



MONROE COUNTY ADAPTATION GUIDE 2015 FOR THE HEALTH CARE COMMUNITY

Abstract

Building Resiliency Against Climate Effects (BRACE) utilizes a five part framework to address climate hazards and health. The members of the Florida BRACE Technical Advisory Group (TAG) were invited to submit project proposals for Community Adaptations. The proposal to develop a guide with targeted recommendations for the Monroe County health care community was selected for support. The Monroe County Adaptation Guide 2015 for the Health Care Community offers targeted adaptation recommendations to the Monroe County, Florida health care community regarding weather-related health impacts and is based on an inventory of the health care community, a survey of the health care community's perceptions, an online presentation, and a follow up survey of perceptions within the Monroe County, Florida health care community regarding weather-related health impacts. Adaptation, and the discussion of weather-related health impacts, are emerging topics on local, regional, and national planning agendas. Active coordination is developing on a federal level. Planning and preparedness promote resilience. Adaptation is viable planning tool.

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Monroe County Adaptation Guide 2015 for the Health Care Community

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“In recent times, the development of floodplain regulations, insurance, wildlife reserves, drinking water reservoirs, and building codes all reflect efforts to stabilize and protect our homes, livelihoods, and food supplies in the face of a variable climate. However, for the past 10,000 years, climate has been relatively stable, and weather patterns have fluctuated within a rather predictable range. Our growing awareness that the Earth’s climate is changing, and that we are facing novel future climate conditions that will interact with and compound our current economic and environmental challenges, has created a new context and a sense of urgency for climate adaptation planning.”

National Academy of Sciences, Adapting to the Impacts of Climate Change, 2010, 61-2

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Cover page images taken from the Nature Conservancy’s planning tool at <http://coastalresilience.org/>

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Introduction

From a health care perspective, few concerns outweigh the importance of the continuum of care. Whether through a referral system, intake assessments, patient recalls, or an established regimen of regular care, the continuum of care promotes the effectiveness of any one single treatment or plan.

Adaptation planning as an integral part of preparedness will promote resilience within the Monroe County health care community and support the continuum of care for the population of patients served.

This report emphasizes the following objectives in setting forth recommendations to the Monroe County health care community regarding weather-related health impacts, the promotion of the continuum of care through resiliency planning, and adaptation as part of the process:

- Weather-related health impacts can be direct or indirect
- Weather-related health impacts are based on relationships
- tools and data are available to help us understand potential scenarios
- a population's vulnerability to weather-related health impacts is an intersection between hazard, social, and medical risk factors
- planning and preparedness promote resilience

Adaptation is a viable preparedness tool. There are changing elements of our climate, those changes manifest in the environment of the human family, and human health impacts can manifest as a result. These impacts can be predicted through a number of modeling techniques, data trend assessments, and comparative analysis of the intersection of vulnerability factors. Adaptation planning is based on anticipated changes and outcomes in accordance with vulnerability. Adaptation, as described in the 2013 document, Adaptation Action Areas: Policy Options for Adaptive

Planning for Rising Sea Levels, a collaborative between the South Florida Regional Planning Council, the Florida Department of Economic Opportunity, Broward County, and the City of Fort Lauderdale, heralds four basic responses to the impacts of rising seas, a major threat in the region. Those four responses are protection, accommodation, managed retreat, and avoidance. How these can be applied in the context of the health care community will be discussed among the conclusions of this report.

Direct vs Indirect Impacts

Weather-Related Health Impacts can be direct such as:

- drowning related to flooding
- heat strokes related to prolonged periods of extreme high temperatures
- more frequent extreme weather events, such as algal blooms, are associated with more frequent and more severe asthma attacks
- more frequent and more severe extreme weather events such as tidal surges, tornadoes, hurricanes, and super storms are associated with injuries to human beings in addition to increased occurrences of both loss of life and property
- more frequent periods of extreme heat can produce greater amounts of unabsorbed cancer causing UV radiation

Weather-Related Health Impacts can also be indirect including:

- mental and behavioral stress related to the loss of property, loss of economic opportunity, or displacement and upheaval, including homelessness
- increased prevalence of respiratory diseases such COPD, Asthma, and heart failure are associated with extreme weather events such as more frequent and longer lasting periods of extreme

heat, drought, tidal surge, or precipitation

- changing air and water temperature ranges are producing new ranges for vectorborne diseases, including some tropical diseases which are presenting in temperate zones
- as a result of the expansion of the warming seas, sea level rise is threatening underground freshwater supplies in many coastal communities including those in South Florida; this type of intrusion can affect water used for municipal drinking supplies
- the same process also threatens agriculture in South Florida communities by attacking the roots of crops planted in the thin layer of muck covering the limestone rock, which is the foundation for much of the region and allows sea water to seep far inland
- warming seas also cause habitat range changes in many species of fish affecting economic livelihoods and food creating both mental health and nutritional impacts in the human population
- waterborne infections such as vibrio and giardia also increase in prevalence in the face of the increased likelihood of standing water and warmer water temperatures

Weather variability and extremes impact health resources through relationships

Weather-related health impacts may not always be immediate or obvious. For example, extreme weather events can damage housing infrastructure through high winds and through standing water associated with flooding and surges. Mold develops over time and may take years to be recognized. Mold in saturated flooring, walls, and roofing, aggravates existing respiratory health challenges and can trigger the onset of new respiratory responses and conditions through regular long term exposure, particularly in the home or

workplace, where exposure periods are long and frequent.

Standing water can result from excessive rain and, on otherwise dry days, from tidal surges potentially pushing both sea water and groundwater up through sewage and drainage systems. This can also leak contaminants into and out of municipal systems and cause salt water intrusion; in addition to the impacts the resulting standing water can have. Bacterial infections can result from contaminant exposure related to standing water and sewage backwash. Furthermore, salt water seeps into ground water storage areas as sea levels rise and threatens urban and rural drinking water supplies in many coastal regions, such as Broward County, Florida.

These same processes, coupled with warmer air temperatures, pose an additional threat by creating new and more extensive breeding grounds for vectorborne diseases such as dengue and waterborne infections such as vibrio.

Agriculture is threatened by each of the weather-related hazards examined in this report: extreme weather events, flooding, drought, high heat, and rising sea levels. Threats to agriculture manifest in food security issues, nutritional maladies, foodborne illnesses, and mental and behavioral health stressors.

While salt water intrusion is a major threat to agricultural lands globally and in South Florida, changing vectors for agri-pests also seriously threaten the reliable productivity of many agricultural regions. According to a 2012 statement from Mr. Charles LaPradd, Agricultural Manager Miami-Dade County (Regulatory and Economic Resources Development) 2-3 new agri-pests are introduced into the region each month through the Port of Miami, many of which will thrive in their new environment promoting hostile conditions for agricultural crops. Citrus

Canker and Citrus Greening, disease conditions expected to eliminate the Florida Citrus crops over the next decade or sooner, were introduced this way as their vector conditions became readily exploitable in state.

Hospitals in Monroe County, Florida are built

**Relationships Example:
Species Conservation and Habitat Maintenance related to Human Population Health**

- Foodborne Disease and Food Security: Fish and wildlife as food resources have been limited and many species are not available in a significant supply or are considered unsafe for consumption, such as Mercury poisoning related to fish consumption.
- Mental and Behavioral Health related to Economic Security: Commercial Fisherman and others who rely on the earth and its bounty for income face drastic changes to the sustainability of their livelihoods promoting negative mental health consequences.
- Vectorborne Disease: Dengue Fever is presenting in more northerly vector ranges.
- Zoonotic Disease: Ciguatera, as passed on from fish, or Lyme's disease from ticks are both increasing in prevalence and in range.

according to County Code above sea level and the flood plain; however, regionally accepted predictions of a sea level rise of 3ft by 2060 put the roads leading to those hospitals underwater.

