by the stress of the disaster. But with the closure of the in-patient psychiatric services at UTMB following Ike, these crisis episodes are uncontrolled, resulting in neighborhood altercations, increased police action and detainment, physical and mental health deterioration of those patients, and occasional injury to others.

Housing. In response to the impact of Hurricane Ike, rebuilding of housing between 2009 and 2014 was focused on two issues: rebuilding of public housing, and rebuilding of (and supporting

owners to rebuild) private affordable housing. A decision was taken to rebuild public housing using cluster housing, and some block-style housing that follows the model that previously existed in Galveston, the last in response to demands from displaced residents. (Cluster housing refers to separate dwellings grouped closely together to form relatively compact units. The space between clusters usually is allocated to pedestrian circulation and cooperative recreational use. This pattern normally results in a higher density of land use than that of a conventional subdivision layout. However, it is advisable to consider and preserve the “grid” street layout in Galveston when developing such neighborhoods.) These rebuilding plans largely keep public housing residents clustered together in residential-only neighborhoods.

During Tina, much of the island’s housing (as well as businesses) are damaged by flood waters and wind. As with Ike, recently rebuilt public housing is disproportionately lost because it is located in areas especially prone to flooding. North Side housing suffers high levels of contamination from heavy metals and other toxins due to proximity to industrial areas and to the contaminated sediment in the harbor, which washes over these areas first. Pre-hurricane efforts by local social service agencies to create electronic copies of residents’ major documents assists many residents to file claims for damaged property and begin benefits processes for funds and services with the County, State and FEMA. This speeds neighborhood recovery and re-integration of residents. Still, many owners are unable or delayed in gaining financial support for rebuilding, either through insurance or through public programs, due to the bureaucratic challenges in applying and responding to agency inquiries. Because the San Jacinto neighborhood was not as significantly impacted by Ike as some other neighborhoods, but is hit by the tornado following Tina, many of the same housing recovery problems from Ike repeat. Like many areas on the island, a number of San Jacinto’s privately owned households do not have clear land titles. Well beyond the San Jacinto neighborhood, many homeowners are un- or under-insured. Desperate to re-integrate into the community, either for financial or social reasons, some owners re-occupy their contaminated houses with their children, living in environmentally unsafe conditions while trying to repair their homes.

As with Ike, public deliberation processes necessary to determine recovery plans slow the rebuilding process. Housing takes 18 months to 5 years to rebuild, and again, many of the occupants that eventually settle are new, not displaced, residents. Low-income families in particular have low rates of re-integration into Galveston, especially in neighborhoods such as the North Side and the Historic District. They face many barriers, including lack of affordable housing, poor condition of certain neighborhoods and lack of “threshold” level of recovery in their neighborhoods to support a safe environment, lack of jobs, lack of access to food, and mental stress leading to a sense of despair and anxiety about the future. Large segments of the population continue to be largely displaced after 3-5 years. Much of the displaced population becomes permanently displaced, having relocated to other cities. Former public housing residents

who are displaced suffer health effects due to mental stress as well as disruption of their social networks and support systems, which can support access and attention to health care needs, healthy early childhood development, healthy eating, and other paths to health.

Food Security. Four full-service grocery stores existed prior to the storm (down from six prior to Ike), and they were all affected by Tina either due to flooding or wind. Although food security (that is, consistent access to sufficient, safe, nutritious food to maintain a healthy and active life), and specifically access to affordable, healthy food, was a problem prior to the storm for many areas of the island, after the storm it is much worse. Access to healthy food decreases in general, with some residents having particular problems accessing healthy foods. Due to reliance on major stores, significant infrastructure has to be recovered before access will be recovered. The major grocery store (Arlan's) on the east end of the island suffers heavy wind damage due to the Tina-spawned tornado, further expanding the food desert that expanded after Ike when the major grocery store for the middle of the island (another Arlan's on 25th Street) was damaged and not re-opened. Consequently, no grocery stores exist east of 45th Street, and many residents, including those with the fewest resources to travel long distances for food, face real barriers to good nutrition for an indefinite period. Consequently, re-integration is undermined, and for those who do return, nutrition generally declines. Those with multiple barriers—long distance to healthy foods, lack of knowledge or experience preparing healthy foods or previous poor eating habits, time constraints, lack of transportation, and limited income to spend on food—rely heavily on processed food and fast food establishments, which are plentiful.

Environmental Health. As with Ike, the hurricane roils waters in the Galveston Channel, and flood waters bring sediment from the Channel floor containing heavy metals, dioxin, and PCB's. Dioxin contamination at the San Jacinto River Wastepits Superfund Site are further mobilized by the storm, washing the poison into the bay, with consequences not only for human health but also for sea life, thereby threatening economic recovery of the seafood industry in the area for decades. On the island, concern and lack of information over the specific threat of the sediment hampers economic recovery, return of residents, and the future of the Island. In the months following the storm, everyone seems to have a nagging cough that won't go away. Infections from cuts and scratches become a major danger for all, and among those with compromised immune systems or who are already sick, there are deaths in the months after the storm. A few receive seemingly minor cuts, with devastating consequences such as limb amputations, due to delayed care; superbugs found in the post-storm environment; weakened immune systems due to stress, poor nutrition, and generally poor health after the hurricane, or a combination of factors. Hazardous wastes stored in households and small businesses, such as construction firms, remain a risk for contamination of surrounding areas if flooding occurs. Waste disposal sites on the mainland, including the Malone Superfund Site and the McGinnis Pits in Hitchcock, remain vulnerable to surge tide flooding and continue to be a threat to surrounding areas.

Early Childhood Development. Most daycare in the low lying sections of Galveston is lost, especially during the response and relief phases, but also extending into the recovery phase. Because daycare is difficult to secure, and many of these people can no longer afford it because they have lost their jobs or businesses, children spend significant periods of time in unsafe environments and in conditions that undermine early childhood development. Parents are busy navigating the bureaucratic maze of recovery and trying to put their lives together, while kids accompany. Other families remain displaced and suffer the health effects mentioned above. Ignoring the need for child care slowed the recovery significantly for the hardest hit parts of Galveston, and also subjected children to unsafe and unhealthy physical and social environments while their parents desperately worked to recover their personal and professional lives, placing further stress on parents as well.

Economic Recovery. While large businesses in Galveston are well-insured, small businesses suffer from the storm, and those that operate on the edge of financial solvency suffer most, as they do not have insurance or lines of credit. While most UTMB employees are largely kept on the rolls, many contract employees—mostly low-wage earners with no benefits—lose their jobs as the city's overall population diminishes with a consequent drop in health care utilization. Tourism jobs, too, are lost with anticipation of diminished revenues in the upcoming winter snowbird season and accompanying festivals such as Dickens on the Strand and Mardi Gras, as well as concern over the coming summer season. As these businesses fail and jobs are lost, health insurance and access to care declines; family incomes decline; stress, and mental health problems, and domestic violence increase; and access to basic goods decreases. For other businesses, financial recovery is hampered because skilled employees cannot return to their homes and neighborhoods quickly, or cannot secure adequate childcare in Galveston, etc. This problem affects broader recovery efforts, too, since many of the people in these families would have been able to generally contribute to the recovery of the community both in their roles in formal employment (e.g. those working in social service or recovery areas) as well as through their personal efforts: helping a neighbor rebuild a fence.

The result of the storm is a community that is more ill, more depressed, less functional, and less able to facilitate recovery in a broad sense and re-establish healthy neighborhoods.

Scenario 2: A Healthy Neighborhoods Approach

In the second scenario, Galveston had decided to make some critical investments to improve the impact of social determinants on health in order to build a healthier city, as envisioned by the Comprehensive Planning Commission. During the recovery phase of Hurricane Ike and also in ongoing planning efforts, many decisions were made by city and county officials as well as among community organizations and others, using evidence showing the likely health impact of various choices. A specific initiative was agreed upon, to emphasize the development of mixed-income / mixed-use neighborhoods, to support quality of life initiatives for all residents with a special focus on physical activity and nutrition, to enhance early childhood development opportunities in the community, and to enhance community cohesion. It was expected, based on experiences in other communities, that these efforts would lead not only to better physical health among Galveston's residents, but also better mental health, lower crime and domestic disruptions, better school performance by children, and—not least of all—increased status as a tourist destination.

After Ike, the city government worked closely with the housing authority, the Economic Development Partnership, the Chamber of Commerce, and many others to create mixed-income / mixed-use neighborhoods as a strategy for rebuilding Galveston to be stronger and healthier. While the historically worst-off neighborhoods were targeted for development, opportunities were created for all neighborhoods to identify needs and areas of improvement, and participate in the program. The City Planning Commission approved a significant re-zoning program that encourages the development of neighborhoods that include both residences as well as appropriate small businesses. This was followed by a major planning initiative that included ongoing input from neighborhood groups, local social service agencies, the tourism board, and other key agencies. Neighborhood plans were scrutinized for their ability to meet the different needs of residents, such as access to food, child care, safe places to walk and play, and common recreational areas for families to enhance social cohesion and neighborhood trust. Neighborhood Watch programs were established. Policemen, teachers, and firefighters became residents of many of the mixed-income / mixed-use neighborhoods. This strategy served a number of needs, including replacing public housing, putting empty or abandoned properties to use, encouraging better geographic distribution of essential services, reducing food deserts, improving public and social services access and delivery, increasing walkability and reducing dependence on transportation, strengthening neighborhood cohesiveness, and other issues that have been on Galveston's wish lists for years, but had never been implemented. The result is more desirable neighborhoods, and smooth transitions to mixed-income communities.

Health Care. After Ike, in addition to the resiliency improvements made to UTMB's physical infrastructure and deployment of field clinics during the response phase described in Scenario 1, County funding was used to expand services to the uninsured population.

Housing. The use of infill housing to replace public housing and support creation of affordable housing in general—part of the mixed-income/mixed-use neighborhood development strategy—effectively reduced the level of segregation and concentrated poverty, leading over the years to significantly better health for those residents since those are possibly the most influential factors on urban health. Sidewalks as well as bike paths connect neighborhoods around the city, enhancing physical activity and social cohesion. Attention is paid to ensuring that all neighborhoods have access to open spaces, parks, and playgrounds.

Food Security. The city used a multiple approach strategy to addressing food security, including improved nutritional intake and access to healthy food as a community priority. The City and its community partners were successful in recruiting back a major store for East End residents, and the City established an incentive program for corner stores and other potential food outlets in remaining food desert areas to carry healthy foods. The City and County also made changes to the transportation routes to decrease travel time for residents in remaining food deserts to reach full-service grocery stores.

Early Childhood Development. Incentives were offered to encourage start up of affordable daycares in geographically diverse areas, including in each neighborhood around the city. Further, after Ike, child advocates promoted a program to ensure that local daycare providers meet standards for supporting early child development, including addressing children's psychological, social, and mental development. Nutrition and physical activity programs were emphasized, and early child development education were offered to parents and caregivers. However, while some had warned that daycare was not given adequate attention in regional disaster response, daycare remained overlooked in the period before Tina. Consequently, a number of daycares are lost after Tina, and for a next generation of families, much of the post-Ike experience repeats itself. Despite the gains of the pre-Tina period, in the wake of the hurricane, children spend significant periods of time un- or under-supervised, and in physically and mentally unhealthy environments. Though family stress levels generally decrease in comparison to Scenario 1, the burden of lack of child care creates its own stress and also somewhat lowers neighborhood resiliency as recovery efforts are diverted to caring for children.

Environmental Health. As part of the infill and damaged housing recovery efforts, the City used grants after the previous hurricane to abate lead in houses, thereby reducing lead exposure for families. They also establish a hazardous waste recovery program to collect various materials from small businesses such as gas stations, auto repair shops, contractors, and others as well as residents.

Economic Development. Support for mixed-use neighborhoods spurs creation of small businesses. Support for mixed-income neighborhoods also ensures a stable, local, diverse workforce to drive marine related services and port expansion as well as new industry.

The result of these investments was not only a population that was more physically active and generally healthy, but also more vibrant neighborhoods with residents invested in their communities. This strength creates resiliency and supported re-integration after Tina hits in important ways, including through a heightened sense among residents of local investment; strengthened social cohesion and confidence in re-creating community connections even under difficult circumstances; and increased affordable housing, improved walkability, access to food, etc. in neighborhoods. After Tina, and despite major damage to many large and small stores, the combination of approaches results in more surviving healthy food outlets, reducing the size of post-disaster food desert areas and supporting resettlement in neighborhoods. Neighborhoods achieve threshold recovery levels, and become economically and socially reinvigorated, which contribute to increased mental and physical health. Groups that particularly benefit include low-income groups, the elderly, and those who otherwise would have resided in newly created food deserts.



Scenario 3: Healthier and More Resilient Neighborhoods

The third scenario assumes the major initiative to create Healthier Neighborhoods occurs as in Scenario 2, and also adds on specific initiatives to improve the resiliency of those neighborhoods, so that the community's health, and re-integration and full and rapid recovery is maximized after Hurricane Tina.

Recovery Social Services. One of the most important planning initiatives following Ike was a mapping of provision of disaster response social services in the county, which identifies a number of gaps. Following that survey, efforts are made to work with existing agencies to fill those gaps, improve communication between agencies to clarify roles and responsibilities and avoid duplication of efforts, and streamline administrative processes and access to funding to speed responsiveness in the event of a disaster. As a result, recovery social services are deployed much faster and more efficiently after Tina, and better address critical needs, resulting in reduced stress and mental health effects, reduced domestic violence, better access to food and benefits, etc.

Health Care. In order to strengthen continuity of care for the displaced population—the weak link in scenario 2—nursing homes developed clear plans for releasing residents, and actively worked with families and regional nursing homes to ensure appropriate caregivers would be available and sufficiently prepared in the event of an evacuation. Home health agencies put plans in place with each client to transfer care in the event of evacuation and displacement. A program was established to ensure that chronic care patients (insured and uninsured), as well as 3-Share subscribers, had more portable access to care and that regional cooperation agreements were in place, including agreements with other institutions in the Texas Medical Center. Additionally, the successful implementation of the Clinical Data Repository dramatically enhanced continuity of care, as new providers at health care institutions throughout the region were able to share patients' medical records. (The Clinical Data Repository is a shared database that allows providers at different institutions to share patient medical records in order to improve continuity and quality of care and reduce duplication of unnecessary care and tests. Legal issues require these institution to work together carefully to establish clear Memoranda of Understanding and official relationships in order to protect the confidentiality of records and privacy of patients. These MOU's can take years to establish.) Further, the need for geographically distributed clinics to be temporarily opened across the island during the response and relief phases was assessed and followed through. Community education and surveillance programs were developed and implemented in cooperation with churches, schools, daycares, and various employers that focus on domestic violence, child physical and mental health needs, and supporting mental health in times of crisis. Community partners received training in specific support and intervention processes, and UTMB regularly checks in with those partners.

Housing. In addition to recovering public housing and rehabilitating infill properties, the City also created an affordable housing program that established a path to home ownership for low- and middle-income residents. The home ownership program further diminished segregation and entrenched poverty, leading to better health. The financial advantages of the affordable home ownership program allowed many participants to afford disaster insurance. Mortgage insurance built into the mortgages also ensured that the mortgage payments will be made for a period of time in the event of the loss of a job; thus enhancing housing security and rapid re-integration. Finally, to support future need for re-integration of displaced residents after Ike, the City had used recovery grant funding to help residents establish clear titles to their properties, even creating an amnesty program or privately supported assistance program to pay property taxes to get home owners back into their houses. New public and infill housing, as well as new private housing was required to meet stronger codes, rendering them more resilient, and ensuring more rapid recovery and re-integration.

As a result, there are many incentives for re-integration, and residents find a number of ways that they are supported to do so, ranging from income recovery, to safe places to live, to recovery social support. Because the members of the police force live in many neighborhoods, and have increased local knowledge of the neighborhoods through the Watch programs established before Hurricane Tina, those programs transform into neighborhood help programs. Police officers and community residents check on elderly residents and identify common-place ways to support families in living “normal” days.

Food Security. The multiple-approach strategy to reducing food deserts was reinforced in terms of resiliency through the active establishment of pre-authorized small business lines of credit for corner stores carrying healthy food in the event of a disaster. The newly adopted combination of policies results in faster and better access to food quickly after the storm, faster resettling of neighborhoods (both because residents have improved access to food and because small businesses can regain their livelihoods), and quicker recovery of the local economy.

