HENNEPIN COUNTY
PUBLIC HEALTH

Jurisdictional Risk Assessment

Executive Report

Jurisdictional Risk Assessment Executive Report

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Contents

Introduction

A Jurisdictional Risk Assessment (JRA) is an approach used to evaluate threats to health, safety, and infrastructure of a jurisdiction. This approach looks at hazards through a public health lens to assess our biggest threats. Risk calculation is based on community characteristics, demographics, health and public health infrastructure, baseline preparedness capabilities, and hazard and impact probability scores.

This assessment is completed every 5 years by the Hennepin County Public Health Emergency Preparedness and Response team. The Hennepin County JRA Executive Report describes the jurisdictional characteristics and vulnerabilities, assessment methodology and results, and potential impacts on public health and at-risk populations. This report is used to identify existing gaps and help determine future hazard-specific planning, training, and exercise activities that should be conducted with public health preparedness and response partners.

The assessment tool includes 21 hazard scenarios to assess the:

- Probability of each risk occurring in Hennepin County
- Severity of the hazard on individual and community health
- Impact the hazard would have on the human health, healthcare service, community operations, and public health service; and
- Current Hennepin County Public Health preparedness level for each hazard.

For more details on the 21 hazard scenarios, see Appendix A.

Background

Jurisdictional Characteristics and Vulnerabilities

Geography

Hennepin County Jurisdictional Map

Area

Hennepin County is approximately 607 square miles.[1]

- Land area: 554 square miles (1,435 square kilometers) or 91%
- Water area: 53 square miles (137 square kilometers) or 9%

Elevation

Mean elevation is 925 feet (282 meters) above sea level.[1]

- Highest: 1120 feet (341 meters) above sea level
- Lowest: 686 feet (209 meters) above sea level
- Vertical Relief: 434 feet (132 meters)

Climate

Hennepin County has a highly variable, continental-type climate with seasonal extremes and a wide range of weather hazards. Climate change has caused "distinct, measurable trends towards warmer, wetter, and more humid conditions" for the county, although occasional moves towards cold or arid conditions continue to be part of the climate.[1]

In general, summers are hot. The mean daily maximum temperature in July is 83.2 degrees F,[2] and the record maximum is 108 degrees F in July 1936.[3] Winters are typically very cold. The mean daily minimum in January is 2.9 degrees F,[2] and the record minimum is -34 degrees F in January 1970.[3] Normal annual snowfall averages 51.2 inches,[4] and the maximum 24-hour snowfall was 21.3 inches in April 2018.[5] Normal annual rain precipitation is 31.6 inches,[4] with the record 24-hour rainfall of over 10 inches occurring during the Twin Cities "Superstorm" in July 1987.[6]

Transportation Infrastructure

Hennepin County has a well-developed highway system. The Hennepin County Highway System comprises approximately 571 miles of roadway.[1] The Highway System is divided into two categories: County State Aid Highways and County Roads. The county road system consists of approximately 80 miles of roadway.[1] The county's residents rely on goods and supplies being carried into the state along these routes. Railways are also a major mode of transportation for goods, supplies and hazardous materials, and are utilized in the county. Additionally, a joint civil-military public international airport, the Minneapolis-Saint Paul International Airport, is in the southeastern corner of the county.

Demographics

Population

Hennepin County is the most populous county in Minnesota and contains over 1/5th of the state's population with over 1.26 million inhabitants.[1] The metropolitan statistical area, or "Twin Cities metro" 7-county area, accounts for 60 percent of Minnesota's population and is the sixteenth largest metropolitan area in the United States.[7] Hennepin County contains a large portion of this 7-county metropolitan statistical area, with the majority residing in and near the urban center of Minneapolis. The size and population of Hennepin County makes it vulnerable to a multitude of incidents that could potentially affect the health of the population.

Household Economics

Hennepin County remains one of the wealthiest counties in Minnesota with an average per capita income of $57,633 and median family income of $92,595 compared to a statewide median family income of $84,313.[8] The most common employment sectors for those who live and work in the county are health care and social assistance; manufacturing; and professional, scientific, and technical services.

In 2022, close to 10% of the population in Hennepin County (123,000 out of 1,250,000 people) lived below the federal poverty line, which is lower than the national average of 12.6%.[1]

Educational Attainment

Overall, the county has an educated resident population; education rates are shown below.[8]

- High school graduate or higher 93.9%
- Bachelor's degree or higher 53.5%

Race and Ethnicity

In 2021, there were 5.14 times more White (Non-Hispanic) residents (850,175 people) in Hennepin County than any other race or ethnicity. There were 167,289 Black or African American (Non-Hispanic) and 90,086 Asian (Non-Hispanic) residents, the second and third most common ethnic groups. Around 7% of the people in Hennepin County are Hispanic (89.3k people).[9]

- White 67%
- Black or African American 13%
- Asian 7%
- Hispanic or Latino/a 7%
- American Indian or Alaska Native 0.4%
- Native Hawaiian or Pacific Islander ~0%
- Two or more races 5%
- Some other race alone 0.7%

Age and Sex

Children account for over 20% of the county's population. In 2024, 1 in 6 Hennepin County residents were aged 65 or older; by 2055, it is estimated this will increase to 1 in 5 residents.[10] The ratio of males to females is 97 to 100, respectively.[11]

Immigrants/Refugees

Foreign-born persons account for close to 14% of Hennepin County residents.[12] There are over 480,000 refugees living in Minnesota, with over 36% (175,190) residing in the county.[12] The influx of refugees to Minnesota dramatically increased over the last 3 years with over 3,000 new refugees arriving in the last year. Most refugees have originated from Somalia, Burma, Democratic Republic of Congo, Ethiopia, Afghanistan, Syria, Eritrea, Ukraine, Venezuela, Nicaragua, and Guatemala; many choose to settle in the Twin Cities metro area.[13] It is estimated there are more than 30 languages spoken by refugees in the county.[14] Approximately 18% of residents 5 years and older speak a language other than English at home, with Spanish being the largest language group, and over 6,000 residents use sign language to communicate.[15]

Residents with Disabilities

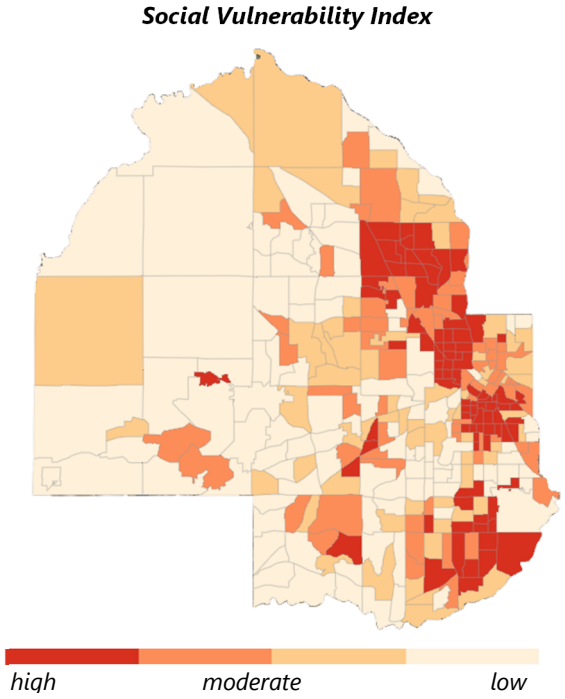
As of 2023, over 1 in 10 Hennepin County residents (10.4%) reported that they lived with a disability of some sort. The most reported disabilities include cognitive difficulty (5.4%), independent living difficulty (5%), ambulatory difficulty (4.5%), hearing difficulty (2.7%), self-care difficulty (2.1%), and vision difficulty (1.6%). Disability was equally reported among men and women. Persons identifying as Native American were more likely to report having a disability than any other races.[16]

Residents without Immunizations

Vaccine misinformation has increased vaccine hesitancy among parents, particularly around the MMR (measles, mumps, and rubella) vaccine, which led to measles outbreaks in Hennepin County in 2017, 2022, and 2024 among unvaccinated children.[17] Based on analysis by the Minnesota Department of Health, in Hennepin County, 75% of 24 to 36 month-old toddlers completed MMR vaccination in 2023, which closely correlates with statewide MMR coverage.[18]

Tourists

The visitor volume to the state has been increasing over the past few years and, in 2023, returned to pre-pandemic levels. Hennepin County accounted for over 1/3 of state tourism spending in 2023, growing at an annual rate of 12.5%. Spring and summer are historically the most popular seasons for travel to Minnesota. Hennepin County contains the top tourist destination in the Midwest, the Mall of America, which welcomes more than 40 million visitors each year.[19]



Social Vulnerability

Social vulnerability refers to the susceptibility of certain social groups to the adverse impacts of hazards. These adverse impacts include disproportionate mortality, injury, loss, and/or disruption of livelihood.[20]

Demographic and socioeconomic factors that contribute to vulnerability are education, income, family characteristics, race, ethnicity, languages spoken, housing, and availability of transportation. Hennepin County's social vulnerability index map, pictured at left, indicates low to mild vulnerability for much of the county; however, areas of higher vulnerability are concentrated in the northeastern and southeastern portions, coinciding with denser populations.[21]

EmPOWER Data

The U.S. Department of Health and Human Services' (HHS) emPOWER Program reports numbers of individuals with electricity-dependent medical and assistive equipment for planning purposes. As of February 2025, there were 220,616 Medicare beneficiaries in Hennepin County, and 6,610 residents utilize electricity-dependent devices and durable medical equipment. Additionally, there are reportedly 870 residents participating in home health services and 429 residents utilizing at-home hospice services.[22]

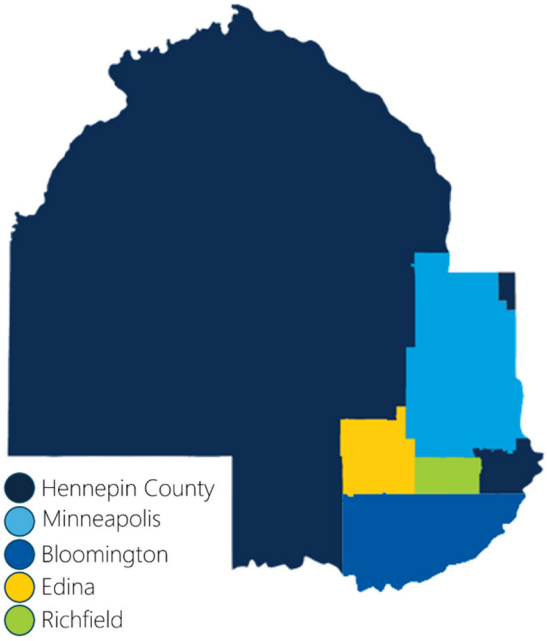
Health Infrastructure

Public Health System

The local public health system is responsible for providing the following services to residents: health education, preventive services, environmental safety, epidemiological surveillance, food safety regulation, emergency preparedness and response, and family health services, among others.

There are five community health boards in Hennepin County. The City of Minneapolis provides public health emergency services to its own residents. The City of Bloomington, through its public health division, provides public health emergency services to the residents of Bloomington, Edina, and Richfield via the Public Health Alliance of Bloomington Edina Richfield. Hennepin County Public Health provides public health emergency services to the remainder of the jurisdiction and coordinates with these local partners when the need arises.

