

Climate Resilience in Carlisle and Cumberland County: Health and Wellbeing

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1. Introduction

This report discusses the important connection between climate change resilience and health and wellbeing in Cumberland County, Pennsylvania. It is becoming increasingly important to assess the county's current state of resilience relating to health and wellbeing as the severity and frequency of climate hazards intensify. This report aims to provide insights for the greater community of Cumberland County by analyzing stressors, vulnerabilities, strengths, weaknesses, resilience strategies, indicators, and metrics. Specifically, this report examines the following planning areas within health and wellbeing: health impacts, healthcare services and facilities, food security, homelessness, and affordable housing.

2. Health Impacts

The health impacts planning area contains multiple sub-topics: safety, heat-related illness, infectious diseases, and effects of air quality on health.

2.1. Safety

There are many climate stressors affecting safety in Cumberland County, including extreme heat events. This can lead to an increase in heat related illness. Another major climate stressor in the County is heavy precipitation, which may lead to flooding. The County is also susceptible to wildfires, whether in the County, or as experienced in summer 2023 with the travelling smoke from the Canadian Wildfires. Tropical storms and other intense weather events also threaten the safety of individuals in the County. All these climate hazards would require emergency response services (Center for Disease Control and Prevention, 2020; N. Harig, personal communication, November 13, 2023).

Workforce recruitment and retainment in emergency response services is a growing challenge (N. Harig, personal communication, November 13, 2023). There are a multitude of causes of this labor shortage, including the danger of the job, low pay, and inflexible working hours. There is overall a general lack of interest in this field, as many other jobs are more appealing to younger generations (Zavadasky, 2022). Another stressor is the population growth of Cumberland County, which has the potential to strain resources and emergency services.

The Two major tributaries to the Susquehanna River, Yellow Breeches Creek and Conodoguinet Creek, are the areas most vulnerable to flooding disasters (FEMA, 2023). Floods can lead to physical injuries, displacement issues, among other health impacts. Other vulnerable areas include the more rural portions of the County, where it may take longer for emergency response to transport to a safety hazard (J. Wintermyer, personal communication, October 20, 2023). A particularly vulnerable group is the emergency responders. As the frequency and severity of these climate hazards continue to increase, they will be placed in unprecedented situations of danger. In addition, the workers in this field will only continue to age, which increases their vulnerability. (N. Harig, personal communication, November 13, 2023). Other vulnerable groups whose safety is at high-risk include people with low socioeconomic status (especially people of color), the elderly, children, and people with a pre-existing medical condition or disability (Centers for Disease Control and Prevention, 2015).

A strength is the Cumberland County Hazard Mitigation plan, prepared by the Cumberland County Planning Department and the Cumberland County Department of Public Safety. This comprehensive plan was developed by County citizens. It aims to establish a pre-disaster multi-hazard mitigation strategy. The plan is designed to align with the unique needs of the County. The purpose is to provide a blueprint to minimize damage, save lives, create resilience and ensure safety in the County. It contains information on natural hazards, like hurricanes, wildfires, and droughts, and human-made or technological hazards, like urban fires or utility interruptions (Cumberland County, 2020).

A weakness witnessed in the County is the lack of safety precautions taken by individuals to minimize their own risk of climate hazards before they occur. After witnessing the

Canadian wildfires in summer 2023, many Cumberland County locals bought air quality monitors for their home. This shows that people are willing to enact safety measures, but only after seeing the threat occur. There may be a lack of community awareness or education on how individuals can prepare for hazards. (N. Harig, personal communication, November 13, 2023).

One example of a resilience strategy is to implement a streamlined system to gather and distribute emergency communication. This could be a similar resilience strategy mentioned later in the food security portion of this report. Another personal strategy that can be taken is to create an emergency self-sustaining kit that can last 72 hours (about 3 days). This would include food, water, a first aid kit, light and heat sources, and basis hygiene and sanitation. (N. Harig, personal communication, November 13, 2023)

Indicators of safety include emergency service availability and preparedness of a community for a climate hazard. Metrics for safety include emergency service response time and number of emergency responders available at any given time (Cumberland County, 2020).