Environmental Health. The EPA provides support to monitor soil burdens of toxins, especially in sensitive land use areas such as playgrounds. They also sample the Galveston Industrial Channel to identify the composition of possible storm surge burden and movement of toxins, and undertake remediation of sensitive land use areas when appropriate. The city monitors air quality during response, relief and recovery phases to assess dangers of aerosolized toxins, and provides frequent watering of streets to keep dust levels down, especially in sensitive land use areas. Finally, pre- and post-storm public education efforts include information on safe re-entry, preventing exposure to toxins, reducing indoor air pollution, appropriate use of equipment. Families are encouraged to add safety equipment to their evacuation kits.

Early Childhood Development. Although the Healthy Neighborhood initiative improved early childhood development through improved access to and quality of daycares, more was done to prepare. A plan was developed by child advocates, schools, and others to establish Memoranda of Understanding among daycare providers in the region to cooperate in terms of accommodating extra children and teachers in the event of closure of daycares. Disaster response organizations also integrate more childcare support functions into their own services. State agencies were successfully lobbied to create policies to allow temporary provisional licenses for daycares to relocate and open their doors quickly, if they have previous records demonstrating high quality care for an extended period, and if the relocation is due to disaster circumstances.

Consequently, when Tina causes many daycares to close either because of damage to infrastructure or displacement of teachers and families, many teachers and children alike who are attempting to re-integrate are able to be absorbed quickly into daycares located both on the Island and off. Inspectors pay regular visits to day care centers to ensure ratios, safety, and other requirements are not being violated. These frequent visits also help reinforce attention to children's mental health needs after the disaster and identification of abuse.

Economic Recovery. The City help economic recovery by creating local jobs. Recognizing the ebb and flow of jobs in a post-disaster environment, the City created a cash-for-work program to be instituted after a disaster, which hires low-wage workers who are residents of Galveston in cleanup and recovery efforts, and links them with reputable local contractors. Planning involved



identifying possible workers, identifying key projects, identifying and planning for likely safety needs (e.g. safety training and equipment), setting up an administrative and communication structure to contact workers, and ensuring that adequate local housing and transportation for those workers would be available quickly. Several additional key issues were identified to support re-integration of displaced populations after a storm.

Communication. Officials established a communication system prior to Tina to connect with displaced populations. This system was intended to provide critical response, relief, and recovery phase information, and to also support effective involvement of all residents, including displaced populations, in recovery phase decision-making. FEMA agreed to allow anyone registering with FEMA to automatically be registered on an email listserv, or be added to an automatic phone tree system for messages.

After Tina, efforts are also made to ensure that recovery committees included representatives from each neighborhood and a broad demographic set; rather than limiting membership to post-storm residency, committee eligibility is based on immediate pre-storm residency. The regional cable television operator agrees for a period of one year to include the local Galveston open access channel to be broadcast meetings and information regionally, including in a number of surrounding counties. These actions lead to additional communication initiatives among various sub-groups, reducing mental stress for a number of families and supporting their effective re-integration.

After Tina, in addition to significantly reducing public health threats after the storm, these families are significantly assisted in their recovery and re-integration into Galveston, and their neighborhoods benefit from their rapid re-integration through strengthened social cohesion, local economic recovery (which in turn supports recovery of other low wage jobs), improved environments for early child development, etc.

Scenario Matrix: Comparing Planning Decisions

In the matrix below, major planning decisions with a health impact are identified for each topic, shown in black. Positive resulting health effects are shown in green, remaining problems in red.

Topic	Scenario 1 – Business as Usual
Neighborhood Level Completeness and Resilience	<p>No major efforts</p> <p>Low resiliency of many neighborhoods, leading to inability to achieve “threshold” recovery levels for over a year</p> <p>Unsafe neighborhoods (see additional issues below)</p>
Social Services support	<p>Recovery social services support rolled out within first few weeks; extended support (e.g. case management) several months later</p> <p>Some families have electronic files of records, facilitating claims and re-integration</p> <p>Many of the worst-off not able to take advantage of social services support because they were too far displaced</p>
Continuity of Health Care Services	<p>Mission-critical services moved above first floor, ensuring continuity of emergency, hospital, and clinical services</p> <p>Access to care good for re-integrated residents who have insurance</p> <p>Uninsured residents still have limited access to care, mostly through St. Vincent’s and through 4C’s once they recover</p> <p>Increased illness and death for displaced residents with chronic diseases, 3-Share subscribers, nursing home and home health patients</p> <p>Providers’ inability to access medical records of displaced persons hampers continuity of care and cost control, increases morbidity</p> <p>Women and children suffer increases in domestic violence and neglect of routine doctor visits</p> <p>Inattention to severe mental illness leads to crisis episodes, neighborhood altercations and deteriorating health of residents</p>
Mental Health	<p>No major planning. Some social service coordination following Tina, but not for those significantly displaced</p> <p>Many who previously did not “need” mental health services now find themselves in need. All residents, especially the lower-middle class and poor, have increased depression and stress due to loss of jobs, finances, and businesses; worry over the future; personal chaos and lack of support services such as daycare; concerns about environmental safety; lack of hope due to slow recovery</p> <p>Elderly, homeless, parolees, and others with serious mental illness are not targeted for evacuation support, and experience significant mental health declines in the months afterward</p> <p>Mild mental illness is poorly diagnosed and treated, especially with loss of local clinics; residents with crisis episodes are sent to regional hospitals with in-patient psychiatric services, separating them from families</p> <p>Former public housing residents suffer due to severe disruption in their lives</p>

Scenario 2- A Healthier Community	Scenario 3 – ...& More Resilient
<p>Major initiative supported to create mixed-income, mixed-use neighborhoods</p> <p>Neighborhoods better support physical activity through safety, walkability, and recreational areas; nutrition; improved mental health and reduced stress, as well as issues below</p> <p>Neighborhoods are still vulnerable to effects of storm; some groups suffer health impact of displacement, job loss, environmental exposure, disruption of social networks and support systems, and decreased access to essential goods and services</p>	<p>Specific efforts added to strengthen the resiliency of neighborhoods to achieve “threshold” recovery necessary to support health after a disaster. Extended displacement of residents is minimized, as they have the motivation and support needed to resume their lives in Galveston</p> <p>With minimized disruption, individual, family, and community health is maximized in the context of many potential health threats</p>
<p>Increased numbers of people reach social services support including the worst-off, since re-integration increases and disaster communication systems are created for displaced populations (see below)</p> <p>Health impact includes improved food security, access to health care and mental health services, decreased domestic abuse, job recovery, etc.</p> <p>Some gaps in social services remain, including prevention of domestic violence, support for enrollment in benefits programs, etc., with consequent health impact</p>	<p>Following mapping of provision of disaster response social services, key gaps are filled. A system is also established to improve communication with the displaced population</p> <p>Residents’ priority needs are better and more quickly addressed, resulting in reduced stress/mental health effects and domestic violence, and improving access to food and benefits, etc.</p> <p>Improved communication reduces mental stress for a number of families and supports their effective re-integration</p>
<p>County funding used to expand services to the uninsured population</p> <p>Access to care and continuity of care increases for uninsured population that is able to re-integrate</p> <p>Displaced population still suffers significant loss of continuity of care, including for chronic disease patients, women and children, and the uninsured, as well as for general patients in terms of lack of access to previous medical records</p>	<p>Programs are put in place to improve continuity of care for displaced populations</p> <p>The health of displaced chronic disease patients, 3-Share subscribers, nursing home and home health patients improves significantly, with concordant increased potential for re-integration</p>
<p>County funding is used to expand services to the uninsured population.</p> <p>Some disaster outreach offered for mental health issues</p> <p>Resident and displaced population less vulnerable to mental health crises after the storm due to higher level of mental health entering the disaster</p> <p>Mental health services are more widely available for uninsured population that is able to re-integrate</p> <p>Neighborhood cohesiveness leads to increased social support and outreach support resources to deal with mental health issues</p> <p>Depression and stress decreases (compared to Scenario 1) due to faster and clearer paths to recovery, increased confidence, fewer job and financial losses, improved social support, and fewer concerns over environmental hazards</p> <p>Displaced population still suffers significant mental health effects</p> <p>Overall, residents still suffer mild but significant mental health effects due to the stress of the disaster combined with insufficient disaster response outreach efforts</p>	<p>Extensive recovery social services programs for mental health diagnosis and treatment are put in place for both re-integrating residents and displaced populations</p> <p>The mental health of re-entering and displaced population is better than usual following a disaster, facilitating successful re-entry and creating virtuous cycles of recovery</p>

Topic	Scenario 1 – Business as Usual
Housing	<p>Public housing rebuilt as cluster housing and block-style housing, replaced in the same areas that flooded previously in Ike</p> <p>Extended displacement for many families, with economic hardship, mental stress, poor child development environments</p> <p>For families returning, health harms include environmental exposures and poor child development environments along with unsafe rebuilding environments</p>
Food Security	<p>No major efforts are made to increase healthy food outlets, resulting in a net outcome of no grocery stores east of 45th Street.</p> <p>General access to healthy food decreases, and inequities in access to healthy food increases, leading to higher morbidity in Galveston. Reliance on processed and fast-food increases for East End residents, and re-integration is undermined</p>
Environmental Health	<p>No major planning. Contaminants from Galveston Channel wash over Island, as are additional household and small business hazardous wastes</p> <p>Families experience exposure to legacy heavy metals in Channel sediment, new dioxin introduced into the Channel, as well as petroleum from the 2010 BP Gulf oil spill.</p> <p>In addition to the direct health threats created by these contaminants, especially for children and those with compromised immune systems, the economic devastation on the Galveston economy creates additional health impacts.</p>
Early Childhood Development	<p>No major planning, resulting in patterns of daycare losses similar to Ike, with major effects especially during the response and relief phases, but also extending into the recovery phase.</p> <p>Children are subjected to unsafe and unhealthy physical and social environments, placing further stress on parents as well. Their cognitive development needs are largely unmet for months, and they internalize a stress and insecurity. These effects, along with environmental health risks, affect their health risks over the course of their lifetimes.</p>
Economic development	<p>No major planning. Contract, low-wage, and small business employees are laid off following Tina.</p> <p>This leads to loss of income, health insurance, stress, increased domestic violence, and lack of access to basic goods. Even families that don't suffer damage to their homes decide to move from Galveston when they lose their jobs, further adding to their, and their communities', stress.</p>

Scenario 2- A Healthier Community	Scenario 3 – ...& More Resilient
<p>Infill housing used as part of the Mixed-income neighborhood strategy, reducing segregation and concentration poverty. Recovery funds from Ike used to abate infill houses with lead</p> <p>Health for public housing residents improves significantly over the years, and health of other residents also improves more modestly as a result of the mixed-income/mixed-use neighborhood development</p> <p>Some residents still lost to displacement, with consequent health impact to them and their former neighbors</p>	<p>Better building codes and buildings reduce damage. Affordable housing program to create path to home ownership implemented</p> <p>Better codes lead to reduced damage and faster recovery, with accompanying health benefits</p> <p>The home ownership program further diminishes segregation and concentration of entrenched poverty for some participants, leading to better health</p>
<p>Multiple approaches to reduce food deserts includes recruiting a large grocery store in the East End, an incentive program for corner stores to carry healthy foods, and transportation routes that reduce travel time to healthy food outlets</p> <p>General nutrition improves, and inequities in food security decline as food deserts are shrunk</p> <p>Some small business outlets are lost due to the storm, resulting in lower nutritional intake that will eventually negatively impact health</p>	<p>Small business lines of credit extended to corner stores</p> <p>Because corner stores recover quickly, food security is strengthened in neighborhoods and nutritional intake improves</p>
<p>City uses recovery funds from Ike to abate lead houses; monitors soil burdens for toxins, especially for sensitive land-use areas, to identify priority areas for voluntary remediation; establishes a local hazardous waste disposal program</p> <p>Housing based lead exposure decreases for families, and children are exposed to fewer toxins on playgrounds, resulting in improved cognitive functioning and improved physical health</p> <p>Lack of pre-emptive action fails to protect Galveston from exposure to toxins created by the storm</p>	<p>Prevention efforts by the EPA include sampling and appropriate remediation of the Galveston Channel and the San Jacinto River.</p> <p>The city implements a public education and provision of safety equipment to families; pre-evacuation pick up of household and small business hazardous waste; monitoring of air quality; and frequent watering of streets after disaster</p> <p>Preventive efforts lead to reduced exposure to toxins, with positive short- and long-term health effects, especially for children, the elderly, and those with weaker immune and respiratory systems</p>
<p>Incentives are created to ensure geographic diversity of affordable daycare; child advocates roll out a program for provider and parent training and for nutrition and physical activity programs</p> <p>Children’s psychological, social, and mental development improves; childhood obesity declines</p> <p>Some daycares are lost due to the storm, resulting in poorer early childhood development environments, increased family stress, and delayed recovery for those families</p>	<p>In addition to small business lines of credit, MOU’s with regional daycare providers and State licensing policy changes are implemented</p> <p>Fewer daycares are lost and continuity of daycare services is improved for re-integrated and regionally displaced children, with accompanying improvements in child health and family stress</p>
<p>Development of small businesses and incentive programs support development of healthy food outlets, daycare centers, and other essential services</p> <p>More complete neighborhoods and job growth, lead to improved health and re-integration potential</p> <p>Storm still eliminates jobs and small businesses serving essential functions, which worsens health, increases stress and reduces re-integration</p>	<p>Pre-approved lines of credit for small businesses support recovery of essential services. Cash-for-work program fills gaps in employment after the storm for many low-wage workers</p> <p>Lines of credit support re-integration, threshold recovery levels in neighborhoods, job recovery, normalization of family life, and more social and social support structures</p> <p>Cash-for-work program ensures income flow and potential for stable and successful re-integration of families, environmental health, “threshold” recovery in neighborhoods, etc.</p>

Unpacking the Issues: How evidence-based planning for health can create Healthy and Resilient Neighborhoods

The stories created in the three scenarios above are fictional, but the cause-effect relationships between planning and health impacts are based on a century of research into what works to improve health in neighborhoods, as well as newer evidence on how to improve health resilience in communities. Much of the evidence has been brought together in the Healthy Development Measurement Tool, (or HDMT) which is a comprehensive evaluation metric to consider health needs in urban development plans and projects. The HDMT explicitly connects public health to urban development planning in efforts to achieve a higher quality social and physical environment that advances health. The tool consists of 125 indicators linked to evidence-based research that provide metrics for evaluating the impact of planning decisions on health and health equity across six domains (called elements). These elements include environmental stewardship, sustainable and safe transportation, social cohesion, public infrastructure / access to goods and services, adequate and healthy housing, and healthy economy. Each plays a role in determining the health and quality of life of residents within any city or neighborhood. In developing the scenarios, we used many these indicators, as they apply in Galveston, to inform predictions of health impacts. The list on the next page shows the indicators that each Topic area analysis in the scenarios is based on.

The maps in this section present the evidence base linking many of the planning decisions to health impacts described in the scenarios. We have also developed additional indicators to fill in information gaps, especially those related to disaster planning. This is not purported to be a comprehensive list; it is only a sampling of the kind of information that can be usefully incorporated into ongoing planning, and institutionalized into planning processes.

Each indicator presents an explanation and limitations of the indicator, including the evidence linking the indicator to improved health outcomes, as well as the evidence-based standard for good health and recommended policy / planning actions based on that evidence. (Information on the studies comprising the evidence base can be found at the HDMT website at www.thehdmt.org.) We have also provided maps showing the application of the indicator to Galveston's neighborhoods. They are, in essence, maps of the status quo, maps of what Galveston is today, not what it could be. For some indicators, we have had to use data based on pre-Ike conditions; however, we have tried to limit these assessments to indicators for which we expect a similar rebuilding approach. Please note that while the East End of the Island is depicted in most of these examples, similar data are being collected or are already in hand and mapped for the entire Island, including the West End, inclusive of the City of Jamaica Beach. As this project continues, more indicators will be evaluated in our city.

Evidence base for scenario issue areas

Below are indicators from the HDMT as well as others used in setting up the Galveston Hurricane Recovery Scenarios, and which guided the development of the maps that follow. The identifying characters, i.e. PI.5.a, indicate which of the six HDMT elements the indicator is drawn from.