Community Health Boards



Health Care System

Hennepin County is part of a seven-county Metro Health and Medical Preparedness Coalition that works together to create a healthcare system that is resilient to disasters or emergencies with public health or medical implications. This metro region includes 29 hospitals; 47 community mental health centers; 2 psychiatric hospitals; 8 Indian Health Service, Tribal, & Urban Indian Health Facilities; 70 intermediate care facilities for individuals with intellectual disabilities; 122 skilled nursing facilities; and 1,396 assisted living facilities.[23]

In Hennepin County, there are 9 hospitals; 23 community mental health centers; 1 psychiatric hospital; 2 Indian Health Service, Tribal, & Urban Indian Health Facilities; 33 intermediate care facilities for individuals with intellectual disabilities; 50 skilled nursing facilities; and 909 assisted living facilities.[23]

Hospitals located within Hennepin County report more than 110,000 emergency department visits and more than 150,000 inpatient admissions annually.[24] As of 2024, there were 5,524 licensed beds at all hospitals in the county.[24]

Mental Health System

Mental health providers are prolific in Hennepin County. As of 2024, there were approximately 7,000 licensed mental health professionals in the county, amounting to 555 providers per 100,000 people, compared to 345 providers per 100,000 nationally.[25]

Methods

Scope

The baseline data for the JRA includes the populations of the cities of Minneapolis, Bloomington, Edina, and Richfield. Risks associated with the hazards in the tool represent the entire Hennepin County population and are not specific to geographic areas within the county.

Approach

To conduct the JRA, Hennepin County Public Health used Pennsylvania's Public Health Risk Assessment Tool (PHRAT). The PHRAT was developed by Drexel University Dornsife School of Public Health for the Pennsylvania Department of Health, in cooperation with the U.S. Centers for Disease Control and Prevention (CDC), to help public health prioritize their planning efforts for emergencies that impact the health of the public. To inform these decisions, the PHRAT guides planners through an analysis of health-related impacts of various hazards that have the potential for occurring in Hennepin County. It assesses the planning that is necessary to ensure access to emergency preparedness and response resources, considering the services provided by public health agencies and the healthcare system. Appendix B provides a visual overview of the PHRAT calculations.

The PHRAT assesses the following hazards:

Biological	Chemical Incident	Extreme Incident	Infrastructure	Terrorism
• Localized Infectious Disease • Opioid Epidemic • Pandemic	• Hazardous Materials Release • Nuclear Facility Accident	• Civil Disturbance • Coastal Storm • Drought • Earthquake • Fire • Flood • Temperature Extremes • Tornado • Winter Storm	• Utility Interruption	• Active Shooter • Biological Terrorism • Chemical Terrorism • Conventional Explosive • Cyber Terrorism • Radiation Dispersal Device

The PHRAT assesses public health risks that result from each hazard through a measurement in four major domains: human health, healthcare services, community operations, and public health services. The tool takes a quantitative approach to impact assessment, measuring baseline levels of morbidity, services, and activities, and comparing them to the morbidity, service impacts, and activities that result from specific hazard incidents. The items listed below inform the severity score for each domain:

Human Health Impact

- Mortality
- EMS transports
- Emergency department visits
- Hospitalizations
- Trauma center injuries
- Mental health impact

Healthcare Service Impact

- Outpatient services
- Emergency department services
- Hospital beds
- Ancillary services
- Trauma units
- Mental health services
- Hospital personnel

Community Operations Impact

- Water supply
- Sewage/Sanitation
- Public utilities
- Transportation
- Business continuity
- Population displacement
- Environmental contamination

Public Health Service Impact

- Public health personnel
- Surveillance
- Mass care
- Medical countermeasures
- Laboratory services
- Health communications
- Fatality management

Hennepin County used the tool to calculate risk, based on the probability and severity identified for each hazard.

$$\text{Risk Score} = \frac{\text{Probability Score} \times \text{Severity Score}}{16} \times 100$$

In addition to prioritizing hazards based on probability and severity, the tool generates an adjusted risk score, which weights the risk of a hazard based on the additional planning necessary to ensure universal access to emergency response resources for at-risk populations.

$$\text{Adjusted Risk Score} = \text{Risk Score} \times \left(\frac{\text{At-Risk Populations Score}}{4} + 1 \right)$$

The following at-risk populations were incorporated using baseline data from the US Census American Community Survey:

- Hearing disability
- Vision disability
- Ambulatory disability
- Cognitive disability
- Limited English proficiency
- Poverty
- Chronic diseases
- Children, 18 and under
- Elderly, 65 and older
- Limited access to technology

A preparedness score is generated using Hennepin County's current capacity in each of the 15 CDC Public Health Emergency Preparedness and Response Capabilities, as well as the relevance of each capability to specific hazards.

$$\text{Preparedness Score} = \frac{\sum_{n=1}^{15} (\text{Capability } n \text{ Score} \times \text{ Capability } n \text{ Relevance Score})}{\sum_{n=1}^{15} \text{Capability } n \text{ Relevance Score}}$$

The final output of the tool is a planning priority indicator, which reflects both adjusted risk and the county's overall preparedness.

$$\text{Planning Priority Indicator} = \frac{\text{Adjusted Risk Score}}{\text{Preparedness Score}}$$

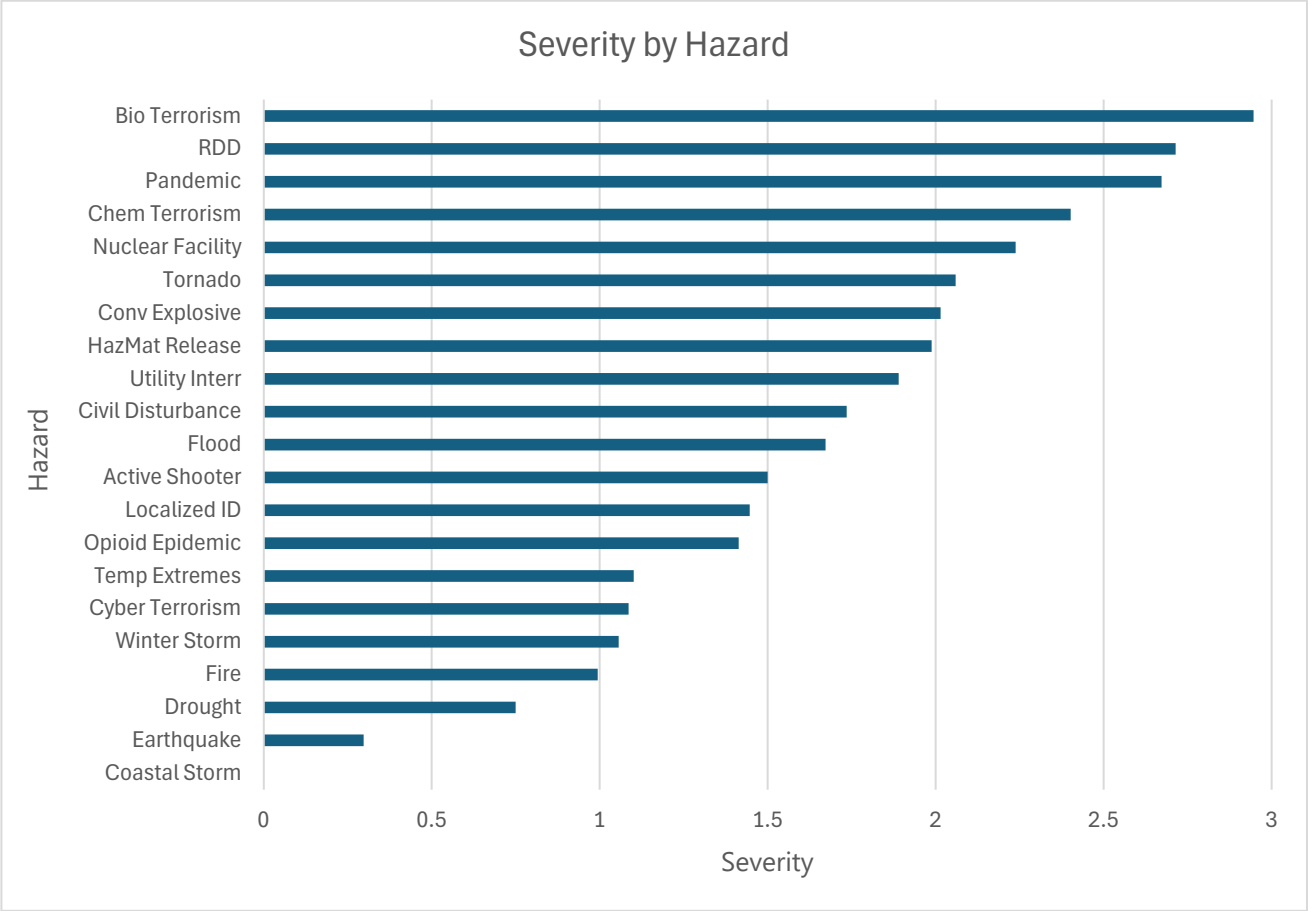
Engagement

In addition to completing the PHRAT tool, Hennepin County Public Health engaged county leadership to obtain their feedback on how impactful the top five identified hazards would be on the at-risk populations they serve through their programs. Details on the survey audience, design, and respondents are in Appendix C. Results from the survey, identifying which at-risk populations would be most impacted by each hazard, are incorporated within the analyses completed for each hazard.

Results

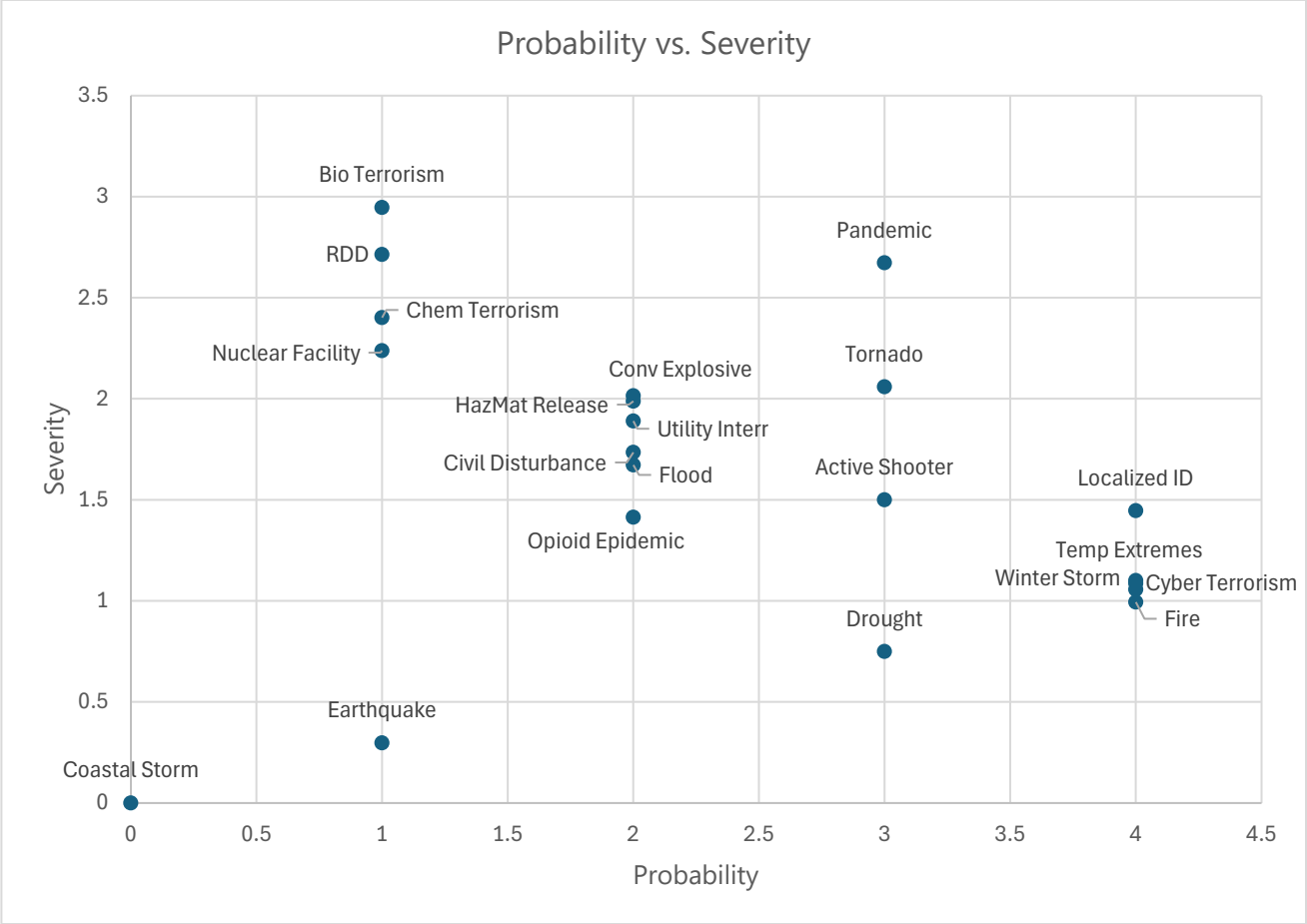
Severity

This graph demonstrates the overall severity of each hazard on individuals, healthcare service, community operations, and public health service.