Extreme temperatures negatively impact respiratory patterns. The acceleration of change denies us the biological adaptation of evolution and requires socio-cultural and intellectual adaptation to our environment.

To further illustrate the imperative of understanding impacts in terms of relationships, consider the following example: recent decades of warmer air have caused conditions which prevent the refreezing of some mountain top glaciers, which in turn

cannot melt to produce the water supply for communities at lower altitudes. This occurs at the poles but also in highland areas of North, South, and Central America. Though Monroe does not directly receive glacial waters in its drinking supplies, a big picture understanding indicates that the underground fresh water system which feeds the states in is some way linked to ice deposits at higher altitudes. A lack of freshwater in some regions has resulted in massive migrations; portions of those populations from Central America have migrated to Monroe County.

In Monroe County, exposures to these processes can occur in the home, the workplace, and in businesses.

Current regional expectations and responses

South Florida is responding and preparing through a number of collaborative efforts.

Building Resilience Against Climate Effects (BRACE)

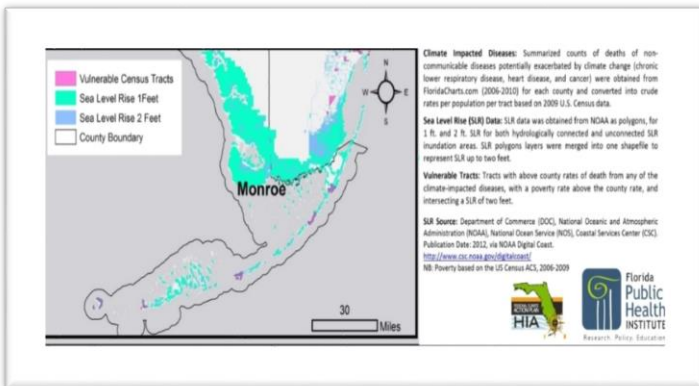
BRACE in Florida is the work of the Florida DOH and County Health Departments, as well as a number of collaborative partners. I serve on the BRACE's TAG. It is a statewide, localized program with Steering committee members from a variety of disciplines and backgrounds, which serves to develop ways to anticipate health effects by applying climate science, predicting health impacts, and preparing flexible programs. BRACE examines health impacts and potential responses related to Drought, Hurricanes, Extreme Heat, Flooding, Wildland Fire, and Sea Level Rise, among other climate events through a five part framework.

Southeast Florida Regional Climate Compact (SEFRCC)

Hailed as an example of regional collaboration, the SFRCC, was founded in 2009 when all four Compact counties recognized not a only a need to respond to changes in their communities, but also saw that their

Monroe County Adaptation Guide 2015 for the Health Care Community responses would need to be aligned, in order to be successful to be successful.

Health Impact Assessment (HIA) Public health leaders at the Florida Institute for Health Innovations (FIHI) (formerly the Florida Public Health institute) recognize the relationship between policies and community health, and it was noted that health effects were not a part of the climate conversation in the regional efforts or at best were limited to side discussions. The HIA determined the impacts of the recommendations of the SEFRCC Regional Climate Action Plan (RCAP) as related to health impacts and made recommendations of its own to be adopted into future planning efforts and strategic models.



Florida Institute for Health Innovation Sea Level Rise Modeling Project (FIHI) The work of FIHI through its, Kresge grant, further explores the processes and impacts of sea level rise in the region and aims to produce community tools for planning and preparedness.

Monroe County Climate Change Advisory Committee (MCCCAC)

The MCCCAC consists of two appointees from each of the Commissioners on the Monroe County Board of County Commissioners; one appointed from within their district and one from the Community at Large. All voting members are Monroe County residents. Utilities and Municipalities are invited to hold non-voting advisory seats on the Committee. This volunteer committee advises the Board of

County Commissioners on climate change related items.

The Marshall Foundation, Earth Learning Miami, Florida International University, the University of Florida’s Extension Service, the South Florida Regional Planning Council, and many other local partners are also responding every day from catching rain to growing food and biking to work to writing Congress, and marching up to Tallahassee.

Monroe County Assessment

Though these regional and local efforts are emerging, much of the discussion regarding weather-related health impacts is marginalized. The baseline data collection provided by the HIA for weather-related health conditions must be monitored over time at the local level and compared with regional, state, and national incidence and prevalence trends. However, while these comparisons are useful, the best measures will be local comparisons over time with a residential, non-transient cohort.

Structured, consistent assessments of the health impacts of specific weather events, particularly extreme events, would further support an understanding of the types of impacts and appropriate responses Monroe County could implement or support in the long term to support and promote resilience.

Anticipated and Perceived Concerns

The 2014 HIA of the SFRCAP identified asthma, respiratory allergies and airway diseases, foodborne disease and nutrition, mental health, vectorborne and zoonotic diseases, and waterborne diseases as health conditions of concern for Southeast Florida. The study also found vulnerability to sea level rise to be a hazard of high concern for Monroe, but that Monroe County is not considered very vulnerable to extreme high heat waves.

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The perspectives provided in the pre-test survey for this work indicated that some conditions of concern for the county are perceived as already being impacted, while others are perceived to remain stable. Data from the Department of Health-Monroe indicate greater increases than perceived in vectorborne and waterborne disease. One

area in particular, mental health conditions, is perceived to be seeing a greater impact than all others; 35% of survey participants perceive an increase in mental health conditions in recent decades and an additional 35% perceive a significant increase in mental health conditions.