- Neighborhood Completeness and Resilience
 - PI.5.a: Proportion of population within ¼ mile of a neighborhood or regional park (p. 36)
 - PI.7.d: Proportion of land zoned for commercial and residential uses (p. 37)
 - ST.1.a: Proportion of households without a motor vehicle (p. 54)
 - SC.1.c: Residential mobility (p. 56)
 - SC.1.f: Density of off-sale alcohol outlets (p. 57)
 - PI.7.c: Proportion of population within ½ mile from bank or credit union (p. 44)
- Recovery Social Support Services
 - SC.1.c: Residential mobility (p. 56)
 - SC.1.f: Density of off-sale alcohol outlets (p. 57)
 - Access to health care (p. 46)
 - Location of food banks / pantries (p. 41)
- Health Care
 - Access to health care (p. 46)
 - Access to pharmacies (p. 47)
 - Food pantries and meal providers (p. 41)
 - HE.3.a: Income inequality (p. 53)
 - SC.1.c: Residential mobility (p. 56)
 - SC.1.f: Density of off-sale alcohol outlets (p. 57)
 - HH.1.b: Proportion of households paying greater than 50% of their income on their homes (p. 48)
 - HH.1.d: Proportion of households living in overcrowded conditions (p. 49)
 - HH.3.d: Proportion living below the poverty level (p. 50-52)
- Housing
 - HH.1.b: Proportion of households paying greater than 50% of their income on their homes (p. 48)
 - HH.1.d: Proportion of households living in overcrowded conditions (p. 49)
 - HH.3.d: Proportion living below the poverty level (p. 50)
- Food security
 - PI.8.a: Proportion of population within ½ mile of a supermarket (p. 38)
 - PI.8.b: Proportion of retail food establishments that accept state/federal food assistance programs (p. 40)
 - PI.8.c: Density of fast food outlets (as well as a location of all restaurants) (p. 42)
 - ST.1.a: Proportion of households without a motor vehicle (p. 54)
 - Location of food banks / pantries (p. 41)
- Environmental Health
 - ES.3.a: Proportion of land that is unutilized, industrial, or contaminated (p. 31-32)
 - ST.1.a: Proportion of households without a motor vehicle (p. 54)
 - Location and results of post-Ike sediment testing sites (p. 33); Location of toxic sites potentially impacted by a storm (p. 34)
- Early Childhood Development
 - PI.1.a: Maximum capacity of licensed child care facilities and proportion of 0 – 14 year olds (p. 34)
 - PI.5.a: Proportion of population within ¼ mile of a neighborhood or regional park (p. 36)
 - SC.1.c: Residential mobility (p. 56)
 - SC.1.f: Density of off-sale alcohol outlets (p. 57)
 - HH.1.d: Proportion of households living in overcrowded conditions (p. 49)
 - HH.3.d: Proportion living below the poverty level (p. 50)
 - PI.8.b: Proportion of retail food establishments that accept state/federal food assistance programs (p. 40)
 - ST.1.a: Proportion of households without a motor vehicle (p. 54)
 - Access to health care (p. 46-47)
 - Food pantries and meal providers (p. 41)
- Economic Development
 - PI.7.c: Proportion of population within ½ mile from bank or credit union (p. 44)
 - PI.7.d: Proportion of land zoned for commercial and residential uses (p. 37)
 - HE.3.a: Income inequality (p. 53)

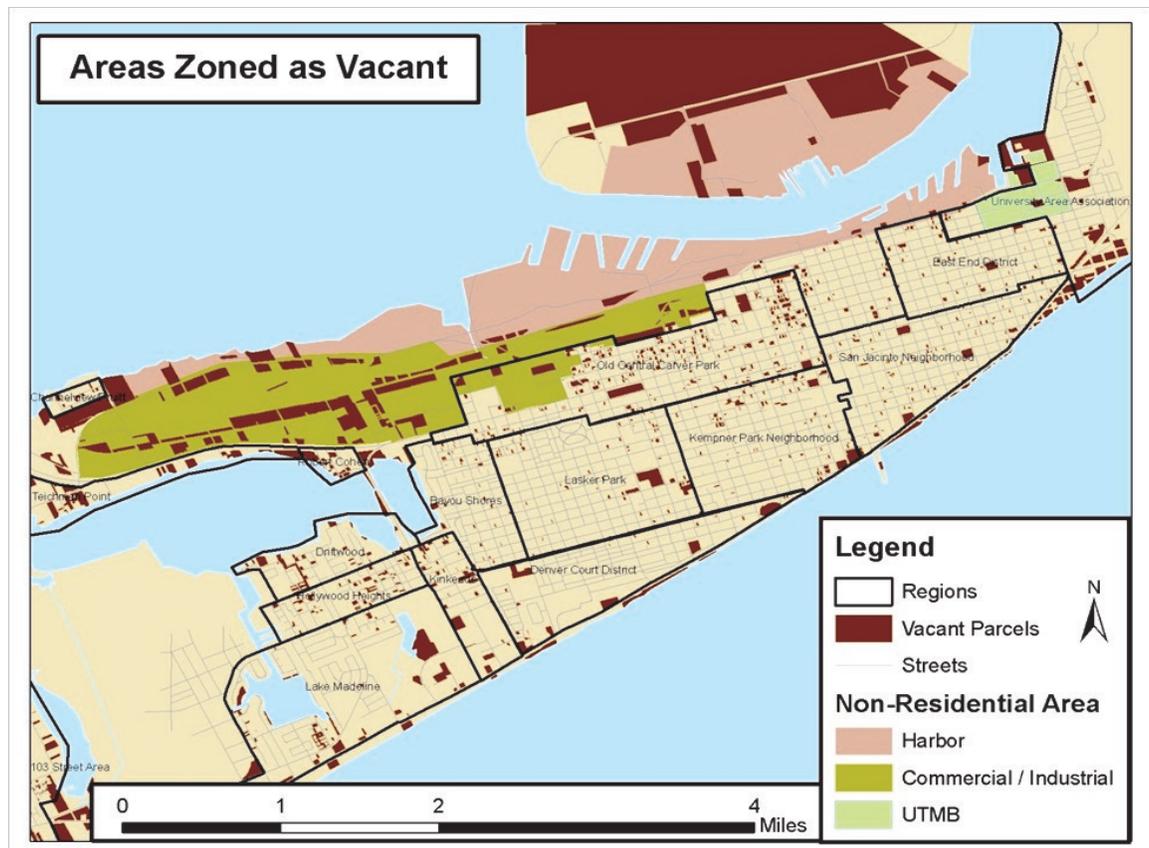
Environmental Stewardship

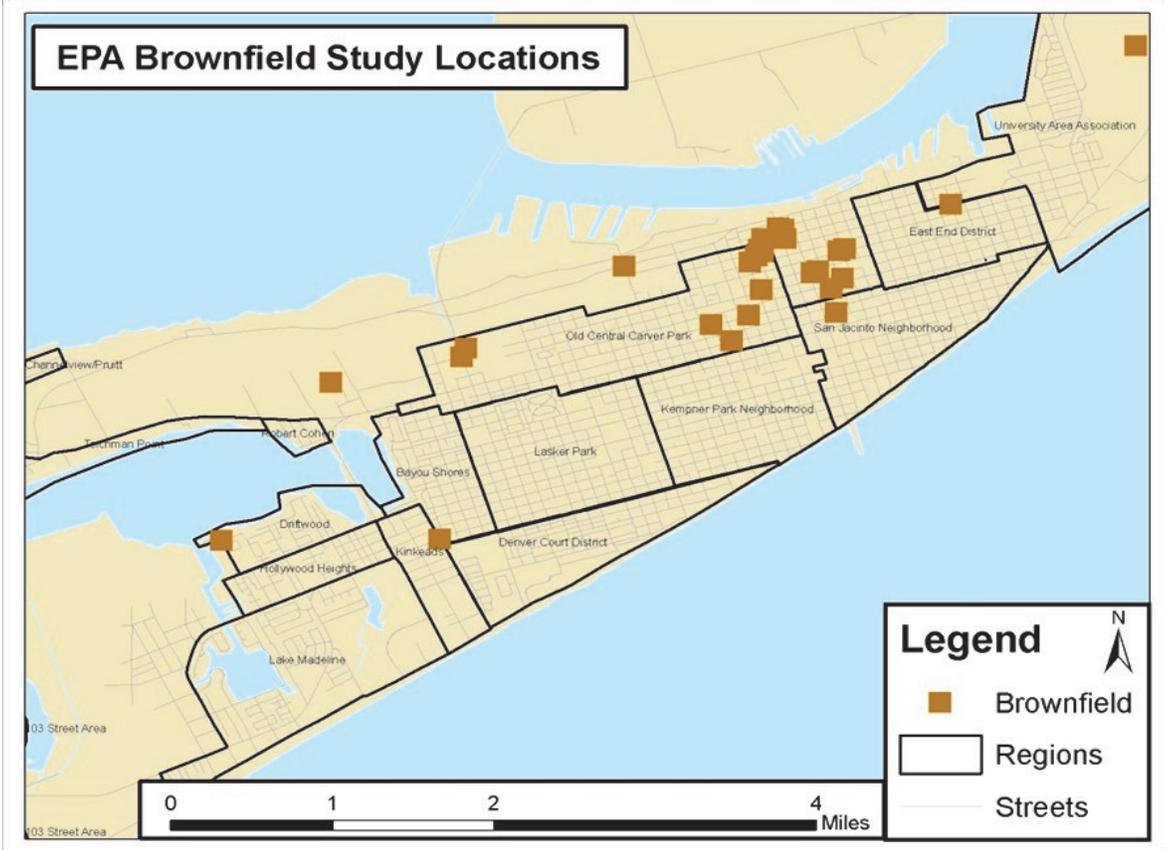
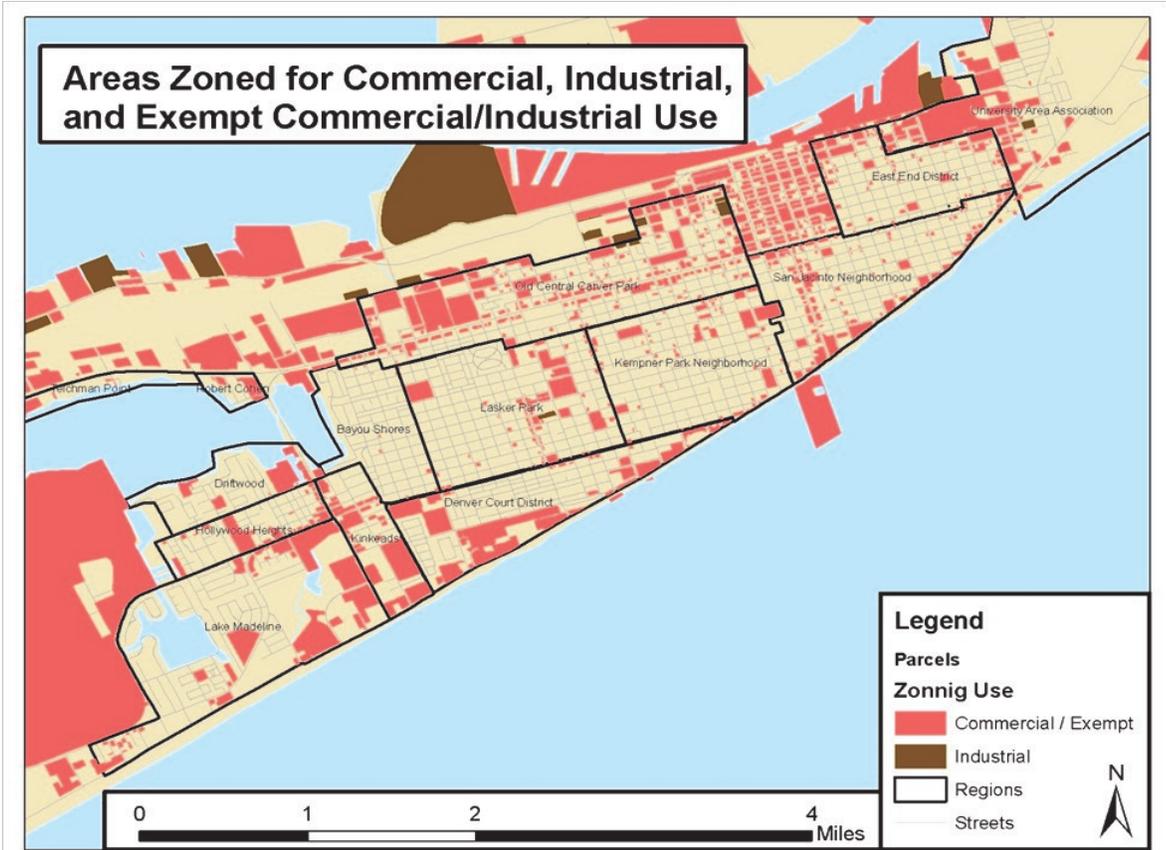
Indicator ES.3.a: Proportion of land that is unutilized, industrial, or contaminated

Why is this a community health indicator? Opportunities for prevention and public health planning must begin with improved environmental health surveillance to track historic hazards in the environment, population exposures to chemical and physical hazards, and priority health conditions in the population. As part of its mission to protect the environment and human health, the United States Environmental Protection Agency is undertaking an important initiative to revitalize land by restoring contaminated, and potentially contaminated, sites to productive economic and green space use. The revitalization initiative seeks to resolve barriers to reuse and promote the reuse of sites that are being or have been cleaned up. A major objective of the revitalization initiative is to instill at EPA a culture of reuse of our precious resources. To this end, EPA is working to ensure that cleanup remedies take into account a property's anticipated future use.

Standard: Lowest number of contaminants or threats per neighborhood

Potential Policy Recommendation: Public/Private partnerships aimed at redeveloping contamination sites and preventing creation of new brownfields on the Island.

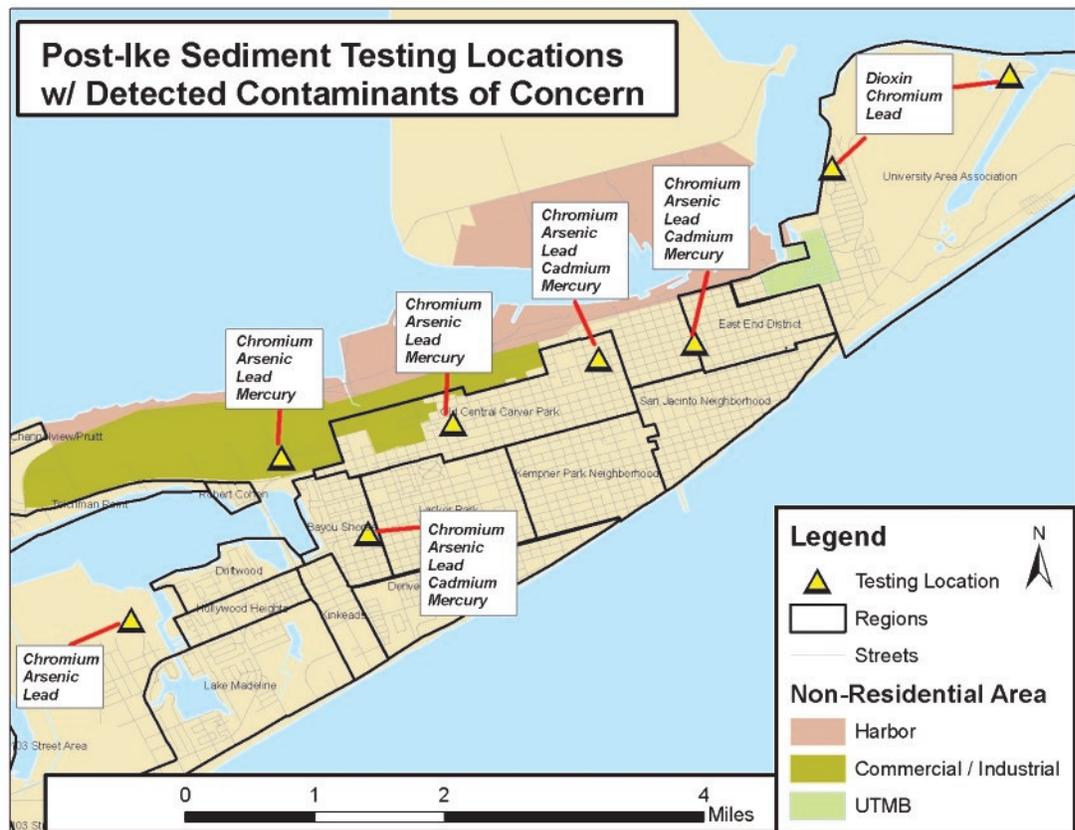




Indicator: Proportion of land with elevated levels of toxins

Issue: Sediment left by Ike was contaminated with elevated, but not actionable, levels of heavy metals and other contaminants. As such, there wasn't enough contamination to warrant remediation, but their presence warrants a degree of caution when handling soil and deposits. Contaminates detected included a range of heavy metals, including lead, which is commonplace in Galveston soil due to the pre-existing lead paint burden on the East End. Also detected were dioxins and related chemicals, though these were only detected in the East End Flats and in Fish Village.