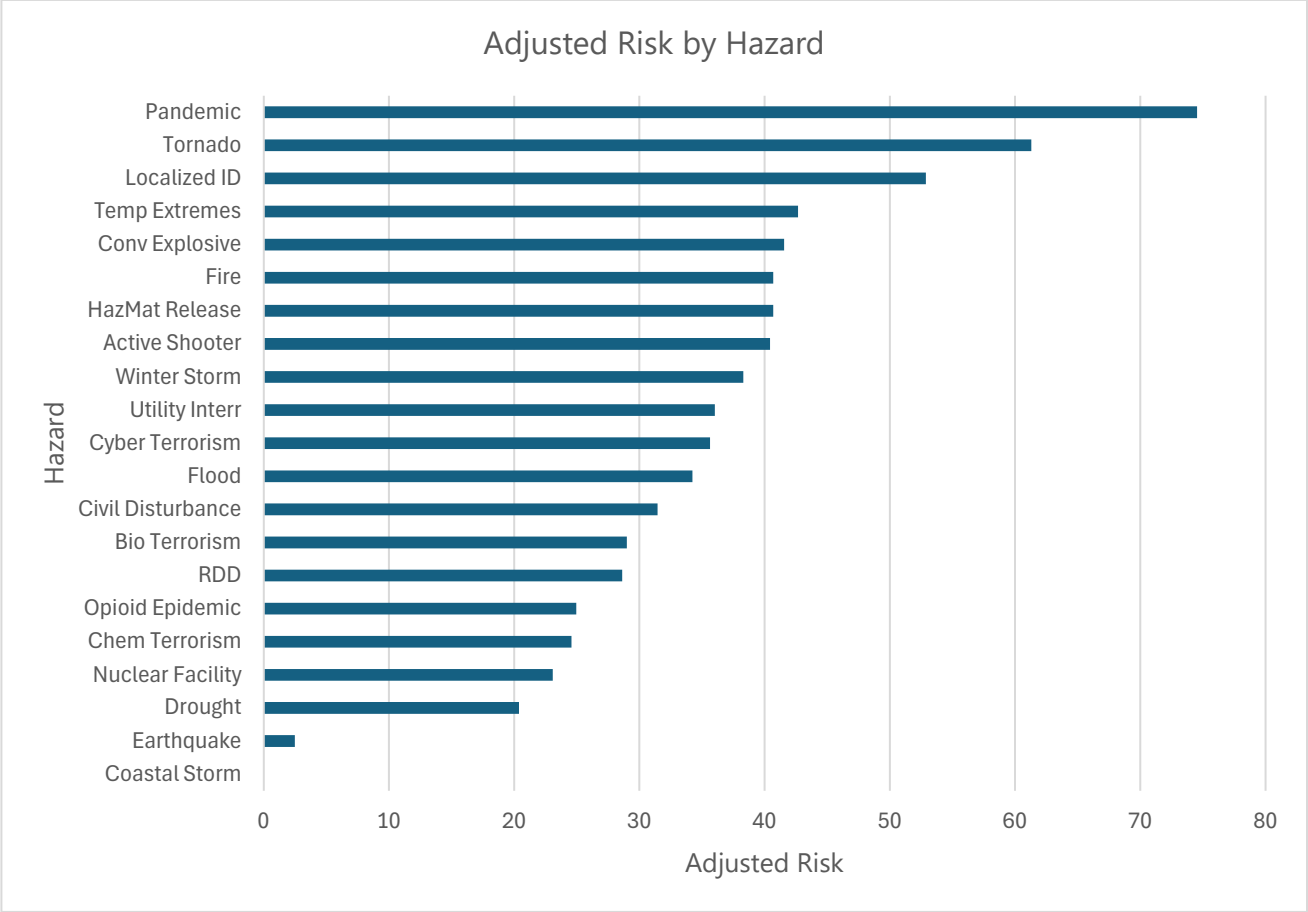
Probability vs. Severity

This graph demonstrates the different hazards based on their probability of occurrence and their associated severity.



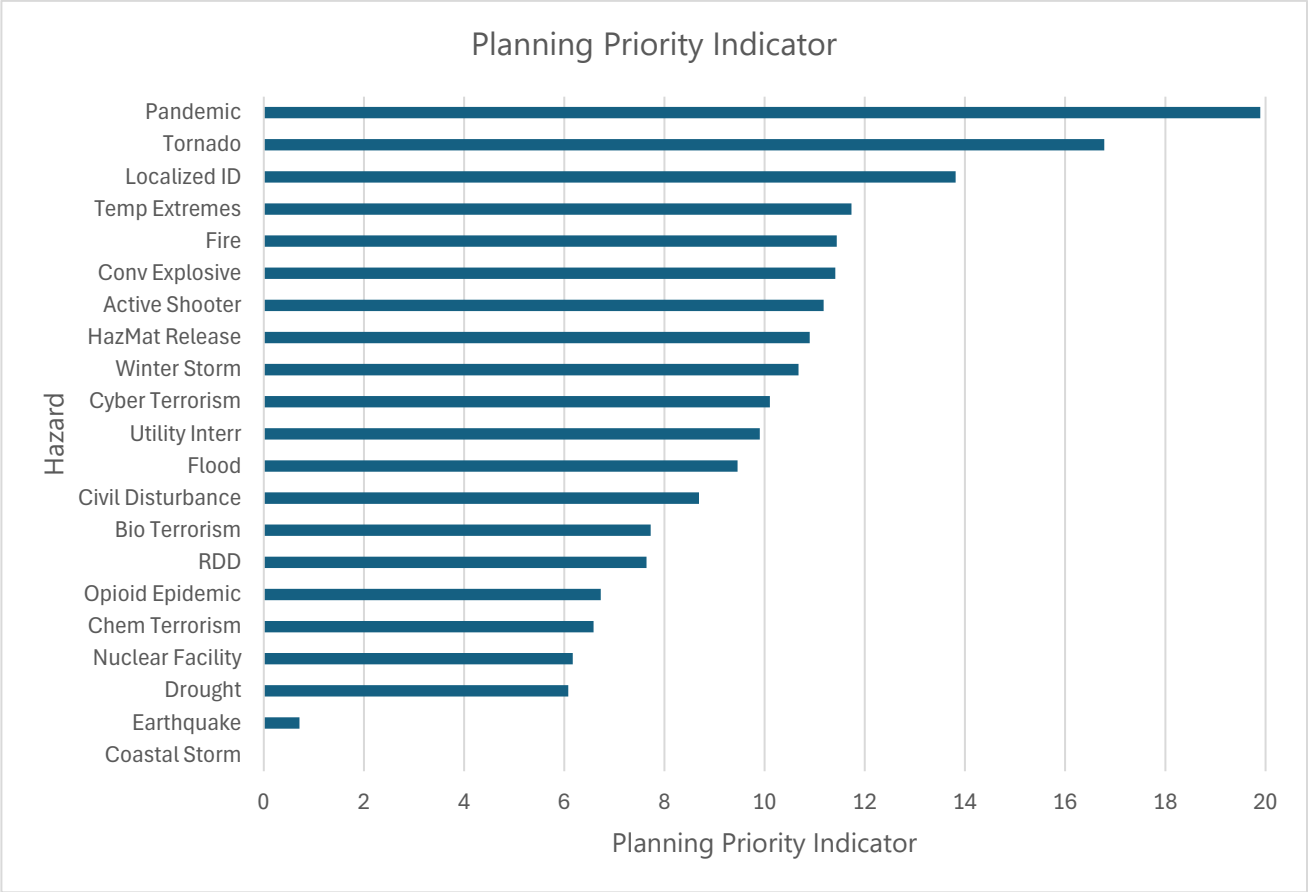
Adjusted Risk

This graph shows the adjusted risk score for each hazard, considering the additional planning required to reduce a hazard's impact on at-risk populations.



Planning Priority Indicator

This graph shows the planning priority indicator, reflecting both adjusted risk and preparedness.



Analysis

Top Five Hazards

The following hazards emerged from the assessment as priorities based on their severity, probability, disproportionate impacts on at-risk populations, and the preparedness of Hennepin County:

1. Pandemic
2. Tornado
3. Localized Infectious Disease
4. Temperature Extremes
5. Fire

Pandemic

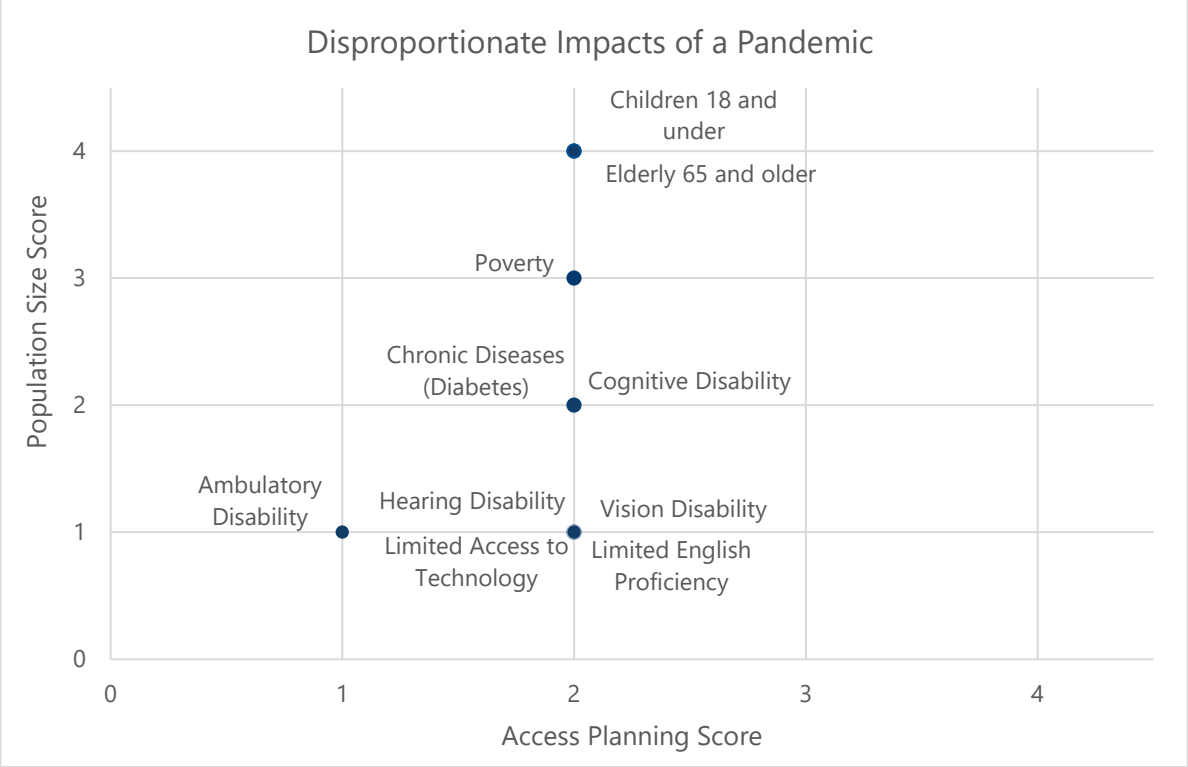
A pandemic is ranked as the top threat for Hennepin County Public Health. The proxy scenario used to predict the impact of a pandemic in Hennepin County was the COVID-19 pandemic. While the recent global COVID-19 pandemic influenced this result, several infectious disease responses occurred globally in 2024. These include mpox clade 1, Marburg virus, dengue, measles, and an increasing number of human influenza A (H5N1) cases related to dairy herds and poultry operations.