2.2. Heat-Related Illness

Extreme heat events, or periods of abnormally high temperatures, are one of the greatest concerns facing Cumberland County. Increased temperatures and extreme heat waves are predicted to increase in frequency and intensity, resulting in more cases of heat-related illness. Urban areas, such as Carlisle, experience the urban heat island effect. This is a phenomenon where buildings and infrastructure create new microclimates, which create hotter temperatures than the surrounding area. A study was completed in Shippensburg, PA, and concluded that even smaller urban areas experience the urban heat island effect (Doyle & Hawkins, 2008). Another climate stressor is humidity, which will exacerbate the effects of extreme heat, as it hinders the body's ability to cool itself through sweat. Increased heat will also decrease air quality and increase the prevalence of infectious diseases, which may have adverse effects on heat-related illnesses (Patel et al., 2022).

A stressor that greatly impacts heat-related illnesses is having lack of access to a cool shelter, whether the person does not own a home, does not have air conditioning, or lacks proper transportation to get to a cooled shelter. Additionally, a lack of adequate hydration can impair the body's ability to cool itself down. Improper clothing choices also present another stressor (Ready PA, n.d.).

Vulnerable groups include the those with prior medical conditions, the elderly, children, those who are physically active outside, those who work outside (particularly in agriculture), pregnant individuals, people of color, and people suffering homelessness. Those who live near urban heat islands are also at great risk of developing heat-related illness. Having a lack of knowledge of how to cope with extreme heat is another vulnerability (Patel et al., 2022).

A significant vulnerability of extreme heat events includes increased instances of heat-related illnesses. These can range from being milder, such as heat rash or heat cramps, to more serious, such as heat syncope, heat exhaustion, or heatstroke. More extreme illnesses can lead to mortality (Ready PA, n.d.). If these cases of heat-related illnesses become too widespread in the County during an extreme heat event, medical facilities could become heavily strained.

A strength present in the County is the presence of shelters and facilities to help cool individuals on extremely hot days. There are a variety of locations available in the County that provide these services (E. Saunders, personal communication, October 23, 2023). However, a weakness is the lack of permanent cooling shelters available during the summer months (Pennsylvania 211, n. d.). Many shelters are only available during weekdays or business hours. Another weakness is the presence of urban heat islands in places like Carlisle and Shippensburg (Doyle & Hawkins, 2008).

A resilience strategy is to educate the public on how to prepare and cope with extreme heat. Many heat-related illnesses can be avoided if individuals possess the knowledge to take personal safety precautions. To prepare for these events, Ready PA suggests building an emergency kit, facilitating family communication, ensuring your home cooling system is working properly, identifying more vulnerable individuals, covering windows, and learning about first aid. During extreme heat events, they suggest staying indoors, drinking fluids, monitoring weather reports, spending time in cooled locations, dressing properly, among other safety precautions. It is vital to have the public aware of the safety measures in order to prevent instances of heat-related illness that can be avoided. (Ready PA, n.d.).

Another resilience strategy is to develop designated cooling shelters during summer months. Vulnerable populations suffer greatly from a lack of access to a cooled shelter, so this strategy would mitigate many of the heat-related illnesses they endure. The CDC provides a comprehensive report on cooling shelters, which could be used as a resource for developing one in Cumberland County. The summary discusses the types of buildings used for these shelters, how governments and communities can work together, their implementation, and their effectiveness (Widerynski et al., 2018).

There are multiple strategies for reducing the urban heat island effect seen in rural parts of the County. These include planting trees and implementing green roofs. Green roofs not only reduce the urban heat island effect, but also improve air quality (Environmental Protection Agency, 2023). Penn State Dickinson Law, located in Carlisle, currently has a green roof (Penn State College of Agricultural Sciences, n.d.).