Potential Policy Recommendation: Public service announcements following sediment deposit about care and handling of deposited material, provisions for having protective equipment available for those involved with clean up, promote educational seminars on proper immediate and long-term clean up of deposited sediment.





Public infrastructure

Indicator PI.1.a: Maximum capacity of licensed child care facilities and proportion of 0-14 year olds

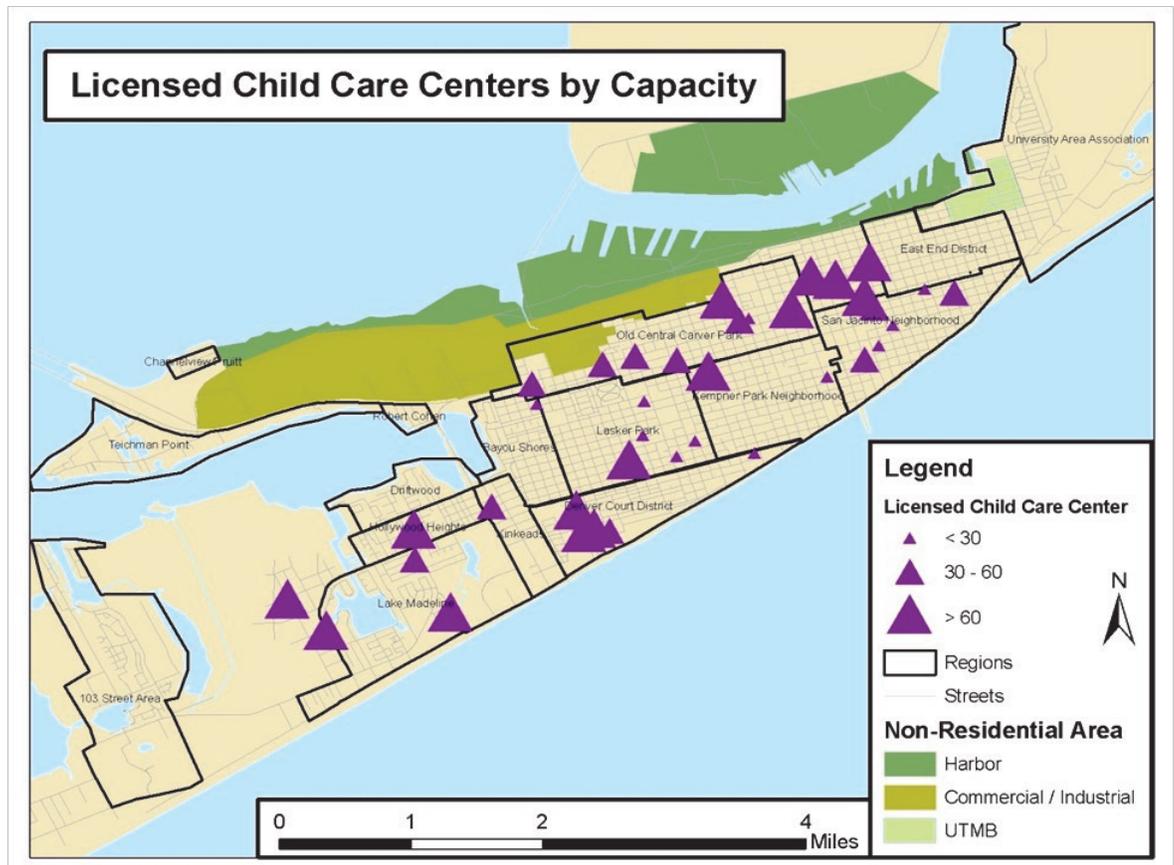
Why is this a community health indicator? Substantial research demonstrates that accessible high quality childcare positively affects childhood growth, physical development, and physical health, cognitive, behavioral and school outcomes. The accessibility of childcare for families with children depends on ability of providers to meet demand.

However, there is a danger in assuming that licensing capacity correlates to supply or met need. While this indicator generally is a useful approach to simplify planning, the indicator has some problems. Many caveats may not match demand, including age groups offered, full-time vs. part-time openings, hours of daycare operation, geographic location of the daycare, or cultural appropriateness, to name a few. Children are often cared for outside their neighborhood for a number of reasons. Many families use care en route between home and work. Others select a particular location because they know and prefer a provider there. Some may assess the quality of a program as being worth the travel outside their neighborhood or route to work. In some instances, a family may move to a new neighborhood but keep their child with a provider they know in their old neighborhood. Another consideration, quality of care, also becomes an issue when considering child care, and therefore it is important to consider state licensing criteria and enforcement of infractions against licensing criteria. These data are available and can be mapped if needed. To better understand parental demand and access to child care, one study by San Francisco's Child Care Resource and Referral Agencies found that of 437 participants, 71% stated they preferred child care near their home, 11% wanted care on the way to somewhere they were going and 8% wanted care near their place of employment. Despite high preference to have child care near the home, only 53% currently use a facility in their home zip code. Location of care was the most important factor for parents choosing a program, followed by the

program's affordability, quality and safety respectively. As such, this need, coupled with the large number of employees on the island, presents an opportunity for economic development in Galveston. Other factors considered included availability, cost, and hours of operation. It should be noted that this indicator does not include residential 24 hour care, foster care, or babysitting.

Standard: Adequate, affordable and quality child care for meeting the needs of neighborhood residents

Potential Policy Recommendation: City or community agency recognition program rewarding facilities with routine high quality assessments, affordable rates, and hours of operation congruent with needs of island residents and those that work on the island.

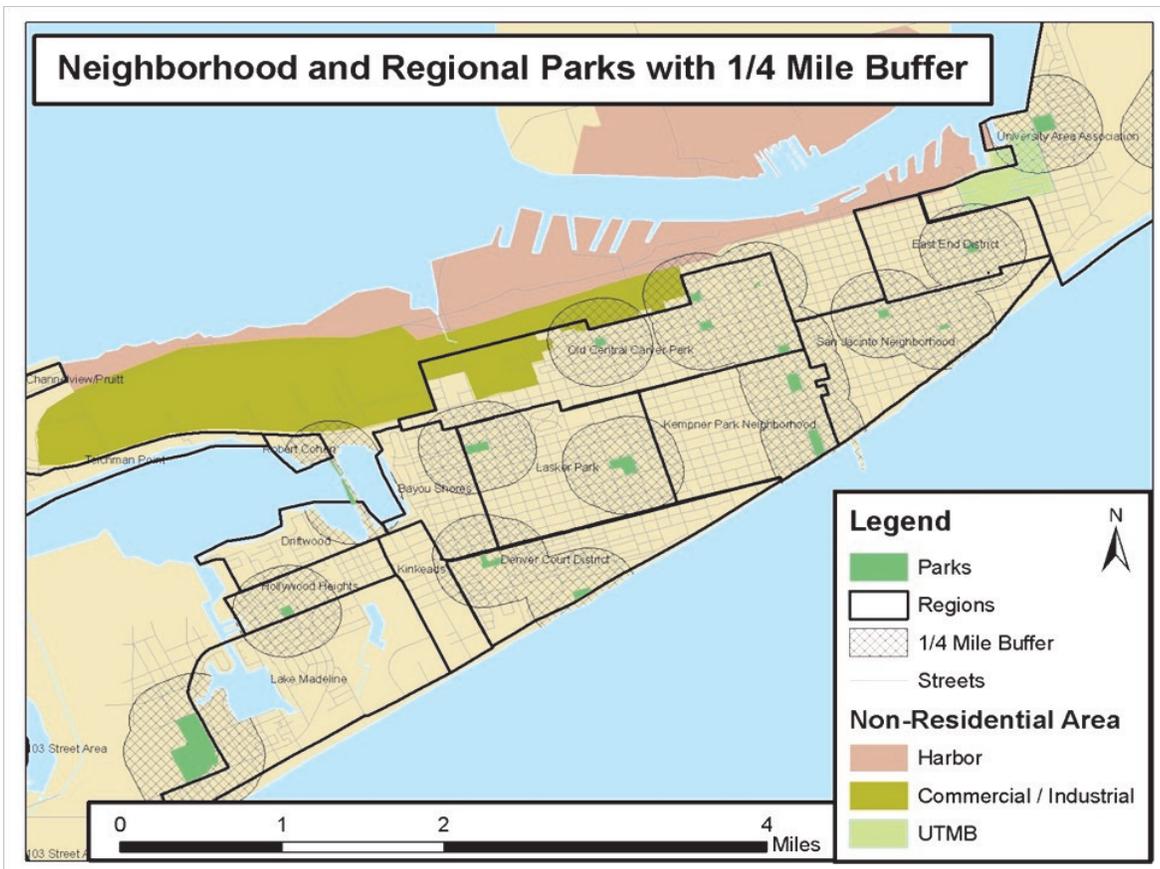


Indicator PI.5.a: Proportion of population within ¼ mile of a neighborhood or regional park

Why is this a community health indicator? Both the number of neighborhood parks in proximity to one's residence and the types of amenities at the park (i.e., lighting, sports fields) predict the duration of physical activity in children. One review of studies showed that access to places for physical activity combined with outreach and education can produce a 48 percent increase in the frequency of physical activity. Evidence also shows that contact or views of the natural environment can improve functioning in children with Attention Deficit and Hyperactivity Disorder (ADHD) and problem solving and cognitive function in people living in public housing. More generally, living in proximity to green space is associated with reduced self-reported health symptoms, better self-rated health, and higher scores on general health questionnaires. Finally, children who live in close proximity to parks, playgrounds, and recreational facilities tend to be more active compared to children who do not live near those facilities. Adolescents who engage in moderate physical activity five or more times a week are more likely to achieve an 'A' in math and science than their peers.

Standard: Locate parks and public open space so that the largest number of residents is within ¼ mile.

Potential Policy Recommendation: Identify potential vacant and/or abandoned tracts of land within neighborhoods that could be developed into public open space. Develop long-term plan for improving amenities across all parks to include outdoor recreational facilities, picnicking facilities, comfort amenities such as access to water and public restrooms, parking, sports fields, fishing/crabbing, and other outdoor activities.

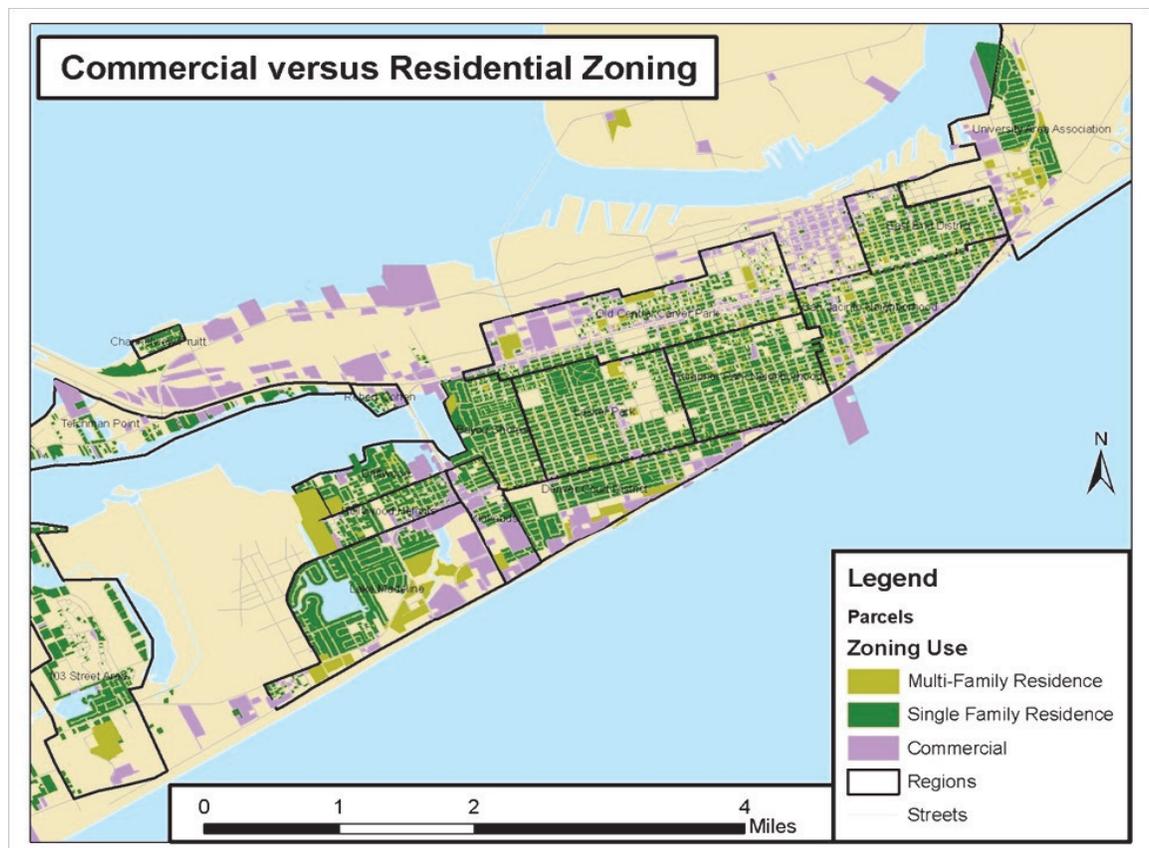


Indicator PI.7.d: Proportion of land zoned for commercial and residential uses

Why is this a community health indicator? Research has found that neighborhoods with diverse and mixed land uses can create proximity between residences, employment, and goods and services, reducing vehicle trips and miles traveled and increasing active transportation such as walking and biking. In addition, a 12.2% reduction in odds of being obese was detected with increase in density, mixed use, and street connectivity within 1 km of residential area, i.e., living in a mixed use area with a variety of shops and services is a robust predictor of obesity in urban areas. Finally, retail development in the context of mixed-use design generates natural public surveillance. Crime reduction and surveillance improves levels of perceived safety.

Standard: Neighborhoods that promote mixed-use development that includes key commercial amenities spaced within residential areas to prevent urban sprawl.

Potential Policy Recommendation: Promote mixed-use zoning as recovery and development efforts continue to encourage locating amenities conducive to improved health and quality of life closer to where people live, work, and play. This could include leveraging the development of vacant and/or abandoned areas for development.