Initial survey input from Monroe County health care community participants

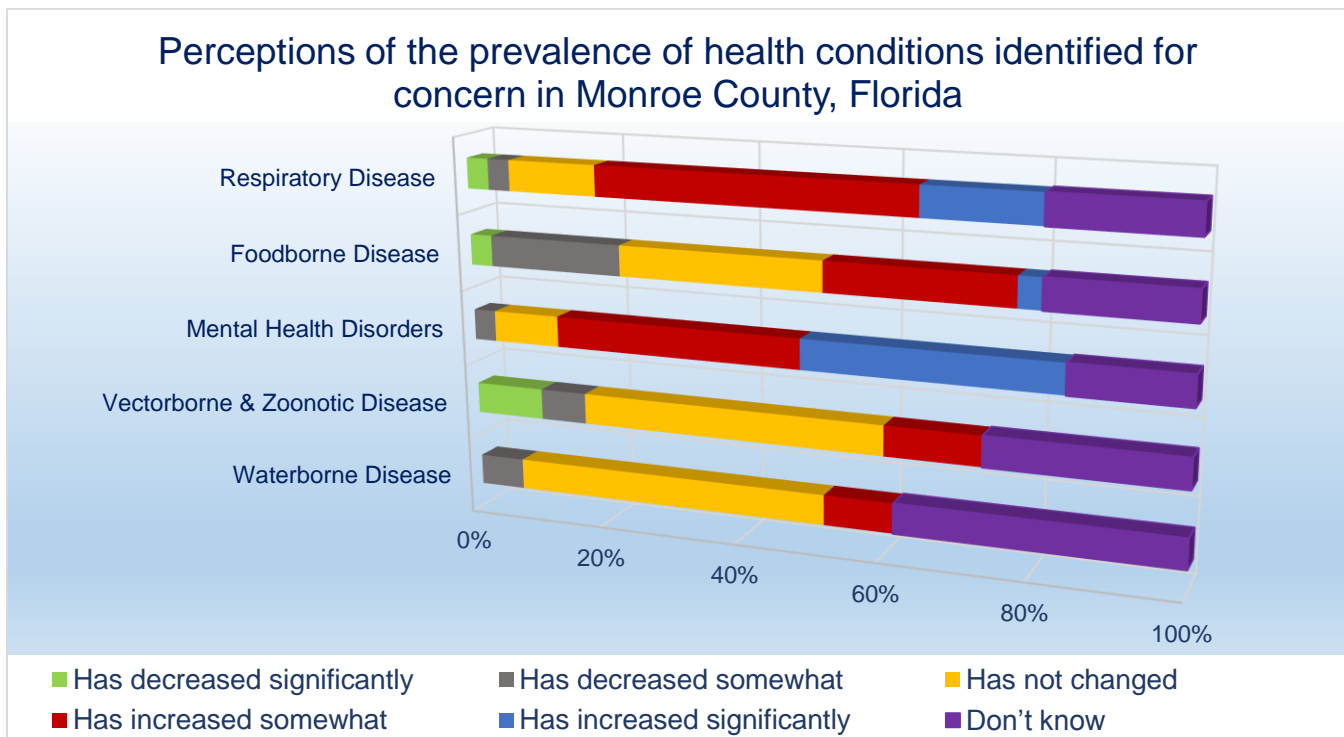


Figure 1

The same variability holds true with regard to weather events impacting Monroe County Health. The majority of survey participants agree or strongly agree that the five named weather hazards

- Extreme Events

- Floods
 - Droughts
 - Rising sea levels
 - High temperatures
- each impact health in Monroe County to some extent.

Monroe County Adaptation Guide 2015 for the Health Care Community
 Perceptions of weather conditions impacting Monroe County health

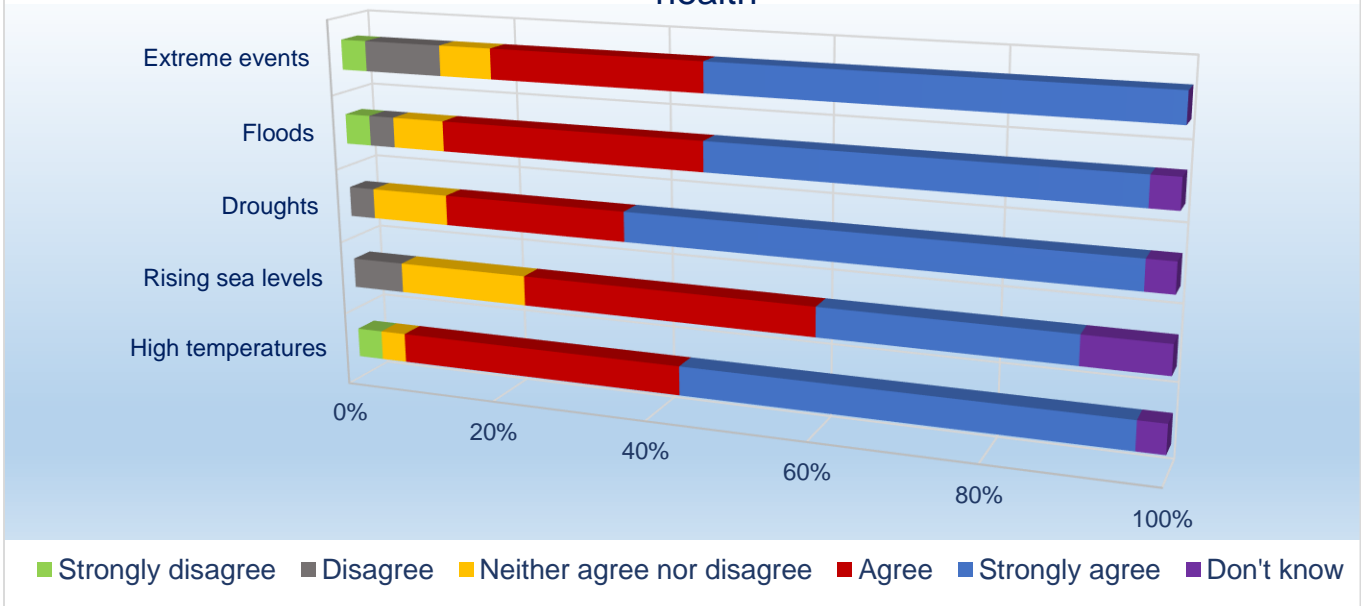


Figure 2

The following figure depicts the percent of Monroe County census tract lands which have experienced exposure to the named hazard and confirms the perceptions of the participants; in some cases actual exposure and related risk may actually be greater than perceived by the survey participants.

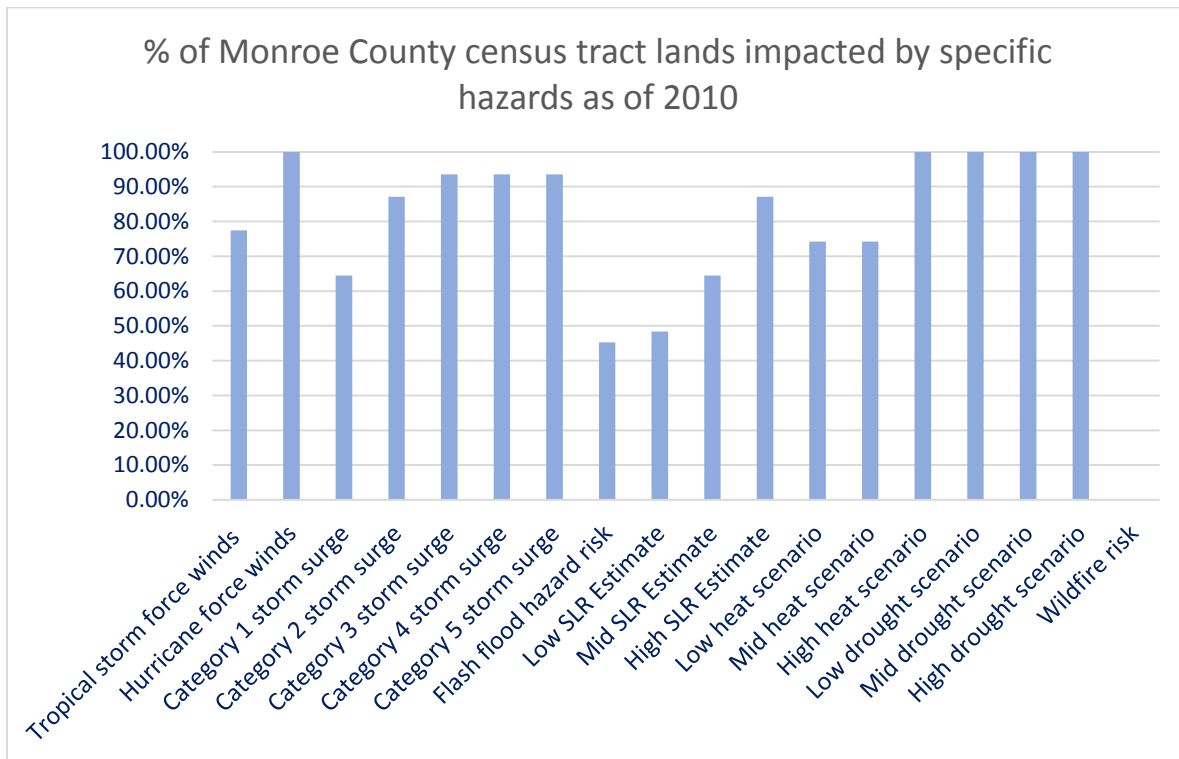


Figure 3 Data courtesy of the BRACE program, FLDOH

Focus Adaptation at the intersections:

Table 1 Intersections for Adaptations

Health Conditions	Relationship Factors	Weather Events
Asthma, Respiratory Allergies, COPD, and other Airway Diseases	mold, standing water, air quality, heat stress	extreme events, floods, high temperatures, drought, SLR
Foodborne Diseases and Nutrition	salt water intrusion, vector variability for agri-pests, species variability in agricultural and marine resources	extreme events, floods, high temperatures, drought, SLR
Mental Health and Stress-Related Disorders	changes to species availability for economic opportunity, loss property, loss of life, loss of economic viability	extreme events, floods, high temperatures, drought, SLR
Vectorborne and Zoonotic Diseases	increased ranges, increased abundance, resistance to controls	extreme events, floods, high temperatures, drought, SLR
Waterborne Diseases	increased standing water, higher temperatures, decreased quality	extreme events, floods, high temperatures, drought, SLR

Discussion of Adaptation

Goals of Adaptive planning

Adaptive planning seeks to recognize and incorporate change into future strategies and objectives. Its overarching goal is to limit future impacts of recognized and anticipated variability by modifying human practice to adapt to newly existing or anticipated conditions. Adaptation to environmental change and the relationship of the human species to its environment have the potential to be developed and coordinated across many levels for success.