The above strategies are vitally important to prevent some instances of heat-related illness. However, during an extreme event, there must be a structured plan for medical facilities and services to manage a significant rise in cases. Hospitals should develop a plan for power outages during a heat wave, ensure clinical staff and first responders are well-equipped to tackle these new challenges, identify the most vulnerable populations within the County, and

update emergency plans. More information on how to construct a medical system resilient to extreme heat events can be found in a journal article published on NEJM Catalyst (Patel et al., 2022).

Indicators of heat related illness include locations for cooling shelters and locations of urban heat islands. Metrics include the number of hospital admissions from heat-related illness, heat index, number of emergency calls related to heat-illness, and mortality rate during a heat wave (Patel et al., 2022).

2.3. Air Quality

A predominant climate stressor on air quality is extreme temperatures; high temperatures can lead to the production of ground-level ozone. High temperatures also lead to the increase of particulate matter (PM2.5 and PM10). Another climate stressor is wildfires, which release large amounts of particulate matter (Environmental Protection Agency, 2023).

A major stressor unique to Cumberland County is the presence of major highways and interstates. Carlisle is situated between two major interstates, I-81 and I-76, and has many large warehouses. Hence, the interstates carry diesel-burning trucks, producing large amounts of PM2.5. Industrial facilities and agricultural practices also contribute to poor air quality in the County. Cumberland County is also located in the valley of the Appalachian Mountains, which traps the air (Hawkins & Holland, 2010).

Vulnerabilities of poor air quality include increased instances of respiratory illnesses, diminished lung quality, effects of the cardiovascular system, reproductive health issues, cancer, and other long-term health effects. Vulnerable groups include children, elderly populations, individuals with pre-existing respiratory conditions, pregnant women, low-income groups, outdoor workers (firefighters, construction workers, farmers), the homeless population, and those who live in urban areas in the County (Environmental Protection Agency, 2023).

A strength of air quality in the County is the presence of the awareness program Clean Air Board of Central PA, dedicated to raising public awareness of air quality issues, promoting policy and practices for clean air, and monitoring air quality (E. Franco, Personal Communication, November 2, 2023). Weaknesses in the County are like the stressors—the presence of major interstates and the valley which contributes to poor air circulation.

County-wide resilience strategies include implementing green roofs, analyzing current fire management capabilities, educating citizens on best practices, and implementing a notification system for advanced warning of hazardous air quality days (Indiana University Environmental Resilience Institute, n. d.).

Metrics relating to air quality include air quality index or number of hospital admissions from respiratory or cardiovascular issues (Environmental Protection Agency, 2023).

3. Healthcare Service and Facilities

A major climate stressor already witnessed in the County is the inability to get to appointments and access services in the event of a weather emergency. As the frequency and severity of extreme weather events increases, this will continue to be a stressor. (C. Wenzel, personal communication, November 8, 2023). Additionally, extreme weather also has the potential to damage healthcare infrastructure. This can lead to a disruption of services or even evacuation of the facilities. This is especially hazardous as it is likely that more people will need access to these vital services in times of a hazard (Al-Marwani, 2023). As fluctuations in temperature and precipitation occur, the distribution of disease carrying vectors and waterborne illness will also change in the County. Healthcare systems will need to respond to possible diseases never previously common in the County (Al-Marwani, 2023). The rising temperatures and increased air pollution due to climate change will exacerbate respiratory conditions, leading to a higher demand for respiratory care services. This is particularly important to consider in Cumberland County, as the air quality is already suboptimal as a result of the presence of major interstates and the geography of the valley (N. Harig, personal communication, November 13, 2023).

A major stressor facing these facilities and services across Cumberland County is workforce challenges, including high staff turnover rates. This could pose severe challenges in the event of a climate emergency where more people may be seeking healthcare services. (N. Harig, personal communication, November 13, 2023). An aging workforce, surge in retirements, and lingering effects from the pandemic increasingly exacerbate healthcare work force challenges. In general, financial challenges relating to rising costs of new technologies, pharmaceuticals, and labor are a continuous stressor (American Hospital Association, 2023).