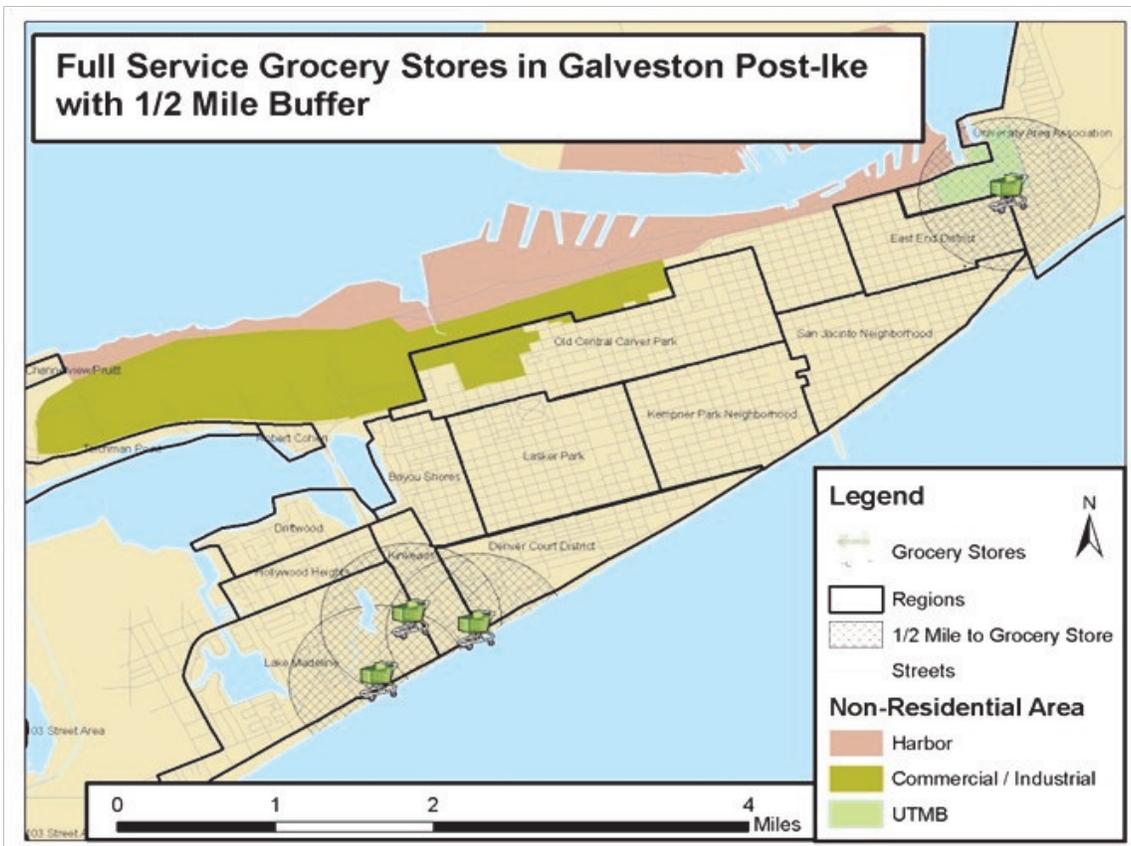


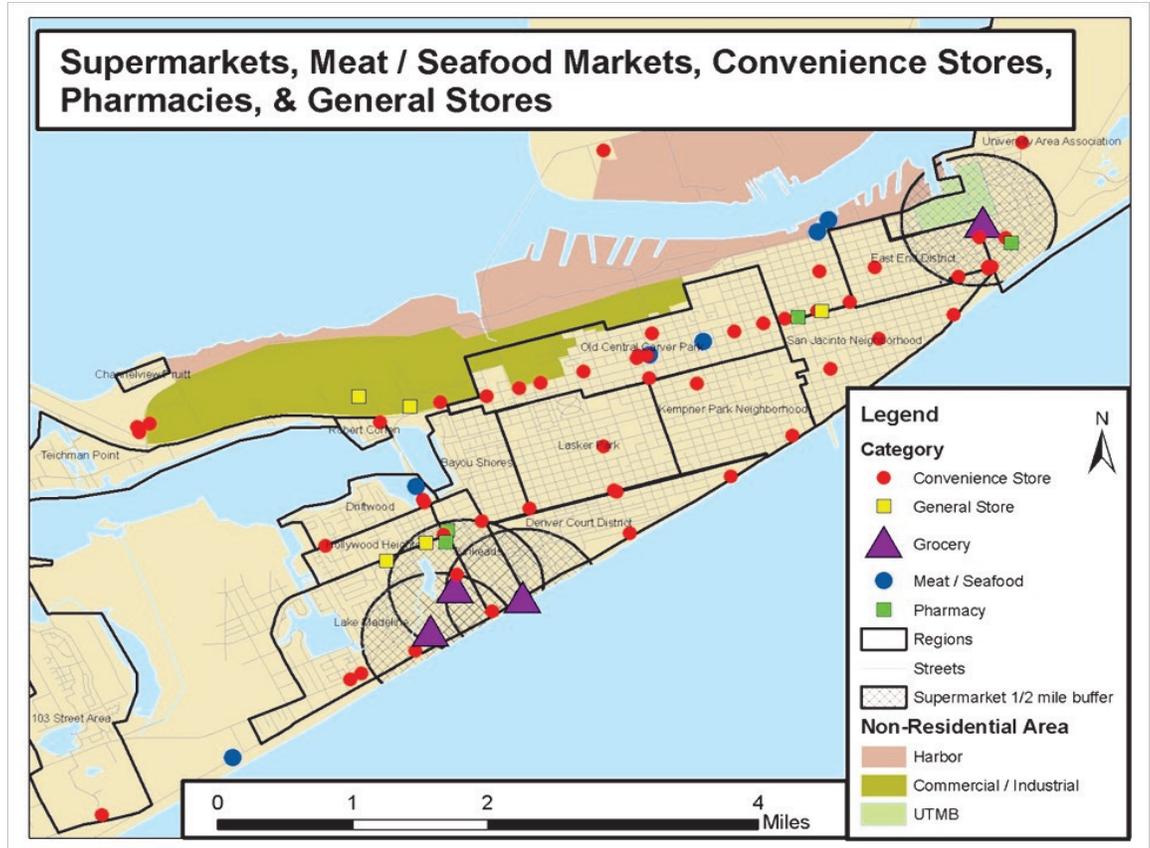
Indicator PI.8.a: Proportion of population within 1/2 mile of a supermarket

Why is this a community health indicator? Local food environments influence the options households and individuals have. Access to healthy food choices is directly correlated to obesity and diabetes rates, which occur in higher rates among people living in low-income communities with worse food environments. Supermarkets may provide access to a greater variety of cheaper and healthier foods, including fresh fruits and vegetables. This access helps to facilitate healthier dietary choices. Research has found that the presence of a supermarket in a neighborhood predicts higher fruit and vegetable consumption and a reduced prevalence of overweight and obesity. As a result, problems of under- and over-nutrition are often attributed to lack of access to supermarkets. Low-income, minority communities typically have fewer supermarkets and grocery stores than higher SES neighborhoods with primarily White residents, and they therefore disproportionately suffer from problems of over- and under-nutrition.

Standard: Full service grocery stores, or a combination of other stores that, when combined, provide a full range of affordable, quality, and healthy foods for purchase, located to be within 1/2 mile of a majority of residents.

Potential Policy Recommendation: Encourage the recruitment of additional full service grocery stores at strategic locations, development of new or enhancing existing corner markets and other related stores to carry a more broad range of affordable and healthy foods, or improving the accessibility to existing grocery stores.



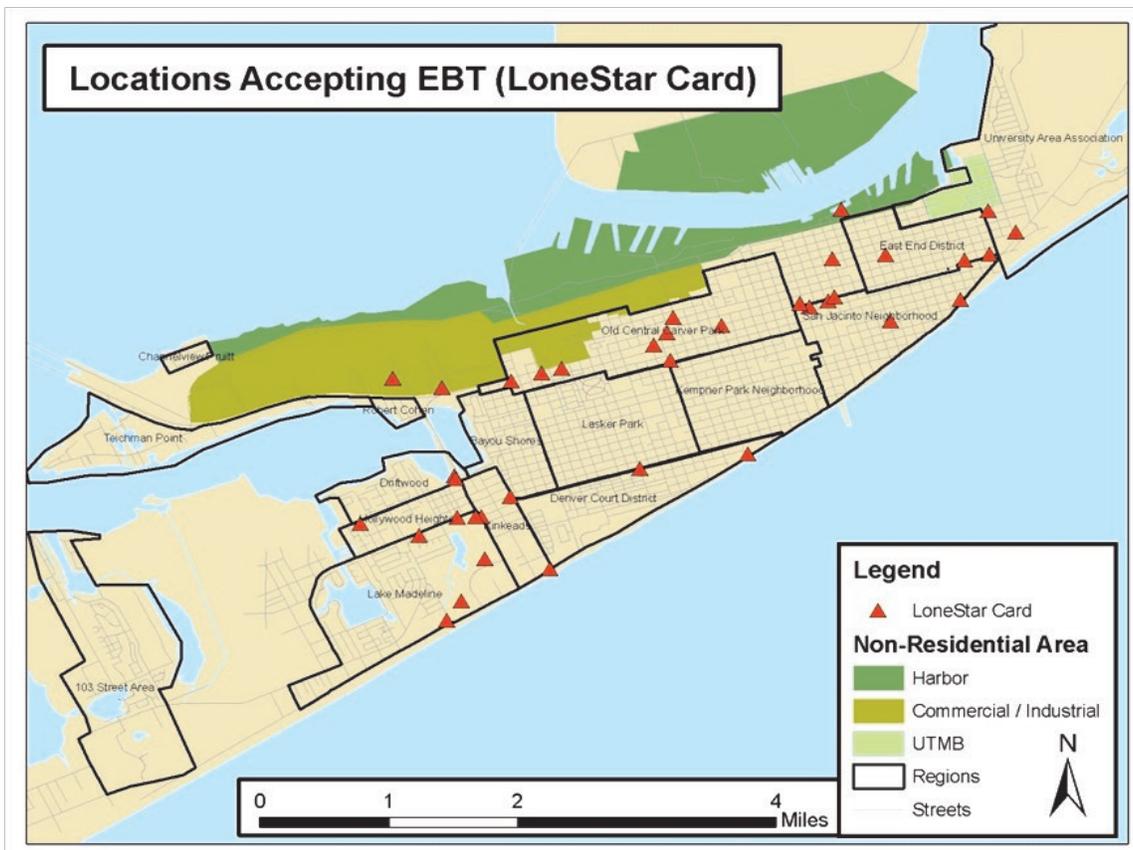


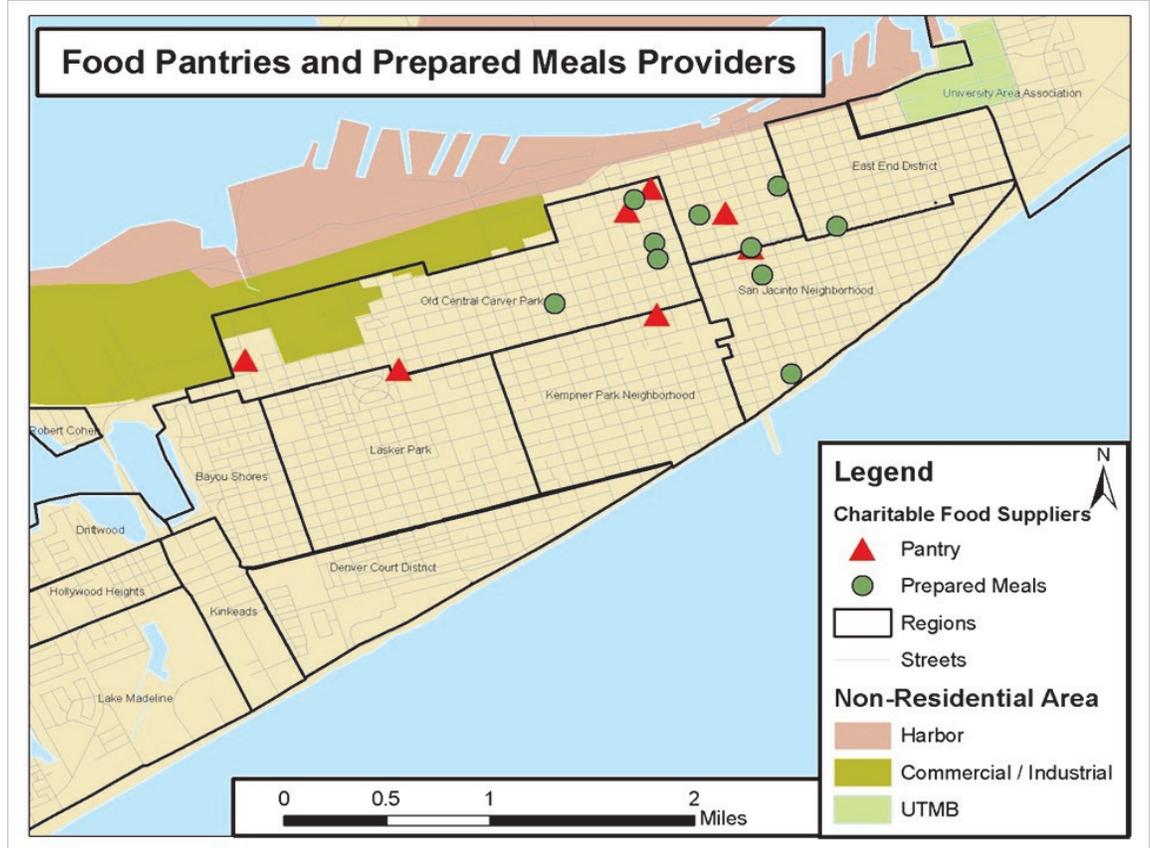
Indicator PI.8.b: Proportion of retail food establishments that accept state/federal food assistance programs

Why is this a community health indicator? To accept food stamp EBT cards, merchants must be authorized for food stamp acceptance by the USDA Food Stamp Program. For a store to be eligible to accept EBT the store must sell food for home preparation and consumption and meet at least one of the criteria : 1) offer for sale at least three different varieties of food in each of the following four staple food groups, with perishable foods in at least two categories, on a daily basis: bread and grains, dairy, fruits and vegetables, meat, poultry, fish OR 2) at least 50% of the total sales (e.g., food, non-food, services, etc.) at the store must be from the sale of eligible staple food. This includes not only grocery stores, but could also include convenience stores, corner markets, pharmacies that sell food, and even liquor stores. Different communities and populations have very different access to healthy and unhealthy foods. Increasingly, access to reliable transportation goes hand-in-hand with access to healthy foods. Food stamp recipients may lack access to larger stores, reducing the availability of nutritious food options. Underutilization of EBT is one likely reason why low-income households continue to suffer from insufficient and unhealthy food supplies.

Standard: Since this indicator is again examining where and how residents access their foods, particularly those residents that are most vulnerable to low quality diets and nutritional insufficiency, it is important to consider all sources of food and begin to build a contextually appropriate standard for each neighborhood/city.

Potential Policy Recommendation: Similar to above, polices addressing this issue should aim at improving the accessibility of these vulnerable populations to affordable and healthy foods. This could include addressing where these resources are located or the means in which people can access them (such as evaluating the role of public transportation).



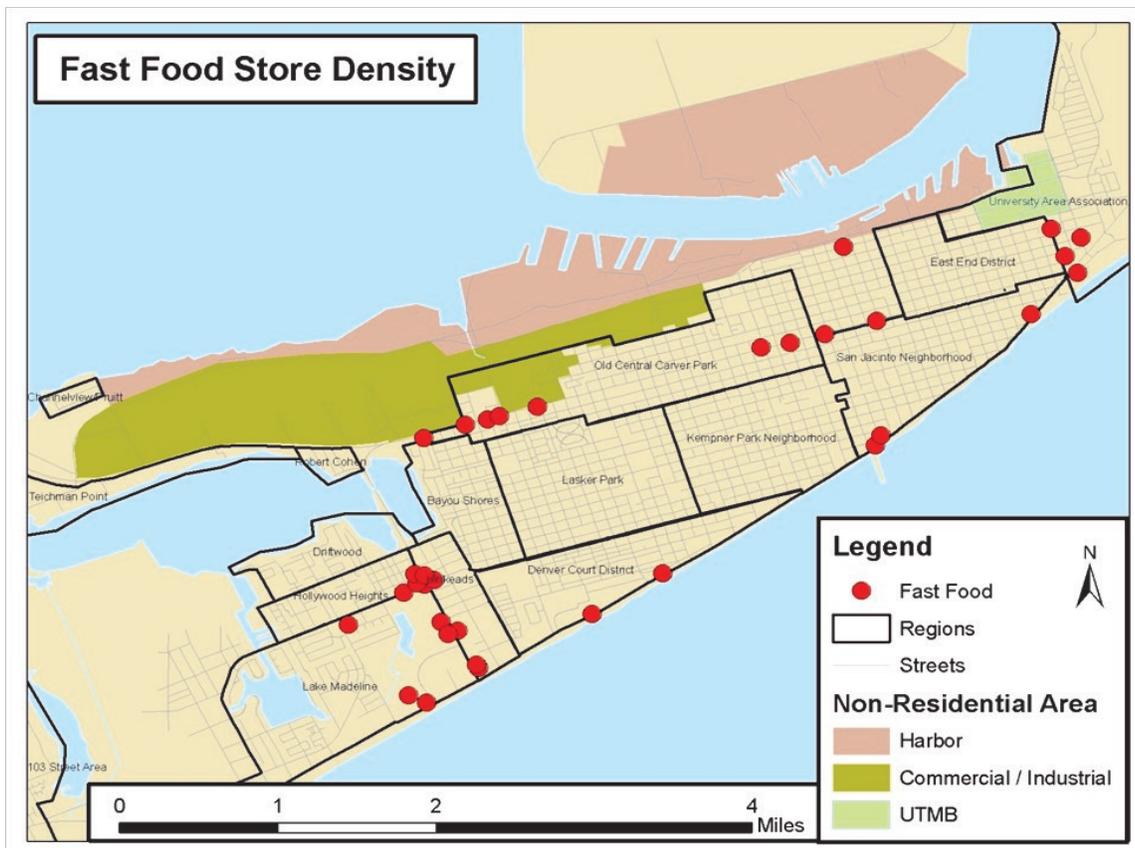


Indicator PI.8.c: Density of fast food outlets

Why is this a community health indicator? People who live near an abundance of fast-food restaurants and convenience stores compared to grocery stores and fresh produce vendors, have a significantly higher prevalence of obesity and diabetes.

Standard: Low density of fast food restaurants within neighborhoods and/or healthy alternatives and activities within neighborhoods with existing high densities fast food outlets.