Local Adaptation

At the municipal level, strategic planning is implemented on an ongoing basis and adaptations take place regularly, as evaluations of processes indicate new needs and assessments of resulting conditions indicate failures or successes. County level planning helps to set the stage for long term infrastructure, and the recently revised comprehensive plan for the county incorporates a Climate and Energy element. Adaptation planning to weather-related events is ongoing, but achieved with greater

detail as science provides greater indicators of projected changes.

Regional and State Adaptation

The Florida Department of Economic Opportunity (DOE) emphasizes a reliance on a local definition of adaptation action areas, local development of priorities, and local implementation of decisions, supported in part by state funds from DOE. Regionally, planning is in alignment and strong collaboration exists among the four Compact Counties. It is expected that while development of adaptation agendas may form at local levels, it is likely to be through collaborative implementation that specific actions take place.

Federal Adaptation

Federal adaptation planning documents recommend addressing adaptation in sectors and the National Research Council’s Panel on Adapting to the Impacts of Climate Change in its 2010 report, *Adapting to the Impacts of Climate Change*, names the following sectors:

- water
- ecosystems
- health
- agriculture

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- energy
- transportation
- coastal vulnerabilities
- international

This guide addresses the health sector; however, it is important to consider the intersections of sectors and the overlap of impacts into more than one sector.

Because larger scale adaptation coordination is recommended by the Panel, “Government actions are important in aligning incentives with adaptation goals, particularly over the long term, and in facilitating a nationally coordinated effort by specifying minimum standards and/or providing funding opportunities” (National Academy of Sciences, Adapting to the Impacts of Climate Change, 2010, 66). With this in mind, within the Monroe County health care community, perhaps coordination through organizations like the American Medical Association, or other nationally based professional organizations within the health sector, is a potential path toward resilience.

Significance of Adaptation

With regard to weather variability, and specifically in this case to sea level rise, according to the Florida Department of Economic Opportunity, “Adaptation...is the steps a community takes to become more resilient to the impacts ... over a period of time.” This type of planning it has been noted, involves a degree of uncertainty as impacts are expected or anticipated based on recognized risk and vulnerability to risk. When examining adaptation and adaptation planning within the health care paradigm it is important to recognize that health consequences be both direct and indirect, that indirect consequences may not manifest in the immediate, but may take years to surface within the population, and mitigation is not likely to impact current populations, but rather has potential to reduce risk in future populations. Adaptation planning is adjusting practices, behaviors, attitudes, and processes in the immediate to changing conditions as they are presently being

experienced and as they are anticipated to be experienced in the future. Local discussions regarding adaptation have emphasized the need to collaborate within the existing planning framework and to utilized existing and active guidance such as stormwater management plans, land conservation plans, and other current document sot define criteria for adaptation.

In order for this type of planning to be comprehensive and inclusive of health considerations, impacts, and health care community based responses, voices from the health care community must contribute to the conversation. This is important in terms of practice sustainability and patient health status, as, “Over time, the accumulation of these stresses will be increasingly harmful to these populations” (Luber, et. Al., U.S. Global Change Research Program, Climate Change Impacts in the United States: The Third National Climate Assessment, 2014, 230). Adaptation in this respect is a valuable planning and preparedness tool, but will only be effective if comprehensive. Just as the four Counties within the Southeast Florida Regional Climate Compact recognized the need for alignment in success, so too must the various community sectors recognize and satisfy this need.

In this way transportation planning, energy planning, health care planning, economic infrastructure planning, and other planning sectors, are integrated in a holistic view of community which engages internal capacity, while leveraging external capacity, to proactively meet community defined needs, including anticipated needs; e.g., adaptation.

Mitigation as an adaptive action
Mitigative actions that will reduce carbon emissions, air pollutants, or contributors to the warming of the seas and sea level rise, are, within certain contexts, considered adaptive strategies which reduce future weather-related health impacts. However, climate scientists are focused on adaptation

strategies to anticipated future impacts because weather-related events have already catalyzed impacts in some areas (i.e., salt water intrusion of fresh water wells in Broward County, Florida) and, according to climatologist, Dr. K. Bolter, of Florida Atlantic University and the South Florida Regional Planning Council, in a 2011 [TEDx talk](#) Miami, explained that even if we were to cut off all emissions today, no more electricity, no more driving cars; we are still committed to a certain degree of increased temperature and sea level rise.” Explaining the cumulative effect of CO2 already in the atmosphere, she declares that “Sea level rise has a long way to go before it is caught up to the CO2 that is already in the ‘pipeline’ (atmospheric system)” (TEDX talk, 2011, Dr. Keren Bolter, [Youtube video](#)).

Challenges to adaptive planning

The primary challenge to Adaptive Planning or Adaptation Strategies is uncertainty. Planning for the unknown based on the known creates an inherent dilemma. However, science and technology tools make modeling possible. One such tool, provided by the Nature Conservancy, has been employed by the Compact Counties for projected Sea Level Rise expectations. A user friendly version of the mapping tool is available at [CoastalResilience.org](#).

A deep and growing understanding of historic geology and past adaptations also provides insights into future expectations and appropriate responses. For example, in South Florida it is understood that sea walls are ineffective against sea level rise because levels rise from a swelling of the ground up, not by encroachment. Therefore coming up under sea walls, eroding their foundations and rendering them useless. Sea level rise is well understood in the region, in part because the oldest records of changes for the United States are based in Monroe County. There has been a sea level measurement gauge (tidal monitor) in place for over 150 years at the United States Naval facility in Key West,

Florida and it has recorded a steady increase over the last century plus. This record provides the data for some of the foundational science of the Southeast Florida Regional Climate Compact’s 2009 formation and aligned response. “Planning for climate change adaptation within the United States is likely to require coordinated public-private planning partnerships to span these scales... In the United States, most adaptation planning at all scales has been initiated since 2005, and early efforts have largely focused on information gathering, vulnerability assessment, and organization—not yet on actions” (National Academy of Sciences, [Adapting to the Impacts of Climate Change](#), 2010, 62).

Co-Benefits of Adaptive Planning

“In addition to producing health co-benefits, climate change prevention and preparedness measures could also yield positive equity impacts” (U.S. Global Change Research Program, [Climate Change Impacts in the United States: The Third National Climate Assessment](#), 2014, Luber, et. Al., 233). Recognizing that inherent in successful planning, according to the ecological model of public health, is an integrated, holistic view of community which engages internal capacity, while leveraging external capacity, to proactively meet community defined needs, including anticipated needs; e.g., adaptation. This model engages stakeholders as process participants vested in the results, familiar with the available resources or capacity for addressing concerns, and capable of leveraging external resources as needed to meet gaps in the internal capacity. Since adaptation planning, in the capacity of a resiliency tool for weather-related health impacts, calls for a coordinated response across levels beginning with federal coordination, it is suggested that this type of planning allows communities to ‘level the playing field’, or address vulnerabilities proactively to foster equity.