Vulnerabilities of healthcare services and facilities in the County include the inability to cope with infectious diseases that may suddenly arise due to increases in temperatures (Paterson et al., n.d.). Additionally, some groups may face cultural and linguistic barriers when attempting to access quality healthcare. This may become more prevalent in the future as the population of Cumberland County continues to grow, with diverse populations growing as a result (E. Saunders, personal communication, October 23, 2023). Vulnerable groups include those without access to adequate health insurance, those living in more rural areas in the County, and those with pre-existing health conditions who need to continuously seek healthcare appointments (J. Wintermyer, personal communication, October 20, 2023).

An overarching strength of healthcare services and facilities in the County is the presence of both quality and easily accessible healthcare. These facilities provide a range of services like emergency assistance, medical and surgical inpatient care, ambulatory surgery, oncology and cardiac services, advanced surgery, sophisticated diagnostic procedures, psychiatric and substance abuse treatment, and children’s health services (Cumberland Area Economic Development Corporation, n.d.). There are three major hospitals—UPMC Carlisle (located in Carlisle), Penn State Health Holy Spirit Medical Center (located in Camp Hill), and UPMC West Shore (located in Mechanicsburg). There are also three urgent care centers, one in Carlisle and two in Mechanicsburg (FEMA, 2023).

In terms of weaknesses, it was noted during some personal communications that the county possesses a segmented nature, which inherently creates disjointed hospital and healthcare systems. This is especially prevalent in the western portion of the County, where there is a lack of hospitals and urgent care (J. Wintermyer, personal communication, October 20, 2023). While there is no concrete evidence that this is how the County functions, this could pose serious threats during a County-wide emergency—these medical systems could be heavily strained and need to rely on one another’s services. Additionally, there is lack of safe transportation for marginalized groups to access healthcare services and facilities. (J. Wintermyer, personal communication, October 20, 2023). While physical health services are undoubtedly a strength in the County, mental health services are a weakness. There is currently not enough of these services for everyone in need, and the demand will only increase during a climate hazard (National Institutes of Health, 2022).

A resilience strategy could be to create climate resilient healthcare facilities, such as implementing effective power backup generators, to ensure continuous delivery of healthcare services in the event of a climate hazard. While this would ultimately be beneficial, it would pose substantial upfront costs in the design and implementation (Al-Marwani, 2023). Additionally, since mental health services are a predominant weakness in the County, another strategy is to build a plan for the delivery of these services during the event of a disaster.

An overarching strategy would be to conduct asset mapping of all of the healthcare services and facilities in Cumberland County. (J. Wintermyer, personal communication, October 20, 2023). Asset mapping in healthcare is a process that involves identifying and utilizing the resources, strengths, and capacities within a healthcare ecosystem. This allows healthcare organizations to gain a comprehensive understanding of the existing infrastructure, working professionals, and technological resources available. This approach would not only encompass traditional healthcare facilities, but also community organizations, educational institutions, and public health services. As a result, asset mapping can help optimize resource allocation, improve healthcare services, address disparities, unify the County, and create a climate resilient healthcare framework (UCLA Center for Health Policy Research, n.d.).

It is also necessary to investigate solutions to workforce and service delivery challenges in healthcare. A report by the American Hospital Association envisions reimagining workforce

roles and responsibilities. Leveraging technology to expand access to care and relying on AI to perform certain responsibilities can help improve efficiency in the healthcare systems. Hybrid and remote work models have also proven to be highly successful, improving employee productivity and resulting in less burnout. (American Hospital Association, 2023)

Resilience indicators of healthcare include quality of care, accessibility to healthcare services, provider productivity, mental health service availability, and emergency healthcare capacity (Second Nature, n.d.). Resilience metrics include number of healthcare professionals relative to the population, number of individuals with health insurance, staffing levels per unit, capacity of mental health professionals available, geographic distance to travel to the nearest hospital, and occupancy rates (Second Nature, 2020).