Outbreaks have the potential to strain all aspects of Minnesota's public health and health care system, as well as having significant impacts on schools, businesses, and other aspects of society. For example, in 2023 the three infectious diseases, RSV, COVID-19, and seasonal influenza, stretched health care systems, and disproportionately affected at-risk populations such as older adults, people who are immuno-compromised, people with disabilities, and people with chronic conditions. Additionally, the strained health care infrastructure due to these multiple, simultaneous outbreaks, impacted delivery of other health care services.

Some public health impacts of a pandemic include:

- Increased demand for disease prevention and control measures (case investigation and contact tracing, surveillance, testing, vaccination)
- Resource constraints (staffing, supply chain shortages, financial strain)
- Disruption to routine services
- Need for community education and risk communication
- Policy and leadership challenges (coordination with other agencies, policy enforcement)

The following graph shows the access planning score in comparison with the size of each at-risk population for a pandemic. The access planning score reflects the unique planning and response needs of each of the ten at-risk populations.

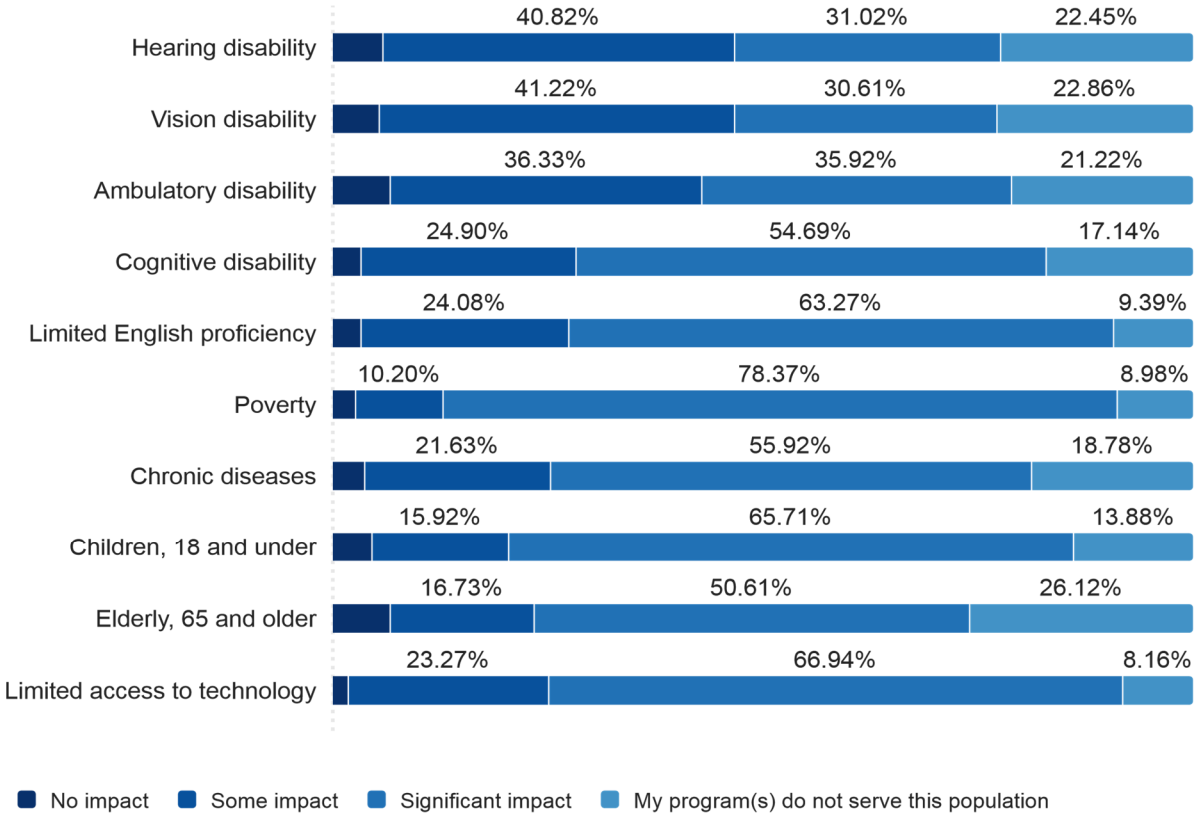


According to the survey conducted of leadership in Public Health and Human Services, the at-risk populations who would be most impacted by a pandemic include:

- Those experiencing poverty
- Those with limited access to technology
- Those with limited English proficiency

Impact of a Pandemic on At-Risk Populations

245 Responses



Tornado

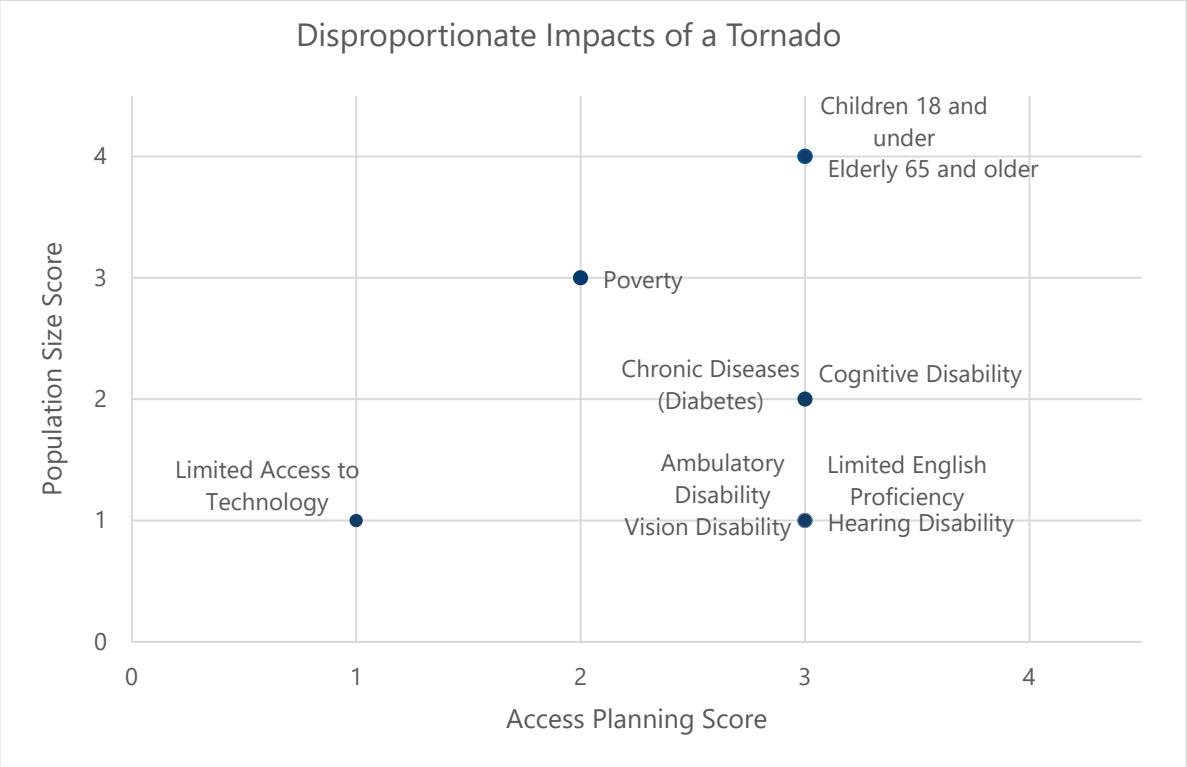
Minnesota lies along the north edge of the region of maximum tornado occurrence in the United States, often referred to as Tornado Alley. A tornado is a top hazard for Hennepin County due to its potential for widespread destruction, injury, and disruption to essential services. Beyond the destruction that tornadoes leave behind, there are many cascading events or hazards that can follow with public health implications. The risk of tornadoes and other extreme weather events has increased due to climate change.

The proxy scenario used to predict the impacts of a tornado in Hennepin County is the North Minneapolis tornado on May 22, 2011. The tornado had a 13.6-mile-long damage path across the Twin Cities metro and was rated EF1 on the Enhanced Fujita Scale (EF0-EF5 with F5 the strongest) resulting in two fatalities and 48 injuries.[26]

Some public health impacts of a tornado include:

- Increased demand for environmental health measures (drinking water safety, food safety, vector-borne disease control, infectious disease outbreak response)
- Disruption of power impacting cooling or availability of medical equipment
- Disruption to routine services
- Need for mental/behavioral health support
- Need for coordination with other agencies
- Need for community education and risk communication
- Displacement and shelter needs

The following graph shows the access planning score in comparison with the size of each at-risk population for a tornado. The access planning score reflects the unique planning and response needs of each of the ten at-risk populations.

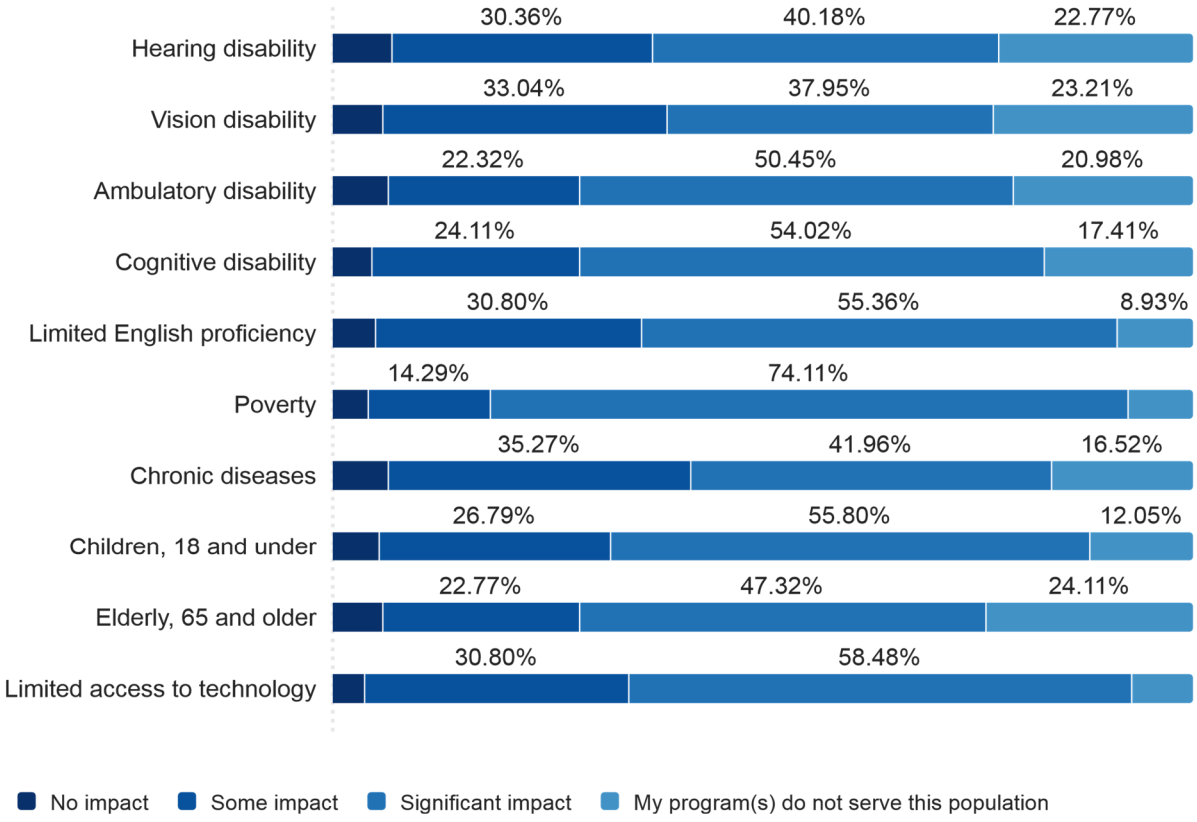


According to the survey conducted of leadership in Public Health and Human Services, the at-risk populations who would be most impacted by a tornado include:

- Those experiencing poverty
- Those with limited access to technology
- Those with limited English proficiency

Impact of a Tornado on At-Risk Populations

224 Responses



Localized Infectious Disease

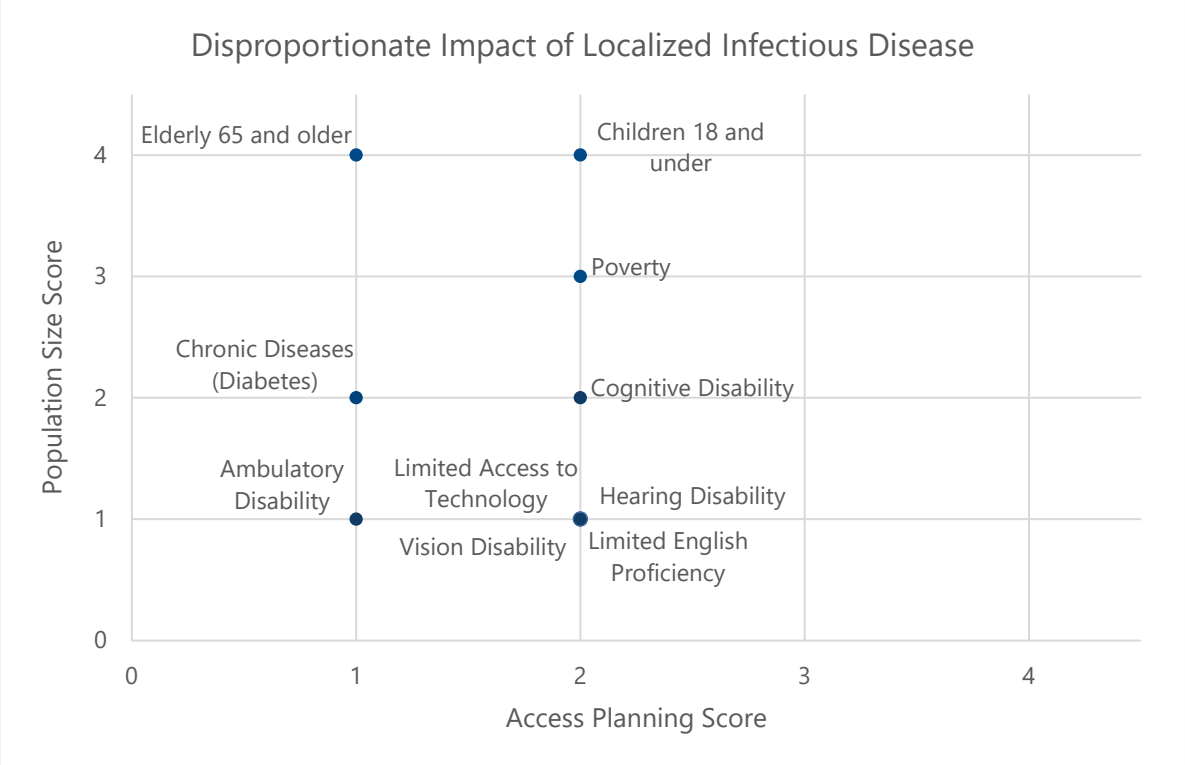
A localized infectious disease would not have the same severity as a pandemic but is still a top hazard due to its high probability. Since 2019, Hennepin County Public Health has responded to localized outbreaks of drug related infectious diseases (hepatitis A, hepatitis C, syphilis, and HIV), mpox, and measles. Decreased vaccination rates due to vaccine skepticism and misinformation could result in more frequent and longer outbreaks of preventable disease.

The proxy scenario used to predict the impacts of a localized infectious disease outbreak is the 2002 hepatitis A outbreak in Beaver County, PA. Contaminated green onions at a Chi Chi's Restaurant led to 610 cases of hepatitis A and three fatalities. Thousands of exposed people received immune globulin within a 2-week timeframe, the recommended measure to prevent disease at that time.

Some public health impacts of a localized infectious disease outbreak include:

- Increased demand for disease prevention and control measures (case investigation and contract tracing, surveillance, testing, vaccination)
- Resource constraints (staffing, supply chain shortages, financial strain)
- Disruption to routine services
- Need for community education and risk communication

The following graph shows the access planning score in comparison with the size of each at-risk population for a localized infectious disease. The access planning score reflects the unique planning and response needs of each of the ten at-risk populations.

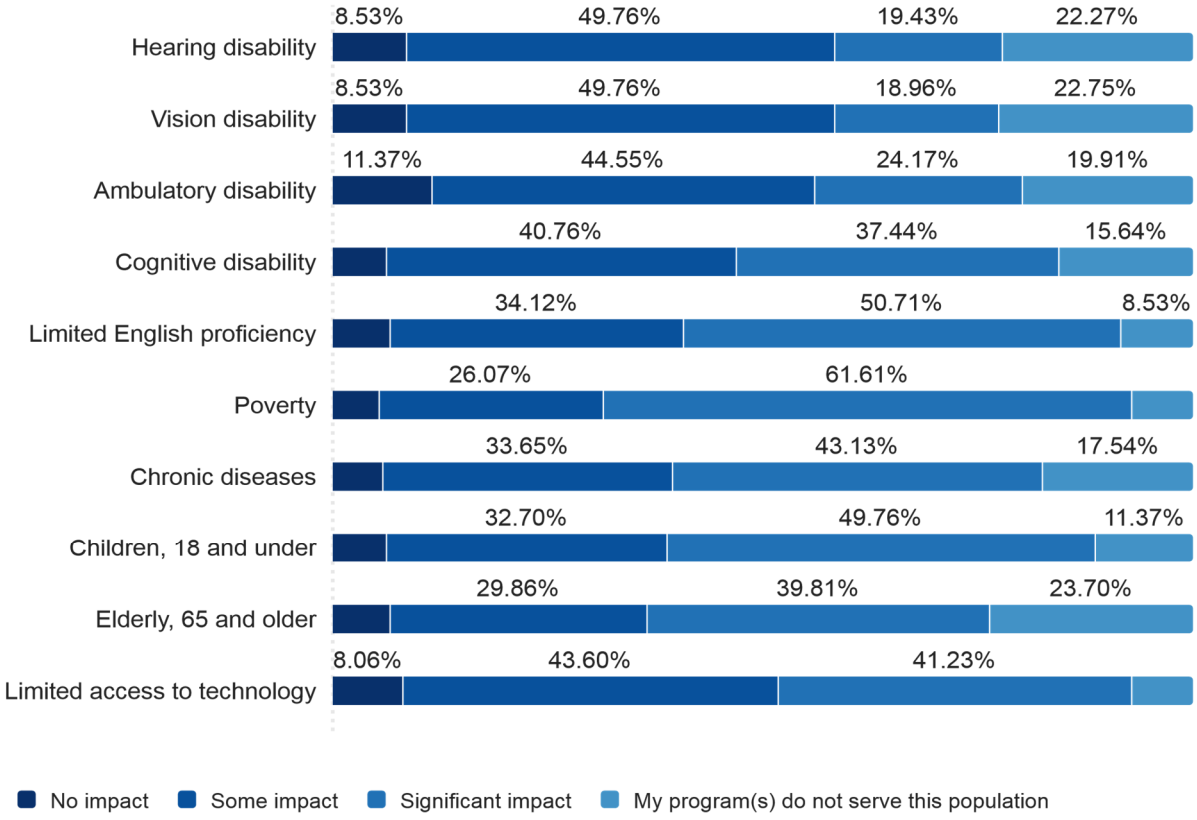


According to the survey conducted of leadership in Public Health and Human Services, the at-risk populations who would be most impacted by a localized infectious disease include:

- Those experiencing poverty
- Those with limited English proficiency
- Children, 18 and under

Impact of a Localized Infectious Disease on At-Risk Populations

211 Responses



Temperature Extremes

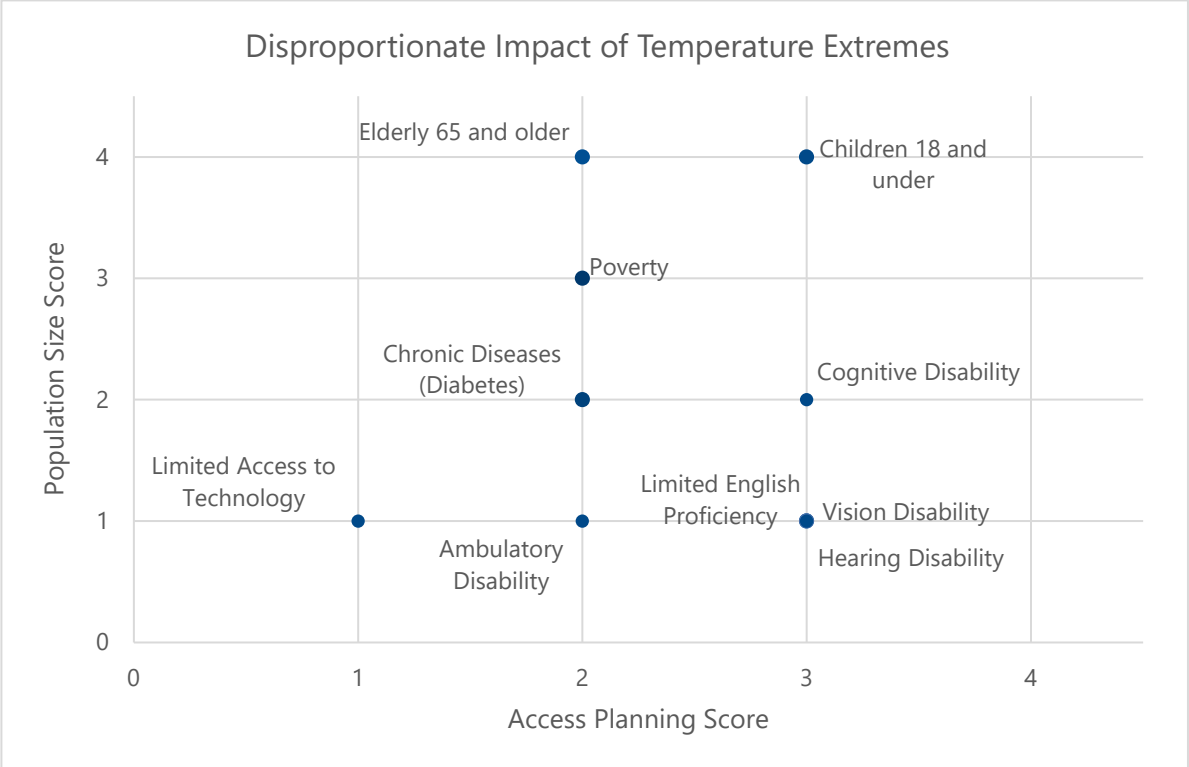
Extreme temperatures, both cold and hot, are a top hazard for Hennepin County Public Health due to their significant impact on vulnerable populations and essential services. In winter, dangerously cold temperatures and wind chills can lead to hypothermia, frostbite, and increased strain on healthcare facilities due to cold-related illnesses.[1] Extreme cold can also cause emergencies in at-risk populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat; infants and the elderly are particularly at risk.[1] In summer, heat waves can cause heat related illnesses, particularly among older adults, young children, those without access to cooling, and those working outside. Over the last three decades, heat waves have accounted for more fatalities in the United States than all other weather-related disasters combined.[27] Extreme heat is becoming more common in places not ordinarily expected to experience such high temperatures due to climate change, a trend that is not expected to abate. Extreme temperatures in either direction can also disrupt transportation and energy systems.[1]