The micro community vulnerability analysis provided here, for example, sets the stage for identifying risk factors which make certain micro community segments more or less vulnerable. While this analysis, could be expanded to include more risk factors, indicating more specific targets for adaptation within the each micro community; looked at comprehensively, as in this report, it provides a basic sketch of vulnerability to indicate where deeper analysis may indicate a need for specific, targeted equity initiatives. For example, “An area where adaptation policy could produce more equitable health outcomes is with respect to extreme weather events. As discussed earlier, Hurricane Katrina demonstrated that communities of color, poor communities, and certain other vulnerable populations (like new immigrant communities) are at a higher risk to the adverse effects of extreme weather events. These vulnerable populations could benefit from urban planning policies that ensure that new buildings, including homes, are constructed to resist extreme weather events” (ibid, 233).

Vulnerability by micro community

Micro Community targets for preparedness

Background

The Florida Department of Health in Monroe County has identified a set of micro-communities within the County based on a combination of census tracts within the collection of zip codes. There are twenty-six census tracts in Monroe County which have been combined and ordered into nineteen micro-communities.

Methodology

Based on the data reported by the DOH-Monroe the micro-communities have been ranked based on a number of factors influencing a community’s vulnerability to

weather-related health impacts. These factors were per capita income (low income is seen as promoting social vulnerability; whereas, higher income, and the associated availability of resources, are said to protect against social vulnerability and support resilience), the percent of the population over the age of sixty-five and the percent of the population under the age of 18 (larger sectors of older or younger residents, those marginalized outside of the workforce, is recognized to promote social vulnerability within a community and special attention must be paid to this reality in planning and preparedness in order to promote resilience), age adjusted death rate (as a factor of population health status and an indicator of both the disease burden and the mortality rate, provides an insight into the medical vulnerability of a community; healthy communities more resilient), and sea level elevation (average ranges are used for groups of micro-communities; these reflect data from the Analysis of the Vulnerability of Southeast Florida to Sea Level Rise, Southeast Florida Regional Climate Change Compact Inundation Mapping and Vulnerability Assessment Work Group [August 2012]).

The list of micro-communities was ranked for each factor and assigned a score based on the position of its rank for each factor (1-19), for sea level elevation the lowest level was assigned the highest vulnerability score (1-4). Each micro community received a score for each factor. These scores were then combined to produce a cumulative community score.

The cumulative community score reflects the combined social, medical, and hazard vulnerability factors for the micro-community and is intended to be an indicator of where preparedness planning and adaptations may be focused.

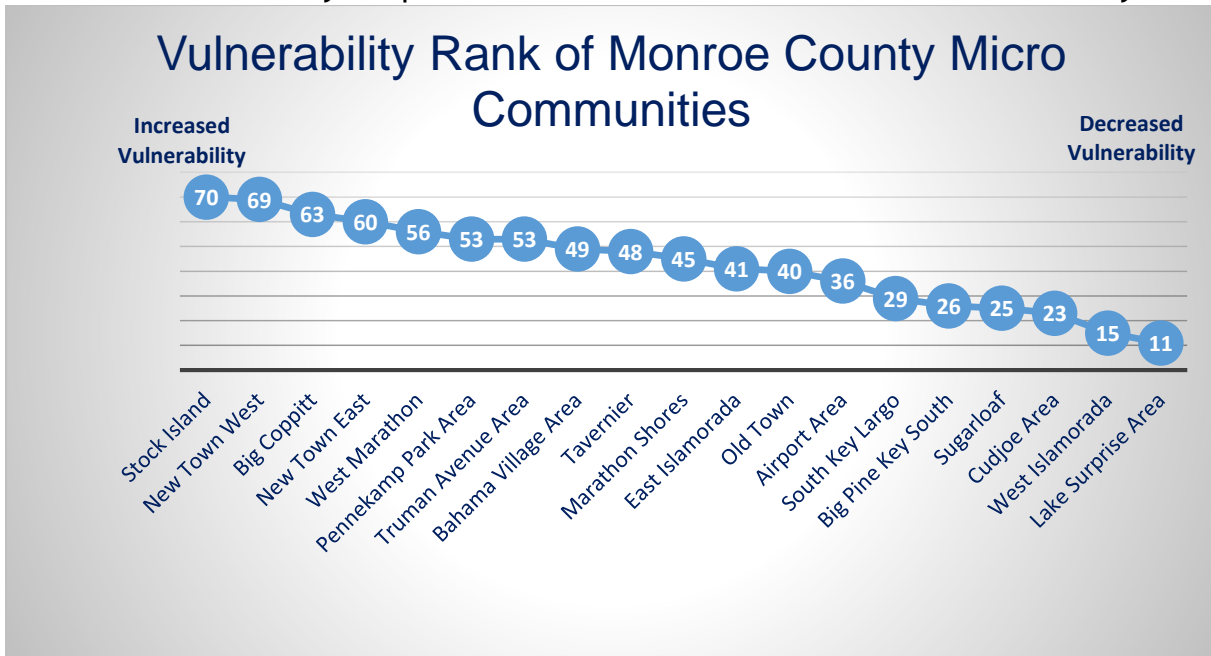


Figure 4 Scores are based on the cumulative intersections of medical (age-adjusted death rate), social (per capita income, % over 65, % under 18), and hazard (average sea level elevation) risk factors for Monroe County micro communities. Data courtesy of FLDOH-Monroe.