3.1. Food Security

Food security is inseparably linked to climate change. Shifting weather patterns and intensifying extreme events pose significant climate stressors to agriculture and food security in Cumberland County. Extreme weather events have the potential to restrict access to infrastructure and power, which poses major stress to food security (E. Saunders, personal communication, October 23, 2023). In these circumstances, it would become difficult for individuals to transport to obtain food and prepare food. Approximately 48% of Cumberland County is composed of farmland, which is at extreme risk of climate stressors (Bedi et al., 2022). First, extreme heat events can reduce crop yields, affect nutritional quality of crops, and increase the risk of heat stress on livestock. Second, altered precipitation patterns, including more extreme precipitation, are harmful to crops. Crops rely on steady, consistent rainfall, and these extremes can greatly affect growth and harvests. Additionally, droughts are also a significant stressor that can lead to crop failure. In summer of 2023, the County experienced a dry period, and farmers in the County struggled with some of their crops (R. Brown, personal communication, November 8, 2023).

There are a variety of other stressors affecting food insecurity in the County. As evidenced by the Covid-19 pandemic, public health crises place an immense strain on the food security system. It caused a disruption in the food supply chain, labor shortages, transportation disruptions, and market volatility. Many families relied on school lunches for meals, which were halted during the pandemic. The Covid-19 pandemic also led to inflation, limiting people's ability to afford an adequate and nutritious diet (Kakaei et al., 2022). These are all food security stressors the County will face again in the event of a public health crisis like a pandemic, which is likely to occur again—climate change is increasing the risk for Covid-19-like pandemics to arise every year (Joi, 2022).

Another stressor impacting food security in the County is the population growth in the County (E. Saunders, personal communication, October 23, 2023). This rapid growth may be a contributing factor to urbanization, which may then contribute to changes in land use, food supply chain dynamics, disparities in access to nutritious foods, and an increase in food waste.

Some of these stressors are already more predominant in more urban areas like Carlisle. The amount of farmland is also decreasing, which is being converted into urban or industrial use (Bedi et al., 2022). The relationship between urbanization, population growth, and food security in the County is complex, and more investigation needs to be done before drawing conclusions on causal relationships.

Vulnerable groups more susceptible to food insecurity include communities of color, households with children, single-parent homes, the elderly, those in poverty, those with a disability, veterans, and those who have been incarcerated (Hake, Engelhard, & Dewey, 2023; Bedi et al., 2022). Food insecurity is four times higher for Hispanic individuals and five times higher for Black individuals in the County (Bedi et al., 2022). Those living in the northern and western areas of the County are in a more rural area, which increases travel distance to quality food stores (Bedi et al., 2022). These travel routes may be heavily impacted in severe weather events, posing a vulnerable group. Lack of general food knowledge or access to utilities to prepare food are additional vulnerabilities (E. Saunders, personal communication, October 23, 2023). Farmland is also exposed to many vulnerabilities—such as increased prevalence of pests affecting crops, altered growing seasons, soil erosion and degradation, and crop failure (Environmental Protection Agency, 2023).

Cumberland County possesses a few notable strengths relating to food security. As mentioned in the section on healthcare services and facilities, the County possesses adequate healthcare services. This positively impacts the overall nutritional status and food security of the County. Cumberland County has many organizations, systems, and procedures established to mitigate food insecurity—including the Cumberland County Food System Alliance, Project SHARE, New Hope Ministries, and other churches and food banks (Bedi et al., 2022). These systems were proven to be highly effective during the Covid-19 pandemic, as it was communicated during multiple personal communications that these organizations were able to provide food to everyone in need during this time. They are equipped with large stockpiles of food that can be accessed if there were to be a climate emergency (E. Saunders, personal communication, October 23, 2023; R. Brown, personal communication, November 8, 2023). These strong community-based organizations and cooperatives promote collaboration and community resilience. They not only provide food, but also offer cooking and nutrition education so vulnerable groups can eventually become self-reliant to obtaining food (E. Saunders, personal communication, October 23, 2023). There are also many resources and programs in Pennsylvania to assist with food security, such as the WIC Farmers' Market Nutrition Program, school nutrition programs, and the Supplemental Nutrition Assistance program (Pennsylvania Department of Agriculture, n. d.). More information on the resources can be found on the Pennsylvania Department of Agriculture website.