The proxy scenario used to predict the impacts of extreme temperatures in Hennepin County is the 2021 Pacific Northwest Heatwave. The record-breaking heat had the largest impact in Oregon and Washington, especially the Portland metropolitan area, with temperatures reaching 116°F (46.7°C), which is 42°F hotter than the average daily maximum June temperature.[28] The heat dome was responsible for more than 250 deaths in the United States and over 400 in Canada.[29] This extreme temperature event also put excess stress on hospitals, with hundreds of heat-related emergency visits reported for Alaska, Idaho, Oregon, and Washington.[29] People who are elderly, unhoused, work outside, or do not have access to air conditioning are especially vulnerable to these impacts.

Some public health impacts of temperature extremes include:

- Air quality and respiratory health concerns
- Water, food, and sanitation concerns
- Need for mental/behavioral health support
- Power outages and infrastructure strain (medical device failures, public transportation disruptions)
- Need for community education and risk communication
- Cooling and shelter needs
    - See Appendix D for the Cooling Options Climate Analysis Map, a GIS tool developed by Public Health to analyze and address vulnerability to extreme heat.

The following graph shows the access planning score in comparison with the size of each at-risk population for temperature extremes. The access planning score reflects the unique planning and response needs of each of the ten at-risk populations.

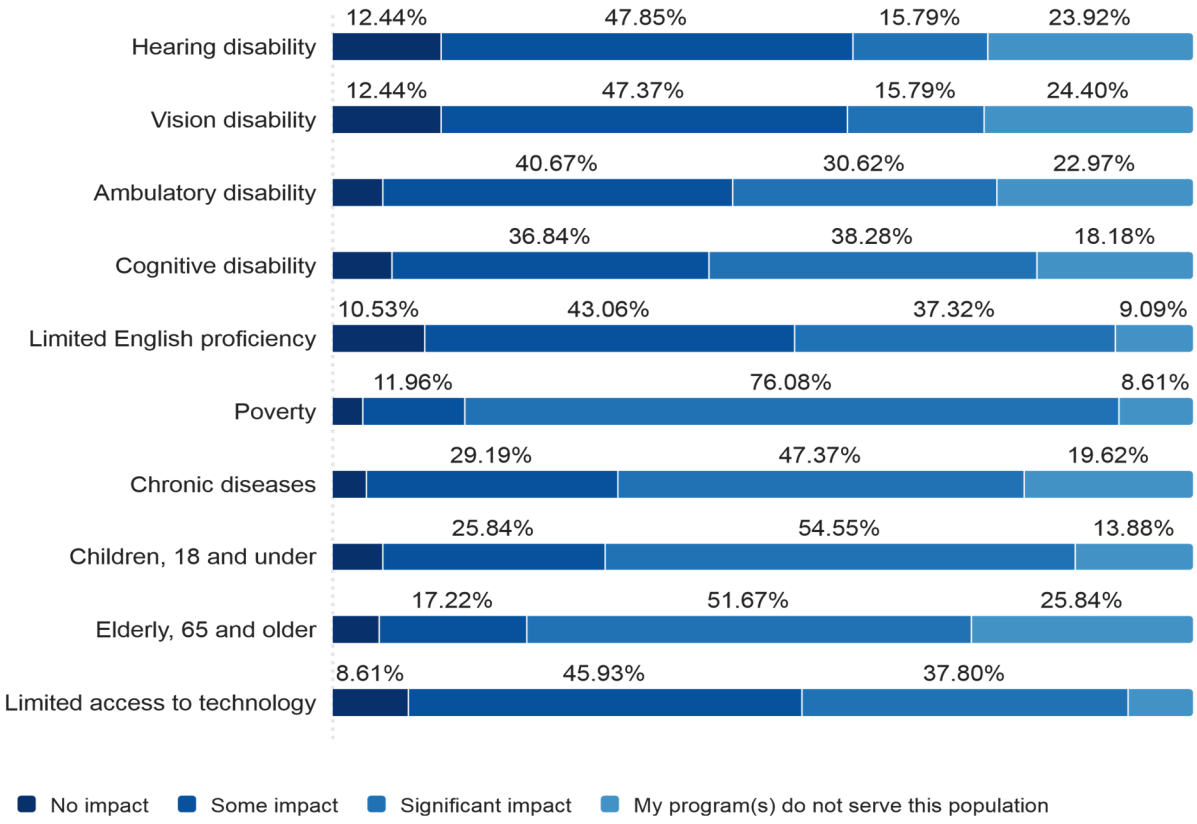


According to the survey conducted of leadership in Public Health and Human Services, the at-risk populations who would be most impacted by temperature extremes include:

- Those experiencing poverty
- Children, 18 and under
- Elderly, 65 and older

Impact of Temperature Extremes on At-Risk Populations

209 Responses



Fire

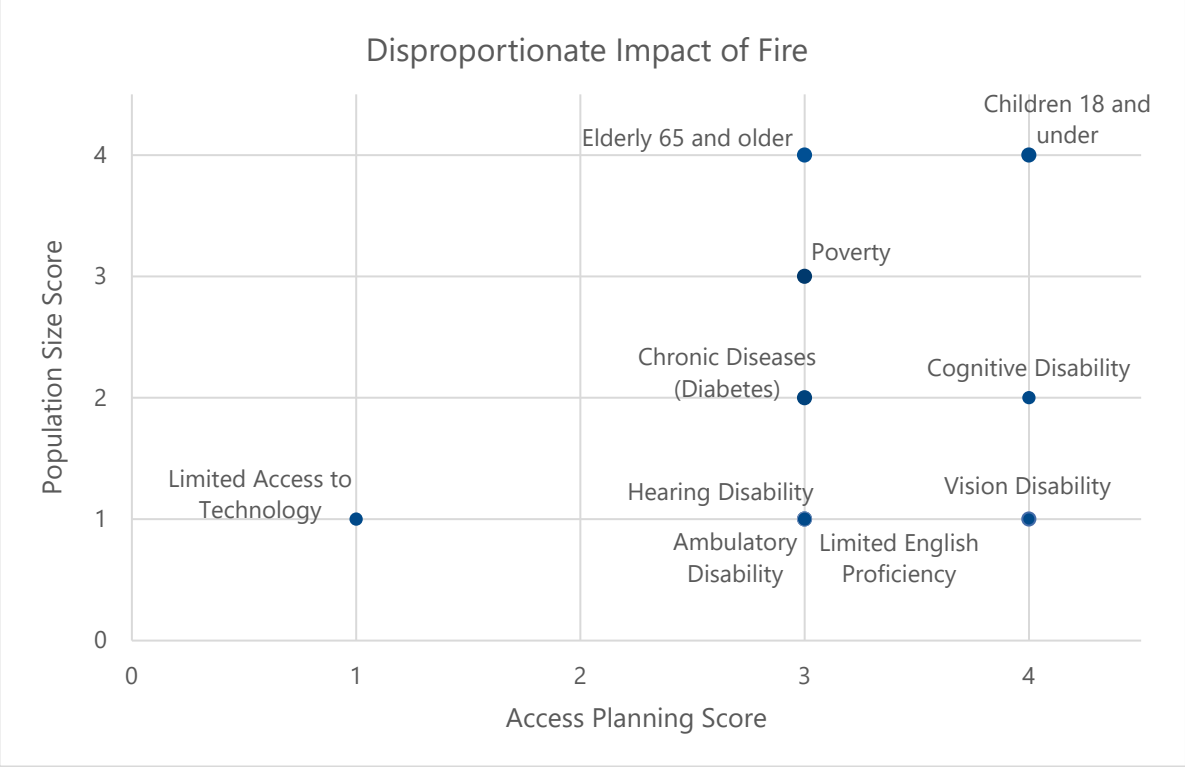
Fire is a top hazard for Hennepin County Public Health due to its potential for injuries, fatalities, and widespread displacement.

The proxy scenario used to predict the impacts of fire in Hennepin County is the 2023 urban fire in Lahaina, Hawaii, which began as a brush fire and made its way to the urban areas. Fires that blaze through the wildland-urban interface (WUI) are becoming more common around the globe, a trend that is likely to continue for at least the next two decades.[30] The wildland forests in Minnesota are candidates for unexpected wildfire, especially in seasons of high drought which are more common due to climate change.[31] While Hennepin County is mostly urban and suburban, parts of the county include wildland forests.

Some public health impacts of a fire include:

- Air quality and respiratory health concerns
- Displacement and shelter needs
- Water, food, and sanitation concerns
- Need for mental/behavioral health support
- Need for community education and risk communication

The following graph shows the access planning score in comparison with the size of each at-risk population for a fire. The access planning score reflects the unique planning and response needs of each of the ten at-risk populations.