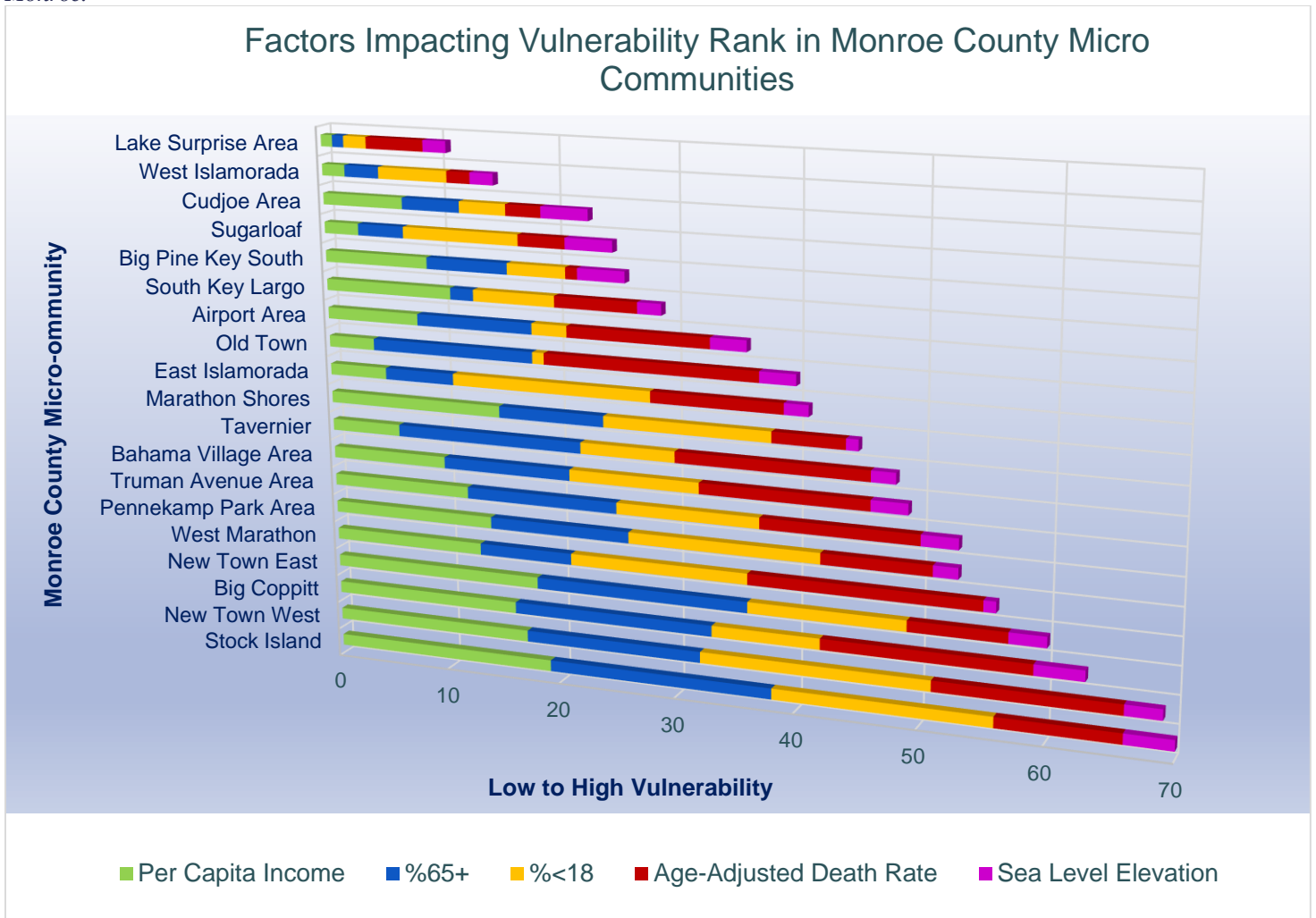


Figure 5 micro community data courtesy of Florida DOH-Monroe and sea level elevation data courtesy of the Southeast Florida Regional Climate Compact

Results of micro community vulnerability analysis

The highest possible score for any one micro community was 80. The highest score achieved for any one micro community was 70, the score for Stock Island. Stock Island is situated in the Lower Keys around mile marker 5. The community has development on both the north and south sides of US1, and houses the jail, the Sherriff’s Office, the Community College, one Elementary School, the animal shelter, and the hospital of access for the Lower Keys. The hospital is owned by one of the nation’s largest health care administration firms, which is based elsewhere. The next closest hospital is fifty miles north, also a vulnerability factor to be considered. The community with the lowest score for the combined, selected social, medical, and hazard vulnerability is the Lake Surprise area within the Key Largo vicinity of northern Monroe County, a section of what is referred to as the Upper Keys. This is one of less densely populated areas of Monroe County, Florida, which also encompasses much of the Everglade, and therefore, scores low in social and medical vulnerability. Its real estate is high end, exclusive, and often isolated. Greater per capita income is a protective factor related to increased access to resources, which promotes resilience. Low numbers of very young or very old residents also protects against vulnerability to weather-related health impacts, as working age populations enjoy a health status which generally makes them more resilient.

The health care community could consider targeting preparedness campaigns and reminders to patients in highly vulnerable micro communities and encourage patient populations to maintain an understanding of the risks within their community. Engaging residents in conversations about health impacts and weather is the starting point for creating improved resilience to anticipated future ecological changes and their potential outcomes over time.

Conclusions and recommendations

In Monroe County, Florida, the health care community encompasses both allopathic and alternative practitioners. The allopathic practitioners are concentrated in three primary areas and affiliations:

- Lower Keys Medical Center, Key West
- Fisherman’s Hospital, Marathon
- Mariners Hospital, Tavernier

Alternative practitioners are concentrated primarily in the same three geographic locations, but two additional areas of concentration also emerged:

- Big Pine Key/ Sugarloaf/Summerland
- Key Largo

Participation overall among the health care community in the first survey was estimated at less than 10% (approximately 500 practitioners were invited and less than 50 participated) with a mix of allopathic health care practitioners and alternative practitioners. Participation in the presentation and follow up survey was lower than in the first survey. Low participation may be indicative of a number of things including: a lack of interest, a lack of concern, a lack of political will to engage, or failed outreach methodology. Attitudes toward participation in conversations with practitioners during the inventory process leaned heavily toward a lack of political will to engage. Participation overall was strongest among administrative health care providers.

“Thus, extreme events in a setting of climate change may pose the double threat of stress to health care systems, including the buildings, systems and the personnel needed to deliver clinical services, as well as increased health problems in the populations served by those systems” (United States Department of Health and Human Services, Primary Protection: Enhancing Health Care Resilience for a Changing Climate, 2014, 5). Two areas of focus for practitioners to direct their adaptation efforts have emerged from a review of the existing literature and responses

from survey participants: patient health status and practice preparedness.

Patient Health Status

Healthy populations, those with a lesser burden of disease, are less vulnerable to weather-related health impacts. They tend to be more resilient socially, economically, and immunologically. Residents with special needs are registered with the County and, according to the Human Services office, are split somewhat evenly throughout the County. Awareness of the needs of special needs residents in a micro community affiliated with your practice can support resiliency across many levels, but most importantly, in the continuity of operations, or process to return to normal.

Develop practice specific messages for local radio and television to promote health, your practice, and awareness of conditions potentially hazardous to patient or client health and resiliency.

Practice Preparedness

Long term stability can promote a passive approach, but planning for the unexpected as well as the expected protects lives, property, and environmental resources. An adaptation for the normally stable practice or business may be to engage in preparedness planning and to have an agenda to turn to in the event of a weather-related emergency.

Gather emergency contact information for all staff, patients, and clients; as well as vendors and collaborative partners. Make this information available as widely as possible across appropriate channels and implement guidance on the appropriate and expected response from your team.

Primary Recommendations to health care community members

- Communicate and advocate with patients through education; including identification of environmental triggers of disease
- Participate in the local and regional planning agenda

- Utilize Florida Department of Health, Monroe County Emergency Management, and Federal Emergency Management Administration preparedness resources including trainings, templates, and continuity of operations planning tools
- Identify baseline health data, monitor conditions, record and report trends, as well as causal relationships
- Coordinate across levels from local to federal civically and within the profession(s)
- Recognize variability in vulnerability within your patient population and scope of practice

Coupling health conditions with micro community vulnerability expectations

In recognizing variability in vulnerability within your patient population and scope of practice it is important to consider where in Monroe County you practice and if it is in multiple locations perhaps a combination of approaches is needed to really meet your patients where they are in terms of vulnerability to weather-related health impacts. Mitigating mold in a new home for a young family who has just purchased their first home will be a different experience than for someone who has lived in their home for decades and is experiencing cumulative effects of years of exposure. Additionally, understanding evacuation procedures for a Big Pine Key family of four will be different than for two retirees living in the County part time on Hawk's Cay, Key Largo.

The hospitals are central community locations which could house preparedness planning discussions for your patients and clients; yet each one would likely need to target its messages slightly to engage the audience in a meaningful dialogue.

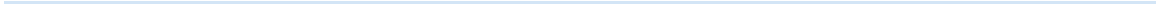
Resiliency Coordination

Florida Department of Health relies on Federal Emergency Response Standards and Systems which are implemented by the County Level Emergency Management Offices. Within the structure and framework of the

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response system is the role of DOH as the Medical Liaison. The Monroe County Emergency Response Medical Liaison could be enlisted to provide regular and evolving emergency management and preparedness training to the health care community. The program could be a coordinated, collaborative effort between the FLDOH-Monroe and Monroe County Emergency Management and other

partners to conduct outreach and education on preparedness strategies, continuity of operations planning, and the local Incident Command Framework. This practice would support and encourage continuity of operations planning and preparedness within the health care community; thereby improving community resiliency.