A primary weakness in the county is the current presence of food insecurity. The food insecurity rate of Cumberland County is 7.2% (Feeding America, 2021). This is considered to be a surprisingly high rate for the County being one of the wealthiest in Pennsylvania (Bedi et al.,

2022). Another weakness witnessed in the County is the utilization of temporary or short-term solutions to limit food insecurity, without having a comprehensive plan to provide food in an emergency. This was especially evident during Covid 19—although these organizations were able to effectively distribute food to those in need, many noted that they used “band-aid” solutions. They realized a weakness in the County’s system of a lack of planning and communication. In the event of an emergency even more extreme than Covid-19, these temporary solutions may not be suitable (E. Saunders, personal communication, October 23, 2023).

There are a variety of resilience strategies Cumberland County could implement to ensure food security in the event of a climate hazard. In terms of local farms, continuous adoption of climate-resilient farming practices can help mitigate the impact of climate stressors, such as extreme precipitation or heat, on crop yields. Farmers can also switch to producing crops that would be adapted to changing precipitation patterns and temperatures (Environmental Protection Agency, 2023). The County could also establish an early warning system to provide timely and accurate information on climate risks to farmers and the community, enabling emergency preparedness (N. Harig, personal communication, November 13, 2023).

Another strategy is to invest in resilient infrastructure to ensure the efficient functioning of food supply chains as well as enable the public safe transportation during extreme weather events. It is important that the more rural portions of the County, such as the north and west, always have safe transportation to access food. Another strategy is to establish a food retailer in these rural areas, which has already been advocated by many stakeholders (Bedi et al., 2022).

Creating a more comprehensive and organized plan surrounding food security instead of relying on temporary solutions is also another resilience strategy. Asset mapping could also be conducted here, similar to the description provided on asset mapping in section II on healthcare services and facilities (J. Wintermyer, personal communication, October 20, 2023). This process would examine food retailers, food banks, and any other organizations in the County that work to provide food, educate the public about nutrition, or assist in minimizing food insecurity in any way. As a result, asset mapping can help optimize food allocation, address disparities, unify the County, and create a climate resilient food system.

A few resilience indicators of food security are prevalence of undernourishment, agricultural productivity, food accessibility, and community perceptions of food security. Resilience metrics include food insecurity rate of the County, percent of household income spent on food, percentage of the population covered by social safety net programs such as food assistance, and frequency and severity of climate-related events impacting agriculture (Hake, Engelhard, & Dewey, 2023).

4. Homelessness

Almost every climate stressor in Cumberland County will have an impact on the homeless population, as they routinely endure prolonged exposure to the elements. Increased temperatures can lead to extreme heat-related illnesses and mortality, as the homeless lack access to cool shelters or hydration sources. This is an even greater concern in urban areas like Carlisle, as they may experience the urban heat island effect. Poor air quality due to wildfires or pollution is very prevalent as they face high exposure to outdoor air, which can lead to cardiovascular issues or mortality. Extreme weather events like hurricanes, storms and floods can lead to mortality, infectious disease, poor mental health outcomes such as PTSD, or physical injuries. Cold events are also dangerous to the homeless but will become less prevalent with warmer winters in the County (Ramín & Svoboda, 2009).

A predominant stressor on homelessness is the current state of the housing market; there is too great of a demand for housing and not enough supply, with vulnerable groups unable to find housing. Houses are becoming unaffordable for many (Lopez, 2022). Another major stressor is poverty and unemployment which leads to financial instability and difficulty in maintaining a house. 8% of Cumberland County is in poverty, which is about 1 in 12 people (United States Census Bureau, 2022). Another stressor is high rates of mental illness and substance abuse in homeless populations. These challenges make it difficult to make an income and find secure housing (M. Kuna, personal communication, October 11, 2023).