Potential Policy Recommendation: Careful consideration about possible impact of locating new fast food restaurants within neighborhoods already dense in less healthy options. Increasing the number of healthy alternatives and/or other health promotive amenities (i.e., parks) within these neighborhoods.



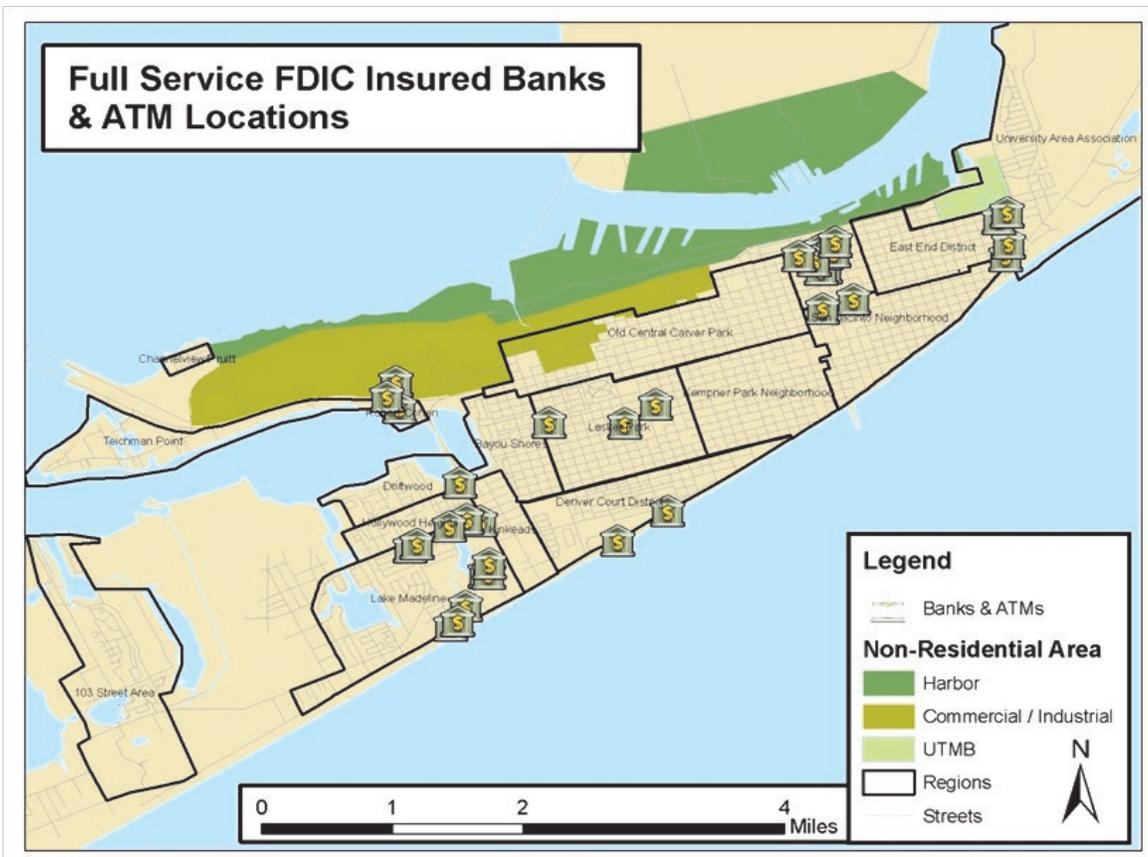


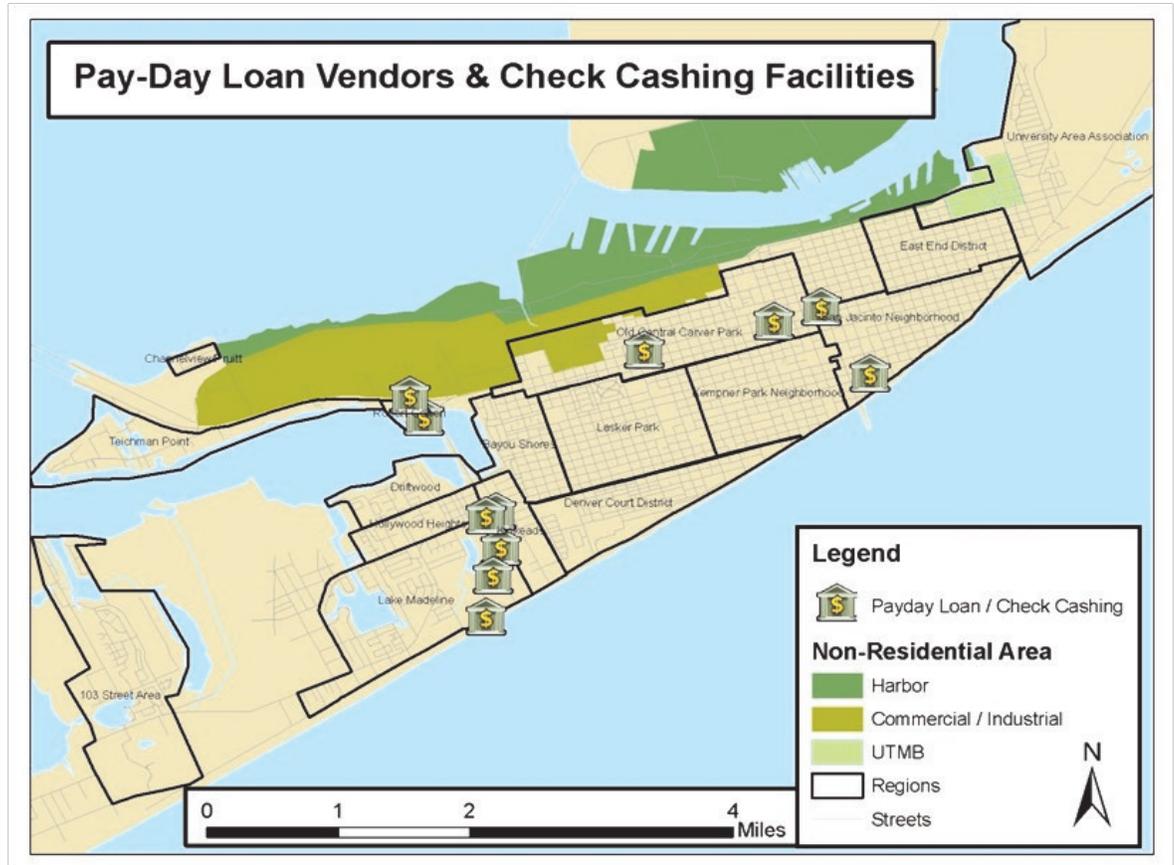
Indicator PI.7.c Proportion of population within 1/2 mile from bank or credit union

Why is this a community health indicator? Studies show the lack of physical proximity to financial services is most frequent in low-income and minority populations compared to wealthier households. In addition, fringe financial services, such as check cashers, payday lenders, and pawn shops, are largely in low-income and minority neighborhoods. These lenders have high fees attached to their service and no savings account options, which puts an additional financial burden on these populations. Being within walking distance of neighborhood goods and services, such as banks and credit unions, promotes physical activity, reduces vehicle trips and miles traveled, and increases neighborhood cohesion and safety. By reducing vehicle trips and miles traveled, dense neighborhoods with diverse and mixed land uses can also reduce air and noise pollution, which subsequently impacts associated respiratory and noise-related health conditions. According to the US Green Building Council, research has shown that "living in a mixed-use environment within walking distance of shops and services results in increased walking and biking, which improve human cardiovascular and respiratory health and reduce the risk of hypertension and obesity."

Standard: Equitable distribution of banks and credit unions, with low densities and concentrations of payday lenders and related businesses.

Potential Policy Recommendation: Careful consideration about possible impact of locating new banks, payday lenders, and ATMs to surrounding neighborhood; disincentives for opening new payday lending facilities in areas of concentrated poverty.



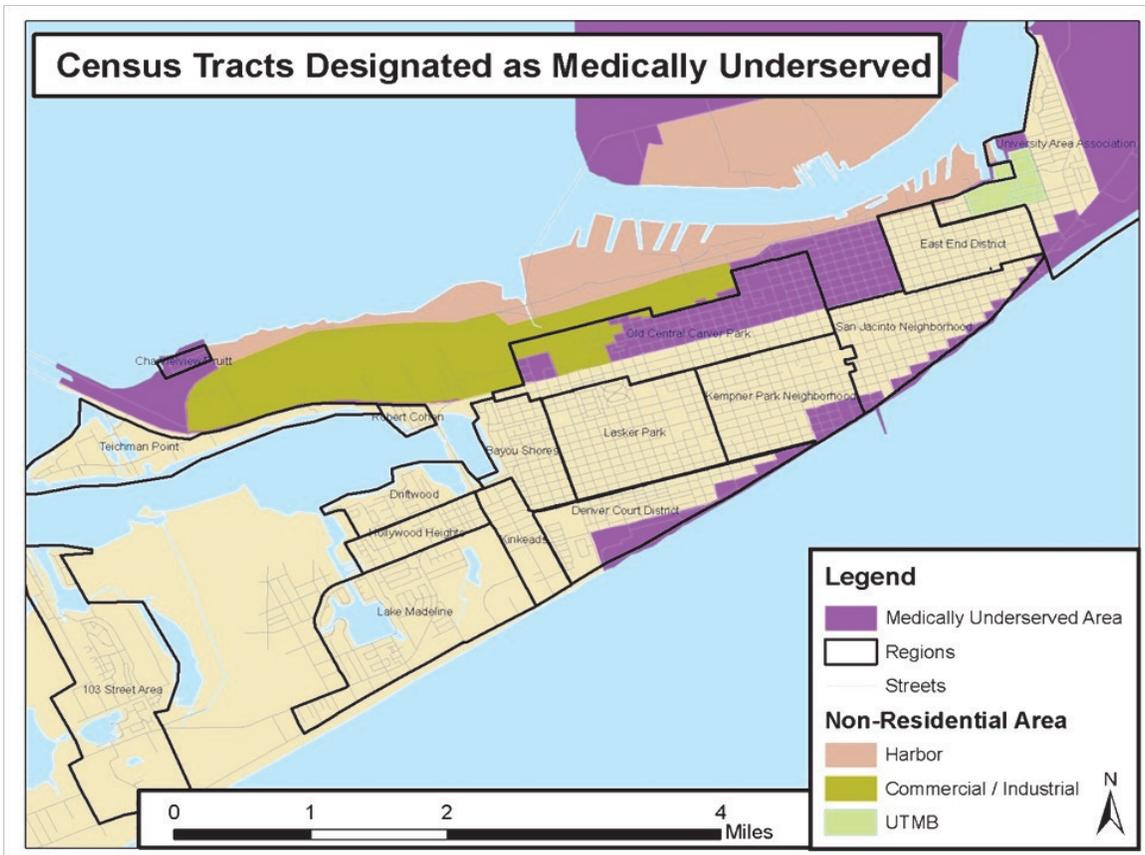


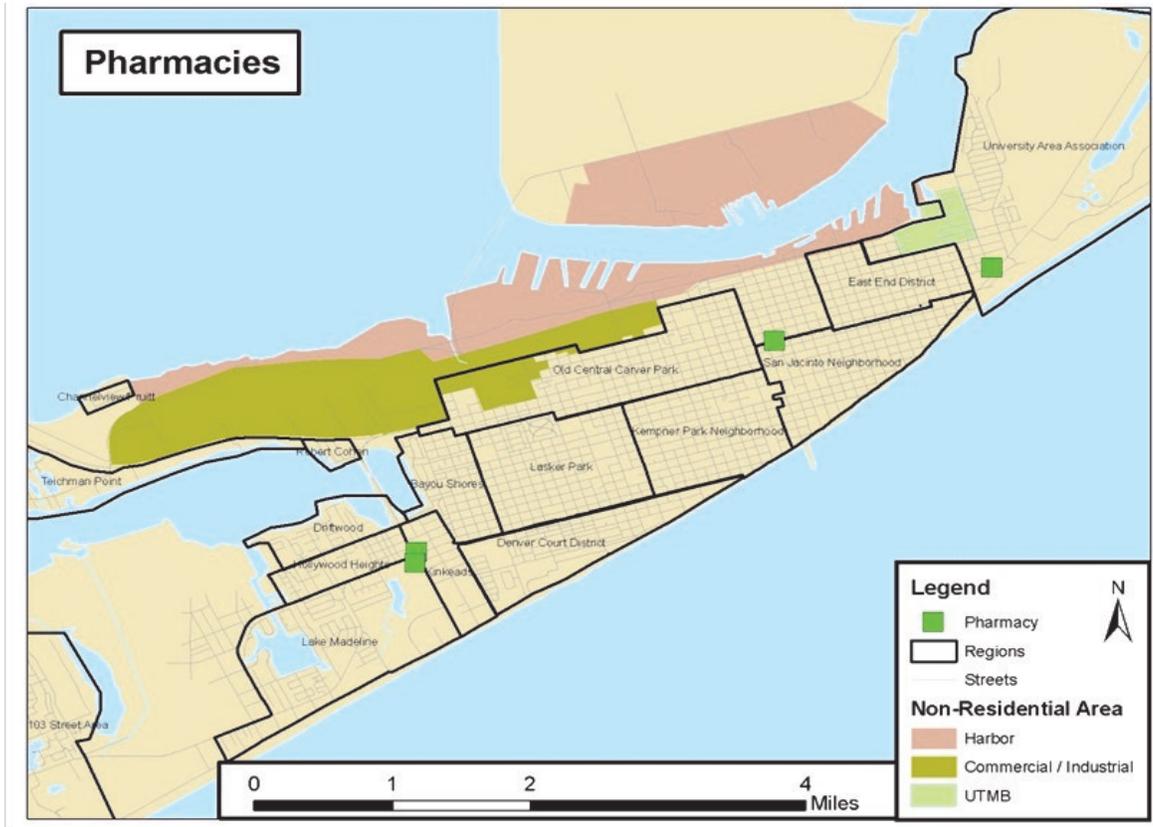
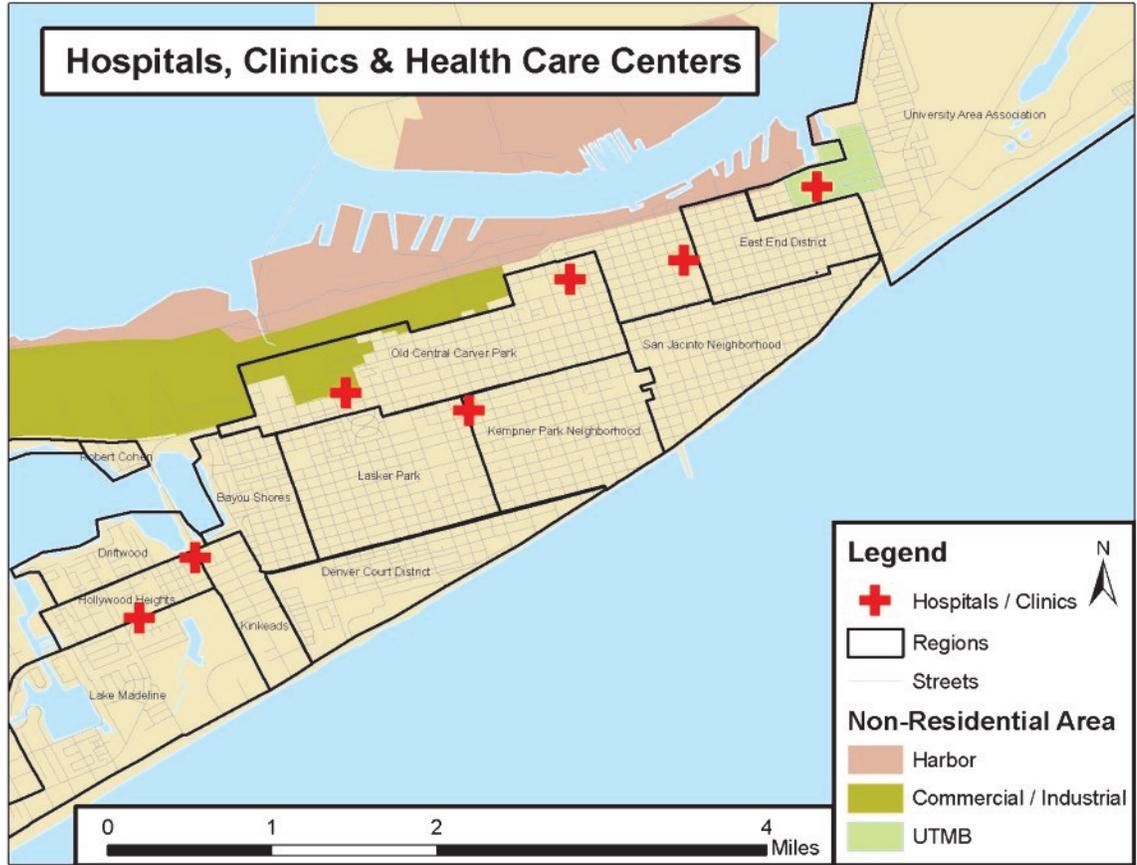
Healthcare

Indicator: Access to healthcare providers, hospitals/clinics, and pharmacies

Why is this a community health indicator? Access to health care including preventive services and treatment, is positively associated with health, especially for children, women, and the elderly. Although Galveston is home to a large academic medical center, UTMB, parts of the island are designated as medically underserved areas by the U.S. Department of Health and Human Services. While there are several factors that influence the health status of neighborhood residents, access to health care, and a “medical home,” plays a role determining the development and progression of disease processes. Early intervention through accessing quality primary care and prevention efforts can provide for prevention, delayed onset, early detection, and/or proper maintenance of chronic conditions.