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Empowerment Evaluation: Knowledge and Tools for Self –Assessment and Accountability, 1996, Fetterman, D. M., Kaftarian, S.J., and Wandersman, A..

Foundations of Empowerment Evaluation, 2001, Fetterman, D..

Four Motives for Community Involvement, *The Journal of Social Issues*, vol 58, no3 The Society for the Psychological Study of Social Issues, 2002, Batson, C., Ahmad, N., and Tsang, J..

Health Program Planning and Evaluation: A Practical, Systematic Approach for Community Health, 2009, Issel, L..

Intervention Mapping: Designing Theory and Evidence Based Health Promotion Programs (ppt), University of Texas, 2003, Bartholomew, L. Kay, Parcel, G., Kok, G., and Gottlieb, N..

Planning Health Promotion Programs: An Intervention Mapping Approach, 2006, Bartholomew, L. Kay, Parcel, G., Kok, G., and Gottlieb, N..

Primary Protections: Enhancing Health Care Resilience for a Changing Climate, 2014, United States Department of Health and Human Services.

Resource Guide to Federal Climate Adaptation Programs for State Fish & Wildlife Agencies, 2014, Association of Fish & Wildlife Agencies.

Websites and Online Resources for additional information

http://www.cdc.gov/climateandhealth/climate_ready.htm

<http://coast.noaa.gov/dataviewer/#>

<http://coast.noaa.gov/dataviewer/#app=b1ed&bda3-selectedIndex>

<http://coastal.er.usgs.gov/hurricanes/cch.php>

<http://coastal.er.usgs.gov/hurricanes/coastal-change/beach-erosion.php>

<http://coastal.er.usgs.gov/hurricanes/lidar.php>

<http://coastal.er.usgs.gov/shoreline-change/>

<https://www.data.gov/climate/>

<http://dictionary.reference.com/browse/climate>

www.flhealthinnovation.org

www.flhealthinnovation.org/portfolio/southeast-florida-regional-climate-change-action-plan-health-impact-assessment-hia/

<http://www.glo.texas.gov/what-we-do/caring-for-the-coast/coastal-erosion/>

<https://noharm.org/>

<http://www.monroecounty-fl.gov/documentcenter/view/5971>

<http://nca2014.globalchange.gov/report/sectors/human-health>

www.nwf.org/ClimateSmartGuide

<http://oceanworld.tamu.edu/resources/oceanography-book/coastalerosion.htm>

<http://www.psr.org/chapters/florida/http://seven50report.org/>

<https://shellcenter.rice.edu/Content.aspx?id=2147483967>

<http://southeastfloridaclimatecompact.org>

<http://southeastfloridaclimatecompact.org/pdf/Regional%20Climate%20Action%20Plan%20FINAL%200ADA%20Compliant.pdf>

<http://southeastfloridaclimatecompact.org/wp-content/uploads/2014/09/final-report-aaa.pdf>

<http://www.tamu.edu/>

http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8724580

<https://toolkit.climate.gov/topics/coastal-flood-risk/coastal-erosion>

Appendix A: pre-test survey questions and results

1. Contact Information (optional)

Name:	ZIP:
Company:	Country:
Address:	Email Address:
City/Town:	Phone Number:
State:	

Health

In your professional experience and opinion, in recent years, the prevalence of these conditions among the population in the region:

2. Respiratory disease (like asthma and allergies)

Has decreased significantly (2) Has decreased somewhat (3) Has not changed
 (4) Has increased somewhat (5) Has increased significantly (6) Don't know

3. Foodborne disease (like salmonella and campylobacter)

Has decreased significantly (2) Has decreased somewhat (3) Has not changed
 (4) Has increased somewhat (5) Has increased significantly (6) Don't know

4. Mental health conditions

Has decreased significantly (2) Has decreased somewhat (3) Has not changed
 (4) Has increased somewhat (5) Has increased significantly (6) Don't know

5. Vectorborne and zoonotic disease (like West Nile Virus and Dengue Virus)

Has decreased significantly (2) Has decreased somewhat (3) Has not changed
 (4) Has increased somewhat (5) Has increased significantly (6) Don't know

6. Waterborne disease (like giardia and vibrio)

Has decreased significantly (2) Has decreased somewhat (3) Has not changed
 (4) Has increased somewhat (5) Has increased significantly (6) Don't know

	Has decreased significantly	Has decreased somewhat	Has not changed	Has increased somewhat	Has increased significantly	Don't know
Waterborne Disease	0.0%	6.5%	45.2%	9.7%	0.0%	38.7%
Vectorborne & Zoonotic Disease	10.0%	6.7%	43.3%	13.3%	0.0%	26.7%
Mental Health Disorders	0.0%	3.2%	9.7%	35.5%	35.5%	16.1%
Foodborne Disease	3.2%	19.4%	29.0%	25.8%	3.2%	19.4%
Respiratory Disease	3.2%	3.2%	12.9%	45.2%	16.1%	19.4%

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Impacts

Weather and climate variability may result in a variety of hazards, including extreme temperatures, precipitation fluctuations, and an increased frequency or intensity of storms. The following hazards can have both direct and indirect impacts on human health:

7. Periods of extremely high temperatures

(1) Strongly disagree (2) Disagree (3) Neither agree nor disagree (4) Agree
 (5) Strongly agree (6) Don't know

8. Rising sea levels

(1) Strongly disagree (2) Disagree (3) Neither agree nor disagree (4) Agree
 (5) Strongly agree (6) Don't know

9. Drought

(1) Strongly disagree (2) Disagree (3) Neither agree nor disagree (4) Agree
 (5) Strongly agree (6) Don't know

10. Floods

(1) Strongly disagree (2) Disagree (3) Neither agree nor disagree (4) Agree
 (5) Strongly agree (6) Don't know

11. More frequent or more severe extreme weather events (including hurricanes and other storms) (1) Strongly disagree (2) Disagree (3) Neither agree nor disagree (4) Agree
 (5) Strongly agree (6) Don't know

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
High temperatures	3.3%	0.0%	3.3%	36.7%	53.3%	3.3%
Rising sea levels	0.0%	6.7%	16.7%	36.7%	30.0%	10.0%
Droughts	0.0%	3.3%	10.0%	23.3%	60.0%	3.3%
Floods	3.3%	3.3%	6.7%	33.3%	50.0%	3.3%
Extremes	3.3%	10.0%	6.7%	26.7%	53.3%	0.0%

Local Life

12. Is climate variability something you are concerned will affect your life while living and working in Monroe County, Florida?

(1) Yes (2) Somewhat (3) No (4) Don't know

Yes	33.3%
Somewhat	40.0%
No	26.7%
Don't know	0.0%

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As one of four counties in the South East Florida Regional Climate Compact, Monroe County has implemented a Climate Change Advisory Committee, a Sustainability Manager, and incorporated sea level rise into its Comprehensive Plan with the agreed upon projection of a rise in seas in the region of 1 ft by 2030 and 2 ft by 2060.

13. How interested are you in seeing the Monroe County health care community represented in these types of community planning activities?