Groups who are vulnerable to becoming homeless include chronically homeless individuals, families with children, youth and young adults, veterans, people with mental illness, substance abusers, and elderly individuals (National Alliance to End Homelessness, n.d.). During personal communications, it was noted that diverse and immigrant communities are another vulnerable group (E. Saunders, personal communication, October 23, 2023). Homeless people who already suffer from health issues, such as cardiovascular, respiratory, or immunocompromised conditions, are more vulnerable to health risks (Ramín & Svoboda, 2009). Non climate resilient homes can lead to damaged infrastructure, which makes these groups more vulnerable to being displaced and may lead to homelessness; it was noted that many houses in the County are old and decrepit (E. Saunders, personal communication, October 23, 2023). These individuals are especially vulnerable if they do not have insurance. Farmers in the County are also another vulnerable group, as the effects of climate hazards on crops and livestock may lead to economic challenges and housing instability (Bedi et al., 2022).

There are a few strengths currently present in the County to manage homelessness in the event of a climate hazard. First, the County has access to various organizations and higher education institutions, that are either currently acting as shelters for those in need or could be used in the event of an emergency (E. Saunders, personal communication, October 23, 2023; J. Wintermyer, personal communication, October 20, 2023). There is also strong collaboration between government agencies, non-profit organizations, and community groups to help

address homelessness comprehensively. For example, Cumberland County provides a homeless assistance program, with the objective of helping people find refuge and attaining self-sufficiency (Cumberland County, n.d.). The Housing and Redevelopment Authority of Cumberland County also provides a program supporting homelessness (M. Kuna, personal communication, October 11, 2023). The Pennsylvania Department of Human Services also offers an assistance program (Department of Human Services, n.d.). There are a multitude of heating shelters available for the homeless for extreme cold events (Pennsylvania 211, n.d.).

However, there are many weaknesses in the current system. Many organizations that do offer shelter, either from heat, cold, or extreme weather, only provide it during working hours. There are currently no permanent cooling or extreme weather shelters available, which is a serious threat as warming continues to increase (E. Saunders, personal communication, October 23, 2023). Another weakness is the lack of mental health care for the homeless. This is a primary reason why many remain homeless, unable to escape their situation. Additionally, there is a lack of financial resources to deal with these immense and convoluted issues—many of the resilience strategies below are costly (M. Kuna, personal communication, October 11, 2023).

During personal communication, the primary resilience strategy discussed for homelessness is to create an emergency shelter where people can have their basic needs met. The shelter would need to provide basic hygiene necessities, bedding, meals, health and wellbeing services, and transportation assistance. This emergency shelter would consequently limit many of the vulnerabilities homeless people face during an extreme event, such as heat-related issues, infectious disease, physical injuries, and even mortality. However, there is a tremendous financial barrier preventing the creation of an emergency shelter for the homeless population (E. Saunders, personal communication, October 23, 2023; M. Kuna, personal communication, October 11, 2023).

A preventive resilience strategy involves constructing climate-resilient housing to withstand extreme weather events and ensure safety during emergencies. This approach includes avoiding construction in flood-prone areas, implementing water management practices, and enhancing structural resilience. Cumberland County can create housing that is better equipped to endure impacts from climate hazards. This would ensure that people currently living in homes do not become homeless due to a climate hazard (E. Saunders, personal communication, October 23, 2023).

Another important strategy is to continue communicating the programs that the County already offers to provide assistance to the homeless. This would involve using various communication channels, such as newspapers, community bulletin boards, and community newsletters. (M. Kuna, personal communication, October 11, 2023)

Resilience indicators include causes of homelessness, utilization of homeless services, exit destination (housing situation individuals move into after leaving homelessness), and

utilization of shelters. Resilience metrics include length of homelessness, point-in-time count (number of homeless individuals counted at a specific time), housing placement rates, or percentage of beds available in a homeless shelter (National Alliance to End Homelessness, n. d.).