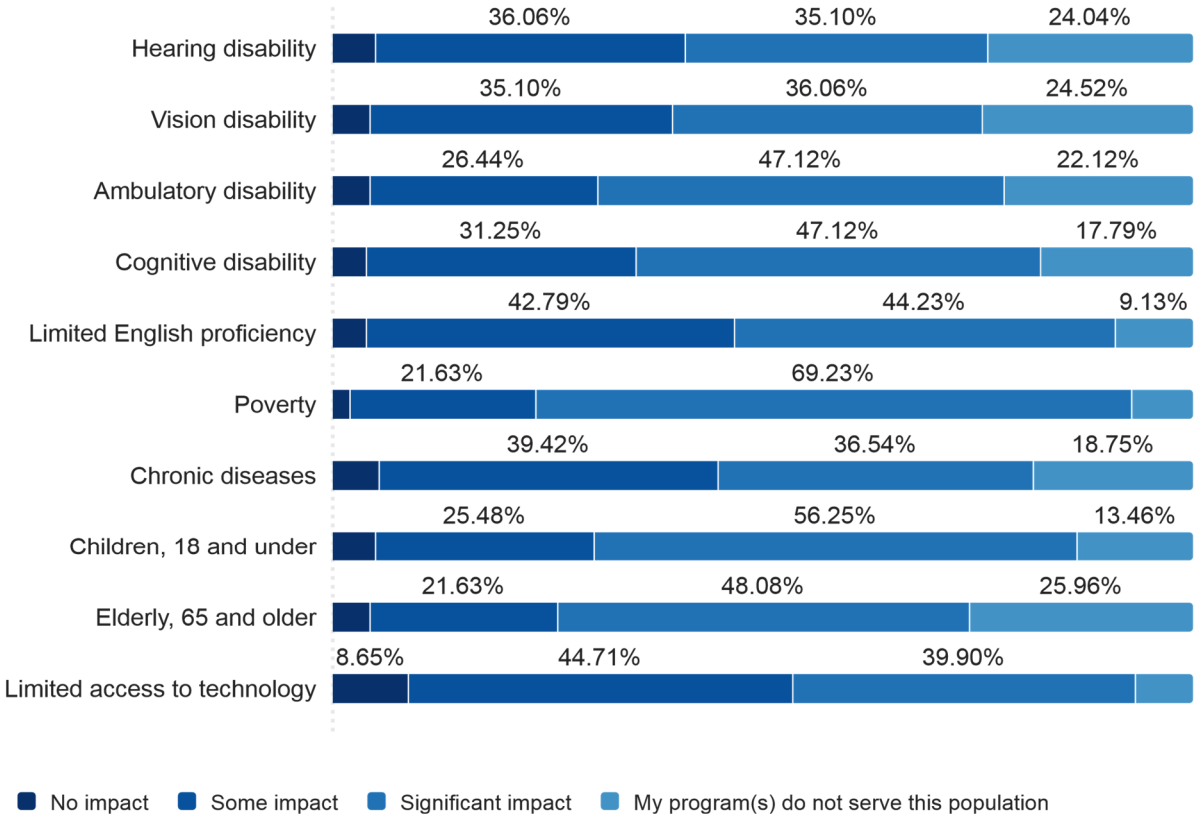


According to the survey conducted of leadership in Public Health and Human Services, the at-risk populations who would be most impacted by a fire include:

- Those experiencing poverty
- Children, 18 and under
- Elderly, 65 and older

Impact of a Fire on At-Risk Populations

208 Responses



Addressing Public Health Impacts

The following table lists the functional, support, or hazard-specific annexes to the Hennepin County Public Health Emergency Response and Recovery Base Plan that address the public health impacts for each of Hennepin County's top hazards.

	Pandemic	Tornado	Localized Infectious Disease	Temperature Extremes	Fire
Access and Functional Needs	x	x	x	x	x
Community Recovery	x	x	x	x	x
Continuity of Operations	x	x			
Disaster Assistance Center		x			x
Disaster Behavioral Health		x			x
Family Assistance Centers		x			x
Infectious Disease	x		x		
Isolation and Quarantine	x		x		
Logistics Support	x		x		
Mass Care Sheltering		x		x	x
Medical Countermeasure Dispensing and Administration	x		x		
Responder Safety and Health	x	x	x	x	x
Risk Communication	x	x	x	x	x
Volunteer Management	x	x	x	x	x

Conclusion

The Hennepin County JRA was conducted to help public health prioritize planning efforts for emergencies that impact the health of the public. Both the process of conducting the assessment and the actions taken based on the results are valuable. To dig deeper into the results, planners identified the public health impacts of each hazard and who would be most affected by each hazard. This included engaging program representatives from across Public Health and Human Services to solicit feedback on how impactful the top five hazards would be on the residents they serve. This feedback will inform future revisions to the Risk Communications and Access and Functional Needs annexes of the Public Health Emergency Response and Recovery Plan.

The results and analysis developed in this report serve as one of many tools to support the identification of gaps in planning, training, and exercising for public health emergency preparedness and response. This report will be shared within the county, with external preparedness and response partners, and will be made publicly available to build visibility, strengthen partnerships, and foster transparency. Together with capability assessments, After Action Reports/Improvement Plans, grant requirements, Project Public Health Ready criteria, and Public Health Accreditation Board standards, the JRA results will be used to inform preparedness priorities for the next five-year cycle.

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Appendix A: Hazard Scenarios

Hazard	Scenario
Active Shooter	The proxy scenario used to predict the impacts of an active shooter incident in Hennepin County is based on the Las Vegas mass shooting of 2017. On October 1, 2017, a Nevada man opened fire into the crowd at the Route 91 Harvest music festival on the Las Vegas strip, killing 58 and injuring over 850 people. Hennepin County hosts many open venue events that could be affected by an active shooter scenario.
Biological Terrorism	The proxy scenario used to predict the impacts of a bioterrorism incident is the National Planning Scenario: "Biological Attack - Aerosol Anthrax." In the scenario, a single aerosol anthrax attack is delivered by a truck using a concealed improvised spraying device in a densely populated urban city with a significant commuter workforce. Anthrax spores delivered by aerosol delivery result in inhalation anthrax, which develops when the bacterial organism, Bacillus anthracis, is inhaled into the lung and a progressive infection follows. BioWatch, a presidential initiative, is a system designed to detect the presence of biological agents that have been intentionally released into the air. The program operates in more than 30 major metropolitan areas across the US, including the Twin Cities.
Chemical Terrorism	The proxy scenario used to predict the impacts of a chemical terrorism incident is based on the National Planning Scenario: "Chemical Attack - Nerve Agent." In the scenario, a terrorist builds six spray dissemination devices and releases Sarin vapor into the ventilation systems of three large commercial office buildings in a metropolitan area. The agent kills 95% of the people in the buildings and kills or sickens many of the first responders. In addition, some of the agent exits through rooftop ventilation stacks, creating a downwind hazard. In the altered scenario, spray dissemination devices are released in the ventilation of a large local building - the building with the largest daytime population in the region. The morbidity and mortality rates of the NPS are applied to the occupancy of this building.
Civil Disturbance	The proxy scenario used to predict the impacts of a civil disturbance in Hennepin County is the Los Angeles Riots of 1992. Thousands of people in Los Angeles rioted for six days after a jury acquitted four LAPD officers involved in the videotaped beating of black motorist Rodney King following a high-speed pursuit. There were 53 deaths.
Coastal Storm	Hennepin County would not be affected by a costal storm.

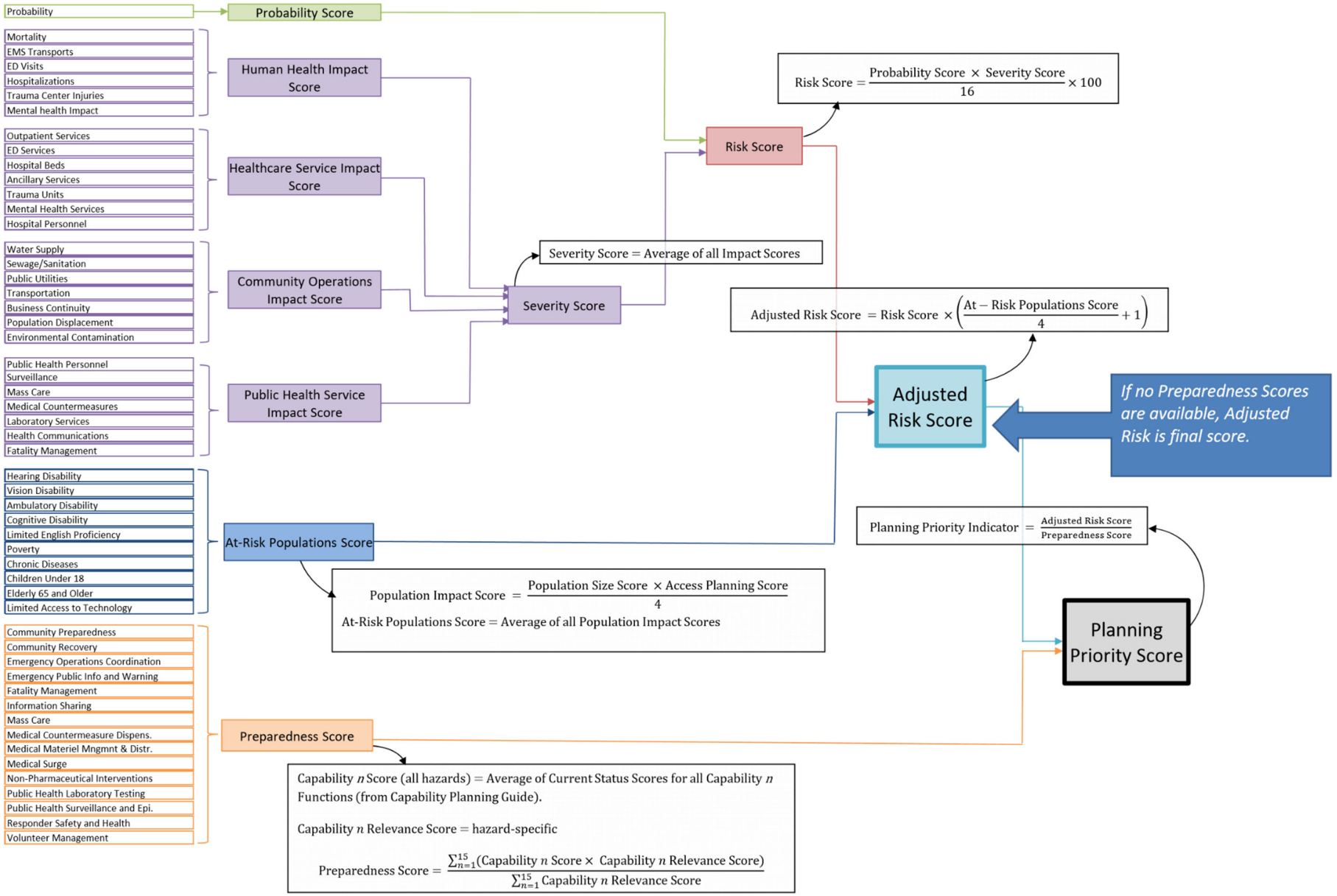
Conventional Explosive	The proxy scenario used to predict the impacts of a conventional explosive incident is the Oklahoma City bombing. On April 19, 1995, a Ryder truck containing more than 4,800 pounds of ammonium nitrate fertilizer, nitromethane, and diesel fuel mixture detonated in front of the north side of the nine-story Alfred P. Murrah Federal Building in Oklahoma City. The blast destroyed or damaged 324 buildings within a sixteen-block radius, destroyed or burned 86 cars, and shattered glass in 258 nearby buildings. To estimate the impacts of a worst-case reasonable scenario in this region, the truck bomb is assumed to be detonated outside of the building with the largest daytime population in the region. The morbidity and mortality rates from the Alfred P. Murrah Federal Building are applied to the occupancy of that building.
Cyber Terrorism	The proxy scenario used to predict the impacts of a cyber terrorism incident is the ransomware attack on the University of Vermont Health Network in October 2020. Ultimately, 3 hospitals in Vermont and 3 in New York were affected. The hospital network serves more than 1 million people. Practice drills presumed a max of 12 hours of offline time; instead, the systems were offline for 28 days. The malware spread to 1300 servers and 5000 end user devices. $50M-60M is the estimated cost, mostly comprising lost patient revenue.
Drought	One of the worst drought events on record in Minnesota occurred in 1988, when precipitation statewide averaged below normal for ten of twelve months. Drought emergency status led to widespread water use restrictions, and reservoirs dipped to record low levels. Corn, hay, and other agricultural products shriveled in parched fields, causing economic losses. More recently, a major drought overtook Minnesota during 2021. In some parts of the state, the drought was as serious as anything experienced in over 40 years, with Hennepin County experiencing severe to extreme intensity according to the DNR.
Earthquake	There have been 14 earthquakes in Minnesota in the last 100 years; however, the Great Lakes Tectonic Zone does not cross Hennepin County. Weak to moderate earthquakes do occur occasionally in Minnesota, but severe earthquakes are very unlikely. Although we cannot assign a zero probability of a seriously damaging earthquake occurring in the time span of a human life, the threat is very small compared to other natural hazards that have well-proven records of destruction, such as winter storms, tornadoes, and flooding. For a proxy, the Pymatuning Earthquake was the strongest recorded in Pennsylvania, which has slightly higher probability and risk profiles to our state.
Fire	The proxy scenario used to predict the impacts of fire in Hennepin County is the 2023 urban fire in Lahaina, Hawaii, which began as a brush fire and made its way to the urban areas. Fires that blaze through the wildland-urban interface (WUI) are becoming more common around the globe, a trend that is likely to continue for at least