- (1) Extremely Interested (2) Very Interested (3) Somewhat Interested
 (4) I will consider this and may be interested at a future time (5) Not interested
 (6) Extremely disinterested

Extremely Interested	10.0%
Very Interested	33.3%
Somewhat Interested	20.0%
I will consider this and may be interested at a future time	20.0%
Not interested	13.3%
Extremely disinterested	3.3%

Commentary

14. Do you have any other comments, questions, or concerns?

I think the biggest threat to human health here in the fl keys is the spraying of aluminum particulates on the population most days of the week. Known as chemtrails.
informed the community if need it without creating panic.
Manmade/ anthropogenic global warming is a joke. We have had ice ages in the past 20,000 years in that man has had nothing to do with. This is an opportunity for government to control more of peoples everyday lives. According to Al Gore the polar ice caps were to have been gone by now, and hurricanes more frequent and severe. We haven't had a hurricane in 10 years and the polar ice caps are thicker and larger than ever. Carbon dioxide is not a hazardous substance. It is food for plants.
no
not sure exactly what information is being asked for.... in this survey. However interested in knowing more about the work being attempted.
I hope that Monroe County health care professionals will respond well to this project. Weather-related health impacts are very clear, especially in Monroe County.
I am not interested in being put in a drawing for a gift card
No faith that Monroe County Government has the real expertise to conduct proper research or intervention. Save dollars and contract to private sector research entity.

Appendix B: post-test survey questions and results

1. Did the presentation provide you with information related to existing concerns?

Yes (100%) No

2. Did the presentation introduce you to new concepts or ideas?

Yes (100%) No

3. Please identify an area you might explore further:

Prepare for hurricanes ahead a time: home care persons i.e. oxygen persons who may need oxygen tanks or medications ahead of time in case outages or flooding.

What to do if you have to stay

4. After having viewed the presentation, how likely are you to adopt one or more recommendations from the forthcoming Adaptation Guide for the Monroe County health care community?

Will not Unlikely Not likely Likely Somewhat likely Very likely Will (100%)

5. Environmental conditions related to changes accelerated by human activity are linked in relationships to socio-cultural, economic, and health conditions.

True (100%) False

6. Adaptation activities implemented through community planning and preparedness can lessen the impacts related environmental changes accelerated by human activities.

True (100%) False

7. Is climate variability something you are concerned will affect your life while living and working in Monroe County, Florida?

Yes (50%) Somewhat (50%) No Don't know

8. How interested are you in seeing the Monroe County health care community represented in these types of community planning activities?

Extremely interested (50%) Very interested (50%) Somewhat interested
I will consider this and may be interested at a future time Not interested
Extremely disinterested

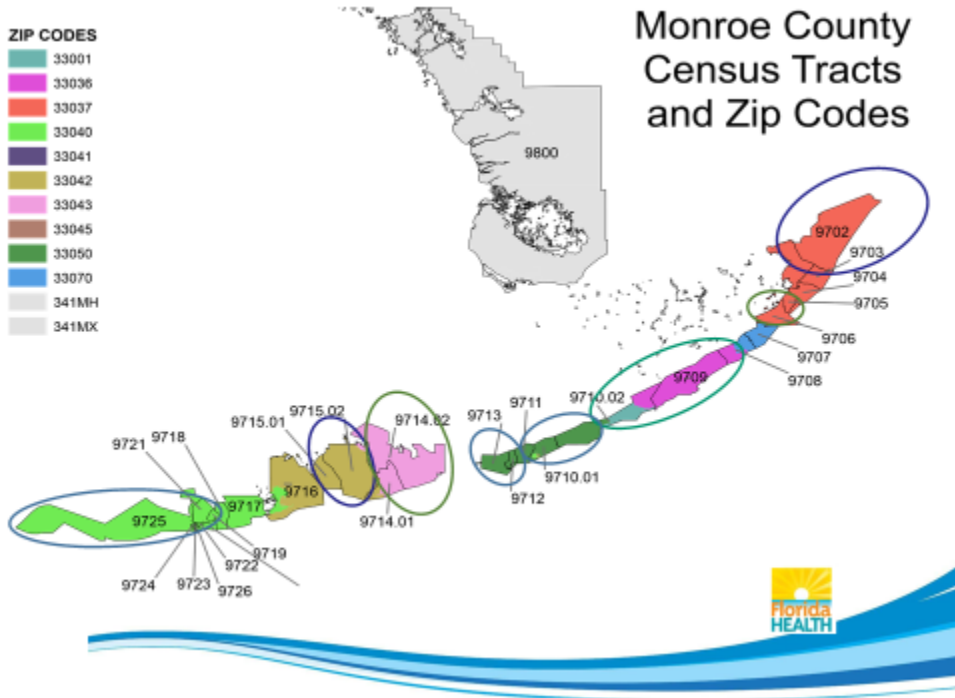
9. Comments

Great presentation Vicki - Good work and THANK YOU !

10. Contact information (optional) (100%)

Monroe County Adaptation Guide 2015 for the Health Care Community
Appendix C: map of Monroe County micro-communities

9720
 Census Tract numbers for Monroe County are the six digits after Data Processing and Cartography: state and county codes (12087) in the Geoid or Census Tract Key. For example, the Geoid/Census Tract Key is 12087970300 for census tract 9703 in this map.
 Florida Department of Health
 Bureau of Community Health Assessment
 Division of Public Health Statistics and Performance Management January 9, 2013



census tract	micro community	census tract	combined into one micro community	census tract	combined into one micro community	average sea level elevation
9703	Lake Surprise Area	9702	N. KL to Ocean Reef			4.8' MC 1-6
9704	Pennekamp Park Area					
9706	South Key Largo	9705	Rock Harbor Area			
9707	Tavernier					
9708	East Islamorada					
9709	West Islamorada	9710.02	Duck Key and Layton			4.9' MC 7&8
9711	Marathon Shores	9710.01	Key Colony Beach			
9713	West Marathon	9712	Central Marathon			3.17' MC 9-13
9714.01	Big Pine Key South	9714.02	Big Pine Key North			
9715.01	Cudjoe Area	9715.02	The Torches			
9716	Sugarloaf					4.7' MC 14-19
9717	Big Coppitt					
9718	Stock Island					
9719	New Town East					
9720	Airport Area					
9721	New Town West					4.7' MC 14-19
9722	17 Truman Avenue Area					
9723	Old Town	9725	Mallory Square Area	9726	Casa Marina District	
9724	19 Bahama Village Area					

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Appendix D: micro-community vulnerability analysis

MICRO COMMUNITY	SCORE
Stock Island	70
New Town West	69
Big Coppitt	63
New Town East	60
West Marathon	56
Pennekamp Park Area	53
Truman Avenue Area	53
Bahama Village Area	49
Tavernier	48

MICRO COMMUNITY	SCORE
Marathon Shores	45
East Islamorada	41
Old Town	40
Airport Area	36
South Key Largo	29
Big Pine Key South	26
Sugarloaf	25
Cudjoe Area	23
West Islamorada	15
Lake Surprise Area	11

Scoring by factor for each micro community

	Per Capita Income	%65+	%<18	Age-Adjusted Death Rate	Sea Level Elevation	Score
Stock Island	19	19	18	10	4	70
New Town West	17	15	19	15	3	69
Big Coppitt	16	17	9	17	4	63
New Town East	18	18	13	8	3	60
West Marathon	13	8	15	19	1	56
Pennekamp Park Area	14	12	16	9	2	53
Truman Avenue Area	12	13	12	13	3	53
Bahama Village Area	10	11	11	14	3	49
Tavernier	6	16	8	16	2	48
Marathon Shores	15	9	14	6	1	45
East Islamorada	5	6	17	11	2	41
Old Town	4	14	1	18	3	40
Airport Area	8	10	3	12	3	36
South Key Largo	11	2	7	7	2	29
Big Pine Key South	9	7	5	1	4	26
Sugarloaf	3	4	10	4	4	25
Cudjoe Area	7	5	4	3	4	23
West Islamorada	2	3	6	2	2	15
Lake Surprise Area	1	1	2	5	2	11



Public Health
Prevent. Promote. Protect.