5. Affordable Housing

Extreme weather is a major stressor on affordable housing, as it threatens to destroy homes in the County. These types of climate stressors include wildfires, extreme precipitation which leads to flooding, and extreme heat. If houses do not possess adequate cooling systems, the cost of cooling will be very high. Other events like hurricanes and storms can physically damage homes (Fu, 2022).

There are many other stressors influencing affordable housing, such as cost of utilities, old and decrepit houses that may lack resilience to weather, and the fact that housing prices have continually been increasing (E. Saunders, personal communication, October 23, 2023 & J. Wintermyer, personal communication, October 20, 2023).

Vulnerabilities include old houses which may lack physical resilience to climate events and houses that are in flood plains. Additionally, utility prices for individuals are likely to increase as they will need to increasingly cool their homes, which at some point may become unaffordable for low-income groups. Vulnerable groups include people with low incomes and people of color. They are disproportionately cost-burdened (Fu, 2022).

There are a few assistance programs currently available, such as LIHEAP (Low Income Home Energy Assistance Program) and Cumberland County's Affordable Housing Trust Fund, which serve as strengths in the County (E. Saunders, personal communication, October 23, 2023 & M. Kuna, personal communication, October 11, 2023). The Cumberland County Housing and Redevelopment Authority helps individuals locate affordable housing options and provide financial assistance in some special circumstances (M. Kuna, personal communication, October 11, 2023).

A predominant weakness in providing affordable housing to everyone in need is a lack of financial resources to support those in need to relocate to affordable and resilient housing options. Another financial weakness is the inability to fund repairs to public housing in the event of a climate emergency (M. Kuna, personal communication, October 11, 2023). Additionally, many affordable housing options are located in areas more susceptible to climate hazards, such as in flooding zones. If their houses get destroyed in a flooding emergency, this creates an inescapable cycle for more vulnerable populations to eventually afford a more resilient housing option (E. Saunders, personal communication, October 23, 2023).

One resilience strategy, although costly, is to encourage and fund the rehabilitation of existing homes to both reduce greenhouse gas emissions and become resilient to climate emergencies. This would include installing renewable energy sources, improving efficiency, and upgrading the old infrastructure. This would enable lower utility costs, making this option more affordable. Grants or loans can be awarded to assist projects like this (Fu, 2022). Another resilience strategy is to invest in public housing that provides green space and resilient infrastructure. As the population of Cumberland County continues to increase, the demand for public housing will grow in response. (Fu, 2022)

Resilience indicators include the climate resiliency of houses in the County, housing price trends, and the availability of government assistance programs. Resilience metrics include the number of cost burdened homeowners, average mortgage costs in the County, and the number of rentals units priced at affordable levels for low-income groups (Fu, 2022; M. Kuna, personal communication, October 11, 2023).

6. Conclusion

This report aims to assess climate resilience in Cumberland County and Carlisle, specifically in relation to health and wellbeing. The planning areas of health impacts, healthcare services and facilities, food security, homelessness, and affordable housing were assessed by examining climate stressors, other stressors, vulnerabilities, strengths, weaknesses, resilience strategies, indicators, and metrics. Climate stressors such as extreme weather, increased precipitation, and extreme heat, are some of the most common risks to health and wellbeing across all planning areas. Health impacts will not be experienced evenly across the County, with marginalized groups being the most affected. Groups most vulnerable to adverse impacts on health caused by climate change include the elderly, children, low-income populations, homeless individuals, people of color, rural communities, pregnant women, and those with pre-existing health conditions. Multiple resilience strategies were suggested in each planning area, but more research needs to be completed to assess how feasible these solutions would be for Cumberland County. Additionally, not all aspects of health and wellbeing were included in this report—additional planning areas that should be further researched are education, health insurance, infectious disease, social vulnerability, and recreation, to name a few.

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Nickie Fickel. October 25, 2023. WellSpan Health and Healthy Franklin County.

Ryan Brown. November 8, 2023. New Life Community.