Potential Policy Recommendation: Continued support and advocacy of efforts aimed at extending primary care access into vulnerable populations on the Island.



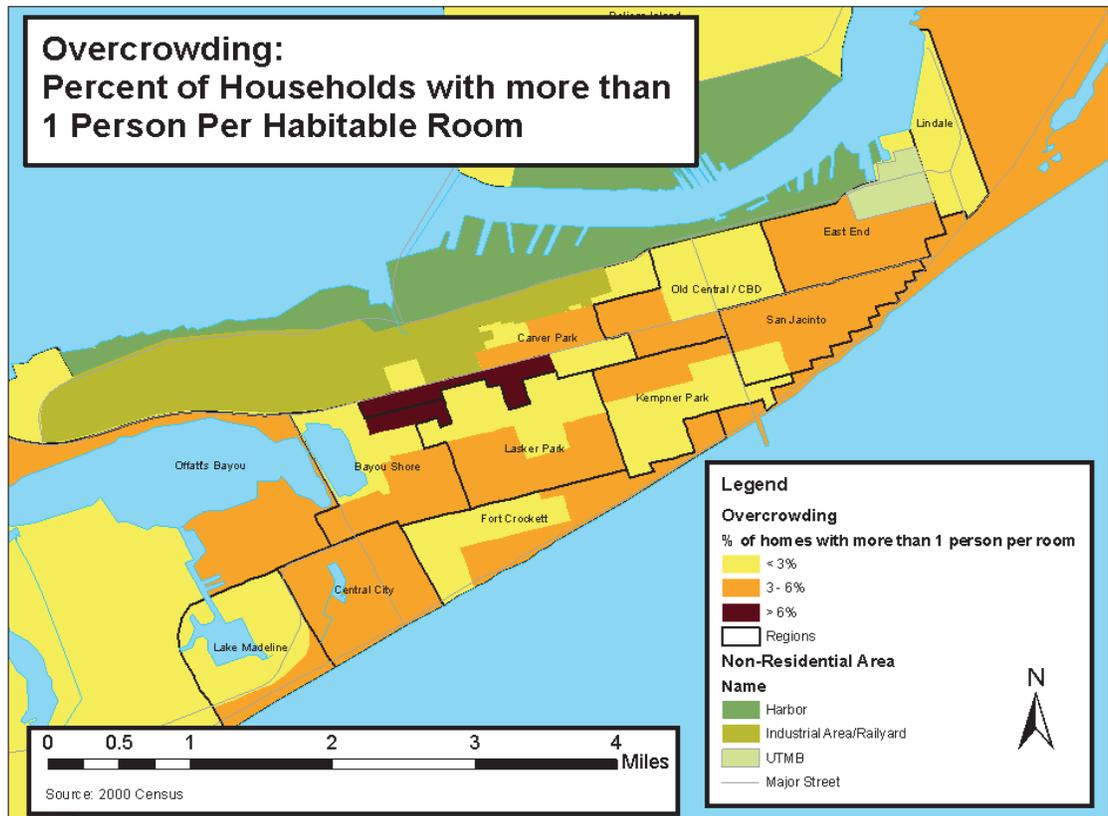


Indicator HH.1.d: Proportion of households living in overcrowded conditions

Why is this a community health indicator? The impacts of overcrowding on health are both direct and indirect. Most immediately, crowding increases risks for respiratory infections such as tuberculosis and ear infection. Overcrowded housing has also been associated with increased mortality rates (particularly for women), meningitis, and *Helicobacter pylori* bacteria which can cause stomach ailments. Crowded housing conditions also contribute to poor child development and school performance, in part, because overcrowding limits the space and quiet necessary for children to do homework. Overcrowding may act cumulatively with other environmental health stressors. For example, one recent study found that crowding combined with noise significantly increases chronic stress hormones in low-income children. Finally, overcrowding affects health indirectly by creating conditions conducive to poor sanitation, high environmental noise, and residential fires.

Standard: No overcrowding, defined as 1 or fewer people per habitable room within a household.

Potential Policy Recommendation: See above.

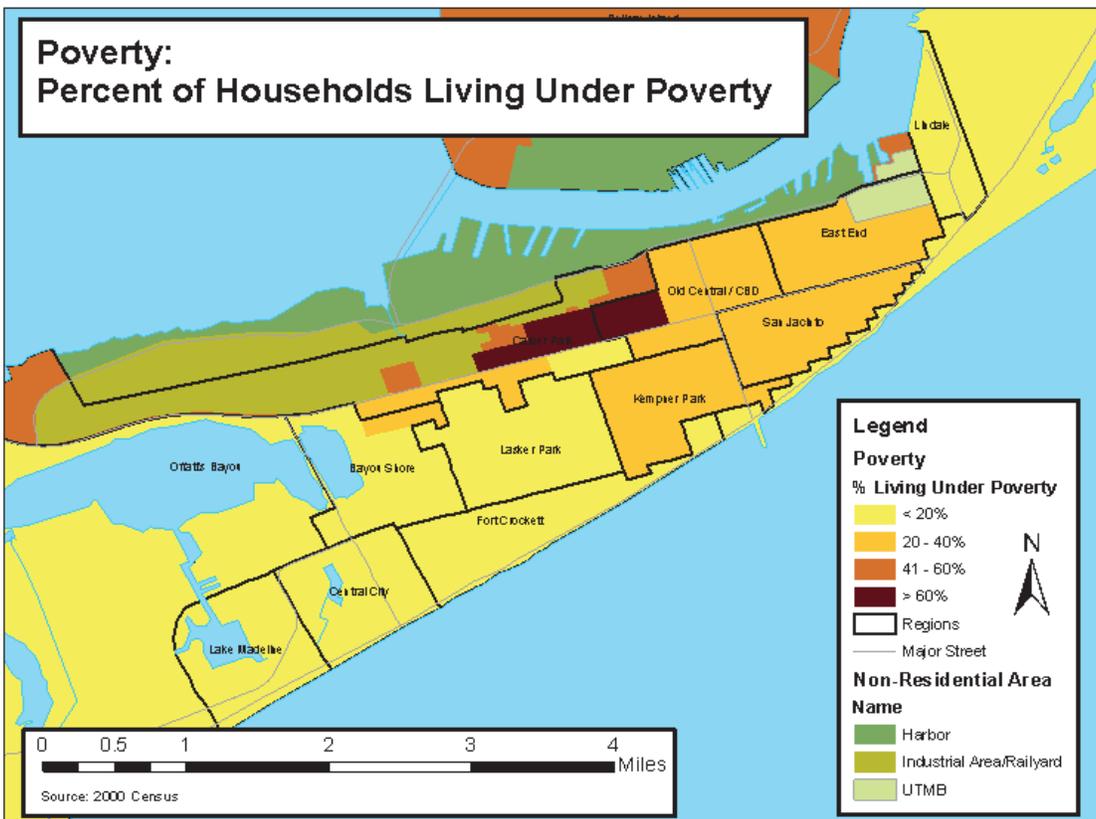


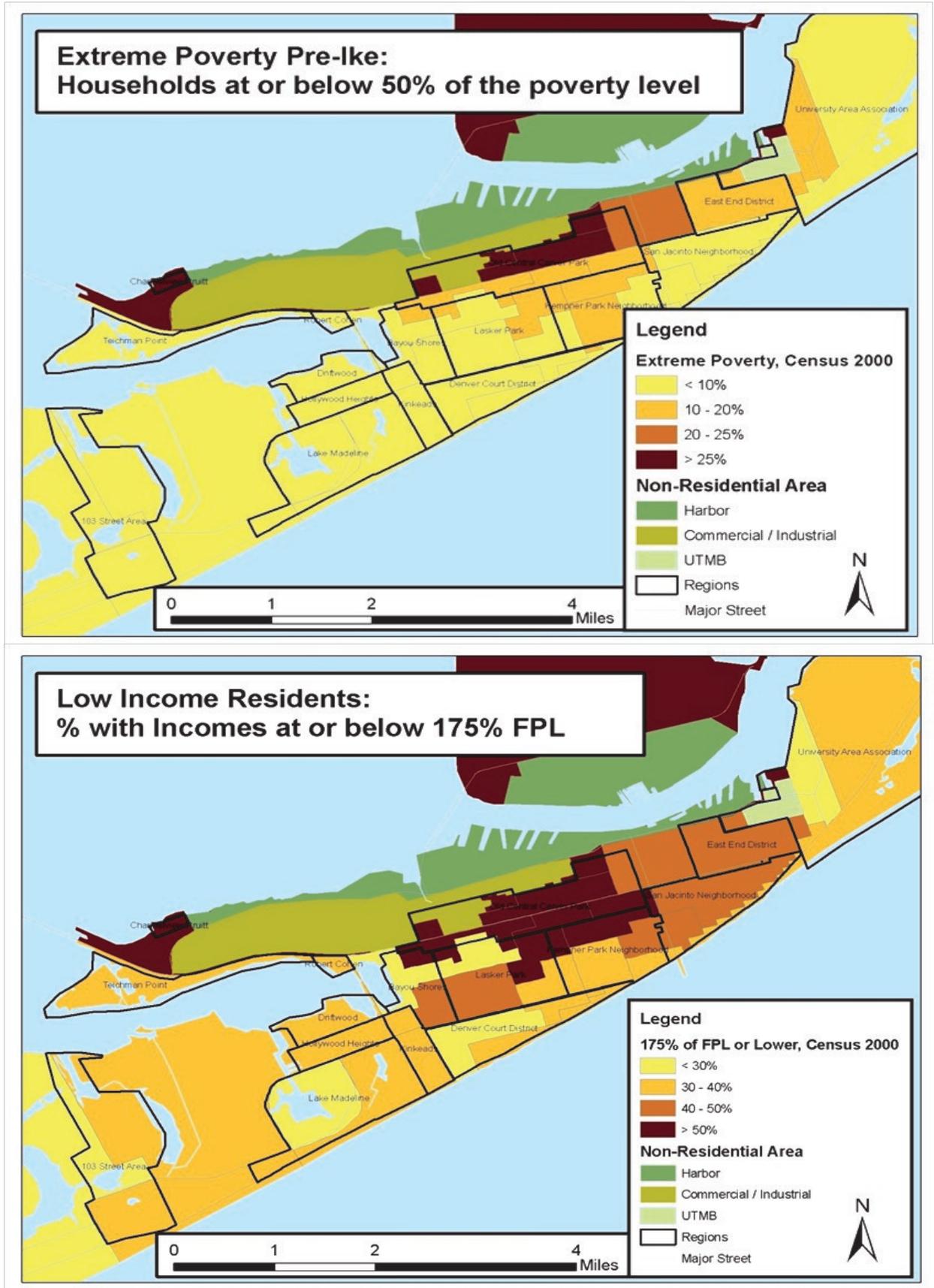
Indicator HH.3.d: Proportion living below the poverty level

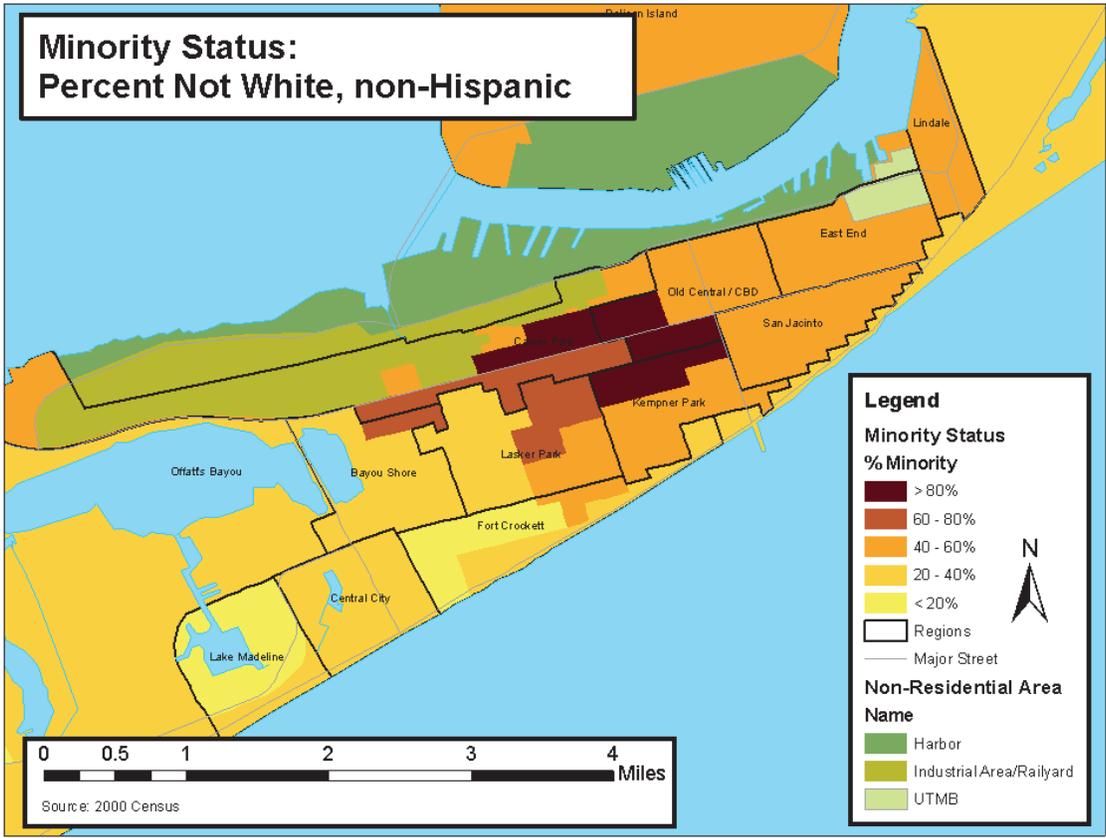
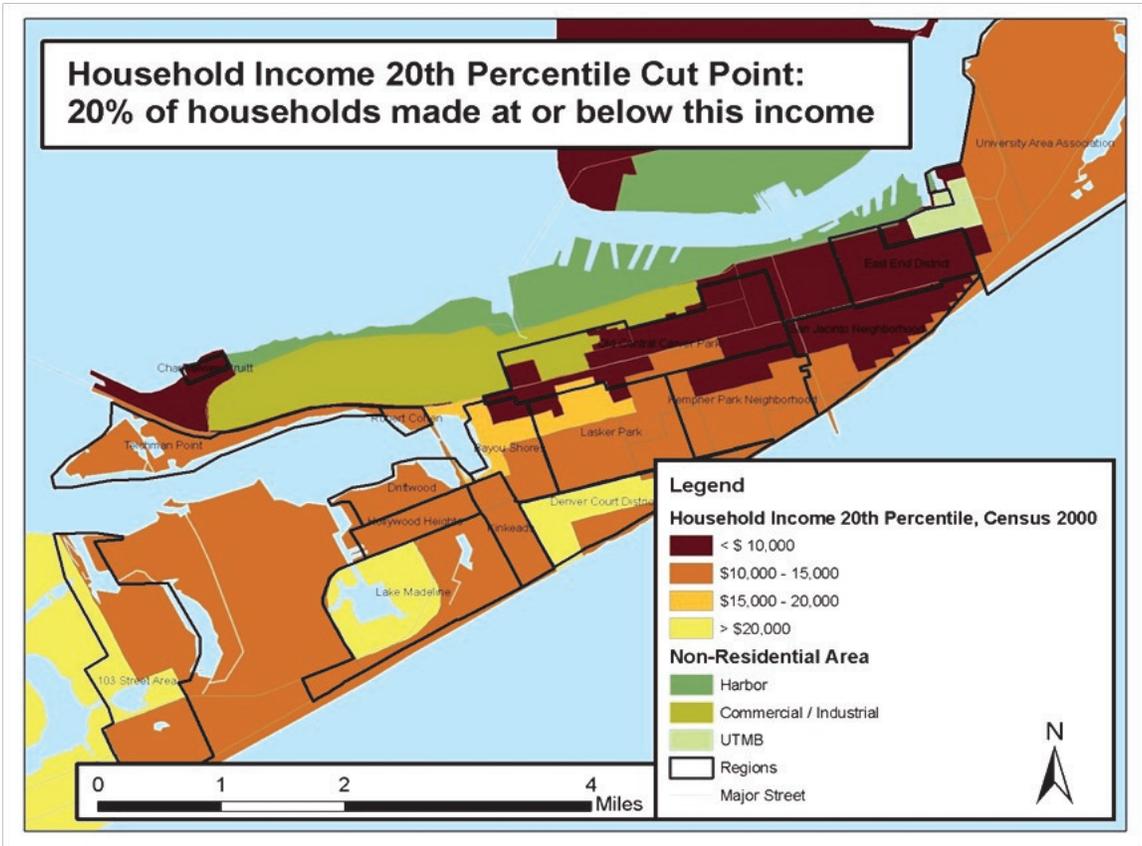
Why is this a community health indicator? Segregated neighborhoods create conditions adverse to health in a number of ways. As places, these neighborhoods typically have fewer assets and resources such as schools, libraries, and public transportation. Segregated low-income neighborhoods host unwanted land uses such as power plants, and solid and hazardous waste sites. Busy roadways often run through them resulting in disproportionately higher exposure to noise and air pollution. Residents are often isolated from economic opportunities and marginalized in political decision-making, limiting their ability to effect change in their circumstances. The attributes of segregated neighborhoods have profound and diverse impacts on health. Residents of high-poverty neighborhoods live about eight fewer years than non-poverty neighborhoods; they also suffer more preventable events like infant mortality, pedestrian injuries, and homicide. Research shows a relationship between segregation and teenage childbearing, tuberculosis, cardiovascular disease, healthy food availability, and exposure to toxic air pollutants. A Housing and Urban Development (HUD) study has shown that when adults move to less segregated, higher income communities, they experience significant gains in mental health, and psychological distress and depression become substantially reduced. Among children of families in the HUD study who were moved to less segregated, higher income communities, girls experienced marked reduction of psychological distress, depression, and generalized anxiety disorder, and improved perceptions of their likelihood of going to college and getting a well paid, stable job as an adult. These girls' behaviors changed as well, with a larger group remaining in school instead of dropping out to work. In addition, they were less likely to engage in risky behavior, or use marijuana.

Standard: Low concentrations of poverty within neighborhoods

Potential Policy Recommendation: Develop or encourage desegregated low-income and/or public housing, encourage policies aimed at improving the employment base.







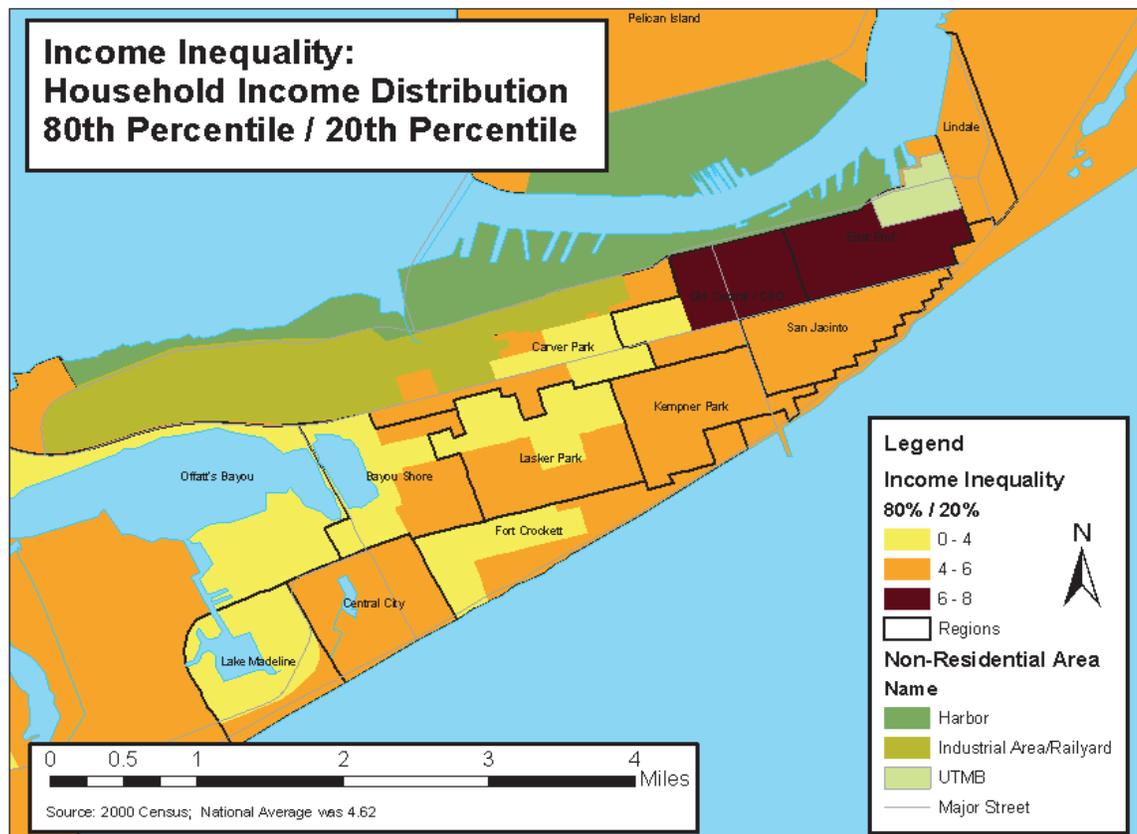
Healthy Economy

Indicator HE.3.a: Income inequality

Why is this a community health indicator? Numerous studies have shown that income inequality, a measure of the distribution of income, is strongly and independently associated with decreased life expectancy and higher mortality, as well as reduced self-rated health status. The effects of income inequality are likely mediated via public investments in shared goods and services and socially via social cohesion, intrapersonal trust, and reciprocity. Accordingly, places with relatively more egalitarian distributions of income would have a higher average expectancy irrespective of the average level of income.

Standard: Minimal income inequality relative to surrounding areas without high rates of concentrated poverty.

Potential Policy Recommendation: Encourage the development of economic drivers to promote the creation of new jobs with salaries compatible with a living wage for the area.

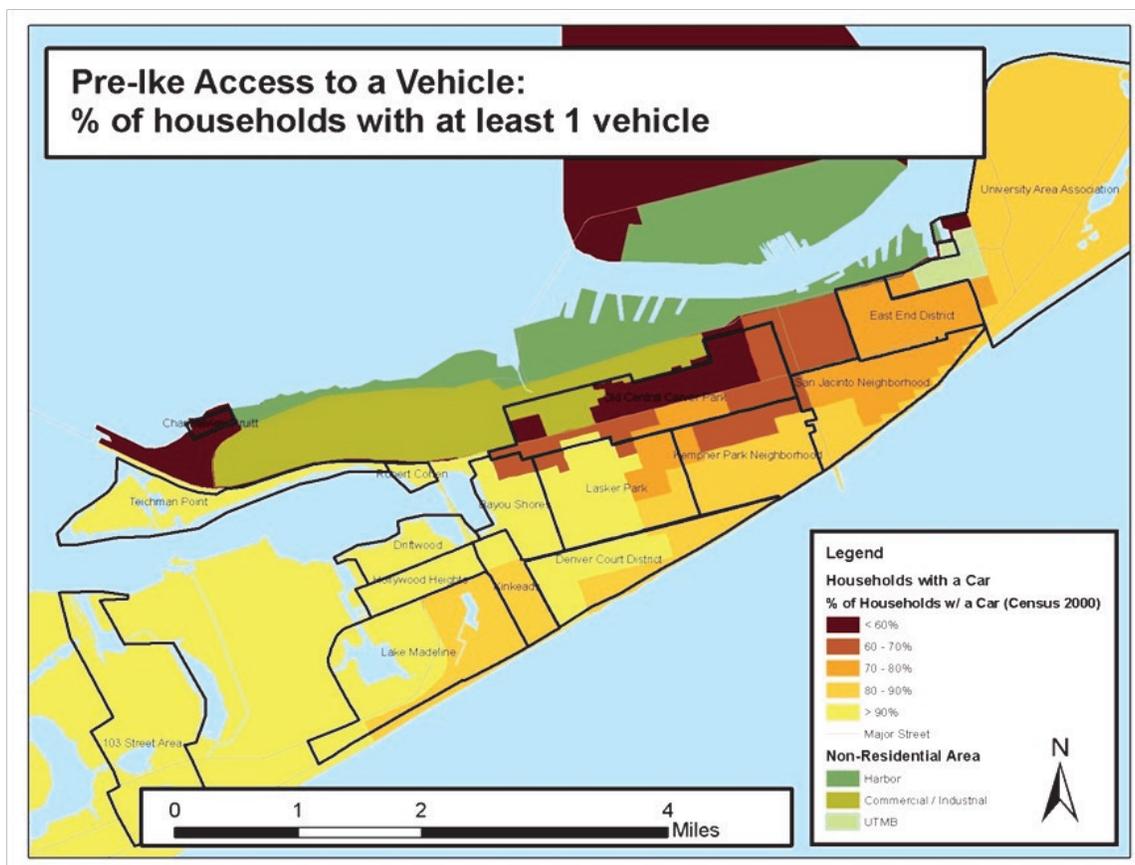


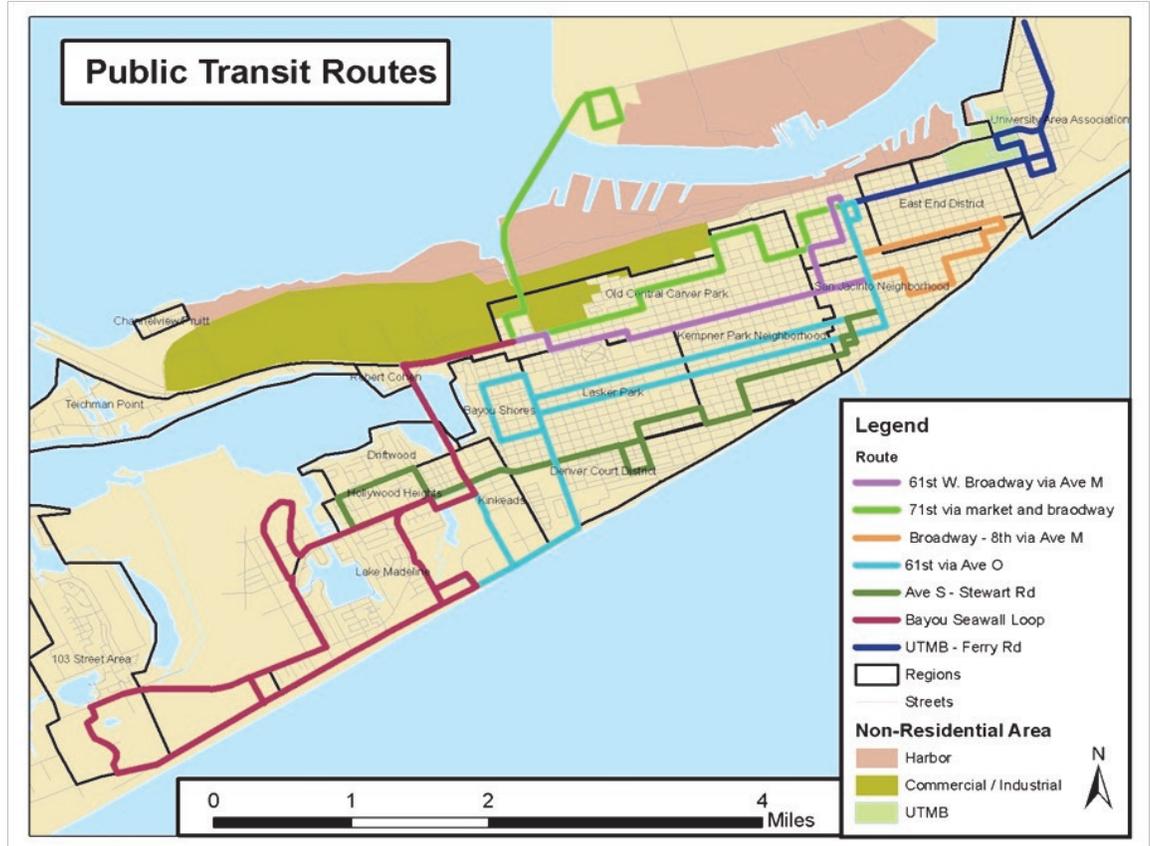
Sustainable Transportation

Indicator ST.1.a: Proportion of households without a motor vehicle

Why is this a community health indicator? Car ownership is directly related to driving behaviors. Vehicle driving, in turn, is directly proportional to air pollution and greenhouse gas emissions. Air pollutants, including ozone and particulate matter are causal factors for cardiovascular mortality and respiratory disease and illness. Areas with high levels of motor vehicle driving also tend to have higher motor vehicle collision and injury rates. Driving time independently predicts obesity risk. A study on the driving habits of over 10,000 Atlanta residents found that each additional hour spent in the car was associated with a 6% increase in the likelihood of being obese. However, owning a car in Galveston may improve resiliency to natural disaster threats by providing increased options for self-directed evacuation and re-entry.

Standard and Potential Policy Recommendation: While related to increased greenhouse gas emissions and decreased physical activity levels, owning a car in Galveston, or having access to one, is an important safety and resources concern with the threat of evacuation due to an approaching storm. As such, Galveston may consider adopting a modified standard of encouraging car ownership, but also creating a built environment that favors walking/bicycling/public transportation over single car transportation for routine daily activities. Pursuing policies such as increasing the walkability of neighborhoods, promoting mixed use zoning, installing bike lanes and paths, and evaluating the efficiency of public transportation may be worthwhile considerations.





Indicator SC.1.f: Density of off-sale alcohol outlets

Why is this a community health indicator? Research strongly suggests that density of alcohol outlets is closely related to crime and violence. Neighborhoods where bars, restaurants and liquor and other stores that sell alcohol are close together suffer more frequent incidences of violence and other alcohol-related problems, according to recent research by the Prevention Research Center and others. The strong connection between alcohol and violence has been clear for a long time -- but now we know that this connection also relates to the location of places that sell alcohol. For example, one study in New Jersey found that neighborhoods with alcohol outlet density, controlling for age and poverty, had more violent crimes, including homicide, rape, assault, and robbery. In Los Angeles, a higher density of alcohol outlets was also associated with more violence, even when controlling for unemployment, age, ethnic and racial characteristics, and other community characteristics. In a six-year study of changes in numbers of alcohol outlets in 551 urban and rural zip code areas in California, an increase in the number of bars and off-premise places (e.g., liquor, convenience and grocery stores) was related to an increase in the rate of violence. These effects were largest in poor, minority areas of the state, those areas already saturated with the greatest numbers of outlets. Finally, people who live near an abundance of fast-food restaurants and convenience stores compared to grocery stores and fresh produce vendors, have a significantly higher prevalence of obesity and diabetes.

Standard: Low density of alcohol outlets within residential neighborhoods.

Potential Policy Recommendation: Control the development of new alcohol outlets within residential neighborhoods. Consider the impact on health of increasing residential density in areas with existing high density of alcohol vendors.



Next steps

This workbook is intended to spark thinking about how we might integrate health considerations into planning decisions in ways we may not routinely consider. It has presented three visions of Galveston's future, along with specific information outlining current advantages and challenges in strengthening healthy neighborhoods as well as resiliency in the wake of a hurricane.

The information collected about Galveston in this workbook is only a beginning, and in the coming months we expect not only to build a more robust database but also to establish ongoing local mechanisms for routine collection, and hopefully routine use of that information. We invite you to share with us your ideas, priorities, interests in needs, to which we hope to be able to respond.

As the city and surrounding area continue to move forward in recovery, we may find new ways to support health along the way. Although it will probably be impossible for us to always choose the decision that most supports health, once we start looking for those opportunities we will likely find them in places we may not expect or have anticipated.





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