	the next two decades. The wildland forests in Minnesota are candidates for unexpected wildfire, especially in seasons of high drought which are more common due to climate change. While Hennepin County is mostly urban and suburban, parts of the county do include wildland forests.
Flood	The proxy scenario used to predict the impacts of flooding in Hennepin County is the July 23-24, 1987, Twin Cities superstorm, which yielded the greatest calendar day precipitation on record for Twin Cities International Airport with 9.15 inches, and over 10 inches in suburbs west and southwest of Minneapolis. This rainfall cataclysm produced the worst flash-flooding on record in the Twin Cities. Its extraordinary magnitude and impact had granted it automatic status as a mega-rain previously. However, its footprint of 6-inch rainfall was estimated to be 574 square miles--well short of the 1000 square-mile requirement. The event was undoubtedly worsened by the high-runoff metropolitan landscapes, as well as the fact that an intense rainfall of 3 to 9 inches had affected much of the same area three nights earlier. Hennepin County is experiencing a significant increase in the number of 2-, 3- and even 4-inch rainfall events in recent years, which increases the probability of another such event.
Hazardous Materials Release	The proxy scenario used to predict the impacts of a hazardous materials release in Hennepin County is the train derailment and subsequent chlorine spill in Graniteville, SC, on January 6, 2005. After a worker forgot to toggle the switch that disconnects the spur from the main line, Freight Train 192 was mistakenly diverted from the main line onto the spur at 47 mph and collided with a parked train at 2:39 a.m. Three engines and 18 cars were derailed. Roughly 60 tons of liquefied chlorine gas spilled out of the ninth freight car. The liquefied gas rapidly vaporized, with volumetric expansion of 450:1. The leaking tank car was patched with a temporary repair four days later. The economic impact for the small community of Graniteville was over $1 billion, and according to Detter-Hoskin: "Had this occurred in Atlanta or another large city, you will have had hundreds of thousands of people hurt and killed within a 10-minute period. The financial impact will be immense, as well. Metal equipment and electrical wiring will be destroyed, and computer data will be lost.”
Localized Infectious Disease	The proxy scenario used to predict the impacts of a localized infectious disease outbreak is the 2002 hepatitis A outbreak in Beaver County, PA. Contaminated green onions at a Chi Chi’s Restaurant led to 610 cases of hepatitis A and three fatalities. Thousands of exposed persons received immune globulin within a 2-week timeframe, the recommended measure to prevent disease at that time.
Nuclear Facility Accident	The proxy scenario used to predict the impacts of a nuclear facility accident in Hennepin County is the Fukushima Daiichi nuclear disaster of 2011. There were no deaths associated with this accident. There are 2 nuclear power stations near Hennepin County: Monticello Nuclear Generating Plant and Prairie Island Nuclear Power Plant. Both

	lie outside the county, but Hennepin County is in the ingestion pathway zone and included in the emergency response and recovery plans.
Opioid Epidemic	The proxy scenario used to predict the impacts of the opioid epidemic in Southeastern Pennsylvania is the 2015 surge in opiate overdoses in Washington County, PA. Over the course of 48 hours, EMS calls for heroin overdoses numbered 26 (16 on day 1 and 10 on day 2), resulting in 3 deaths in a county of about 200,000. Mitigating factors include the recent decision to equip first responders with naloxone. Overall, in 2015 drug-related deaths numbered 73, up from 33 in 2014.
Pandemic	The proxy scenario used to predict the impacts of a pandemic in Hennepin County is the COVID-19 pandemic. Additional predictions for a similar scenario from the department of Health and Human Services and other government agencies are used where necessary.
Radiation Dispersal Device	The proxy scenario used to predict the impacts of a radiation dispersal device detonation is based on the National Planning Scenario: "Radiological Attack - Radiological Dispersal Device." In the scenario, a 3,000-lb truck bomb containing 2,300 curies of 137Cs is detonated in a moderate-to-large city. The contaminated region covers approximately thirty-six blocks and includes the business district, residential row houses, crowded shopping areas, and a high school. Where possible, additional predictions are drawn from the EPA exercise, "Liberty RadEx". To modify the scenario to be appropriate for this region, certain blast casualty estimates are extrapolated from the 4,800-pound truck bomb detonated in Oklahoma City, using the population density and community characteristics of the region.
Temperature Extremes	The proxy scenario used to predict the impacts of extreme temperatures in Hennepin County is the 2021 Pacific Northwest Heatwave. The record-breaking heat had the largest impact in Oregon and Washington, especially the Portland metropolitan area, with temperatures reaching 116°F (46.7°C), which is 42°F hotter than the average daily maximum June temperature. The heat dome caused over 250 deaths in the U.S. and more than 400 in Canada. This event also put stress on hospitals, with hundreds of heat-related emergency visits reported for Oregon, Idaho, Washington, and Alaska. Elderly people, unsheltered people, people who work outside, and people who do not have access to air conditioning are especially vulnerable to these impacts.
Tornado	The proxy scenario used to predict the impacts of a tornado in Hennepin County is the North Minneapolis tornado on May 22, 2011. The tornado had a 13.6-mile-long damage path across twin cities metro and was rated EF1 on the Enhanced Fujita Scale (EF0-EF5 with F5 the strongest) resulting in two fatalities and 48 injuries.

Utility Interruption	The proxy scenario used to predict the impacts of a widespread utility interruption in Hennepin County is the Northeast Blackout of 2003, which began on Thursday, August 14, 2003, at 4:15 p.m. A cascading electrical power failure occurred throughout parts of the Northeastern and Midwestern United States and Ontario, Canada, resulting in the second most widespread power failure in history.
Winter Storm	The proxy scenarios used to predict the impacts of a winter storm in Hennepin County are the North American Blizzards of February 2010. Between February 4th and 6th, 2010, the storm dubbed "Snowmageddon" caused government offices, schools, and airports to close. Some locations in Maryland, Pennsylvania, Virginia, and West Virginia recorded more than 30 inches of snow. Washington, D.C., received 17.8 inches in two days. Philadelphia received 28.5 inches. Another blizzard followed closely behind the first, between February 9th and 11th. The second storm produced 14 inches in D.C., 24 inches in northern Maryland, 17 inches in New Jersey, more than 27 inches in Pennsylvania. Several locations broke century-old seasonal snowfall records.

Appendix B: PHRAT Overview



Appendix C: Engagement Survey Overview

Audience

The Jurisdictional Risk Assessment survey was sent to Managers and Supervisors at Hennepin County Public Health and Hennepin County Human Services.

Survey Design

Survey respondents were asked to rate the level of impact each hazard would have on the at-risk populations their program serves. Below is an example of the matrix developed for each of the top five hazards.

*** 1. Pandemic**

A pandemic is an epidemic that occurs over a wide geographic area, often global. A pandemic results when a new disease condition emerges that is pathogenic for humans but to which humans have no immunity or prior protection, and the number of cases substantially exceeds the number of expected cases over a given period. Examples of pathogens include: COVID-19, Mpox, Marburg Virus, Dengue, Measles, and Influenza A.

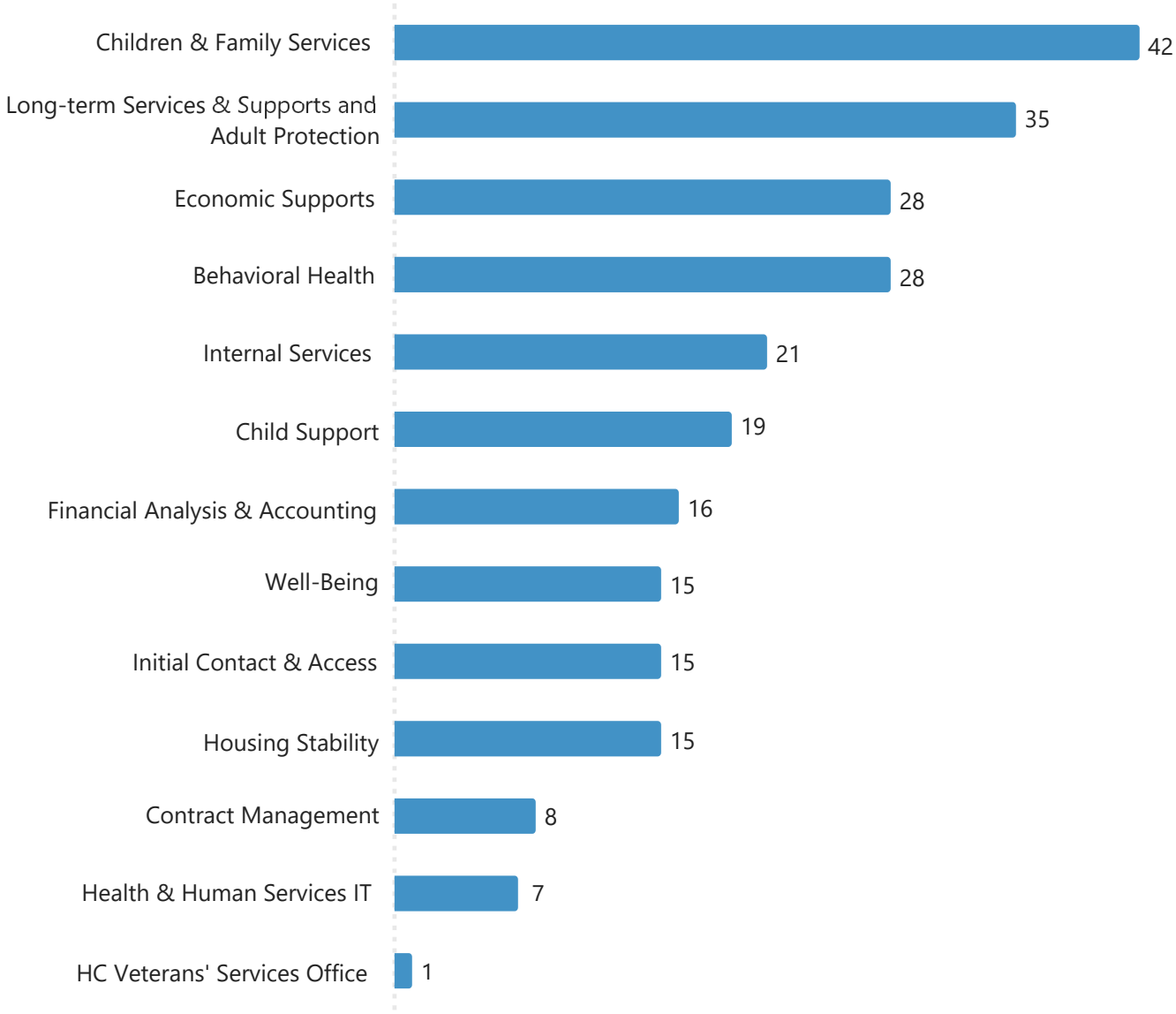
	No impact	Some impact	Significant impact	My program(s) do not serve this population
Hearing disability	○	○	○	○
Vision disability	○	○	○	○
Ambulatory disability	○	○	○	○
Cognitive disability	○	○	○	○
Limited English proficiency	○	○	○	○
Poverty	○	○	○	○
Chronic diseases	○	○	○	○
Children, 18 and under	○	○	○	○
Elderly, 65 and older	○	○	○	○
Limited access to technology	○	○	○	○

Respondents

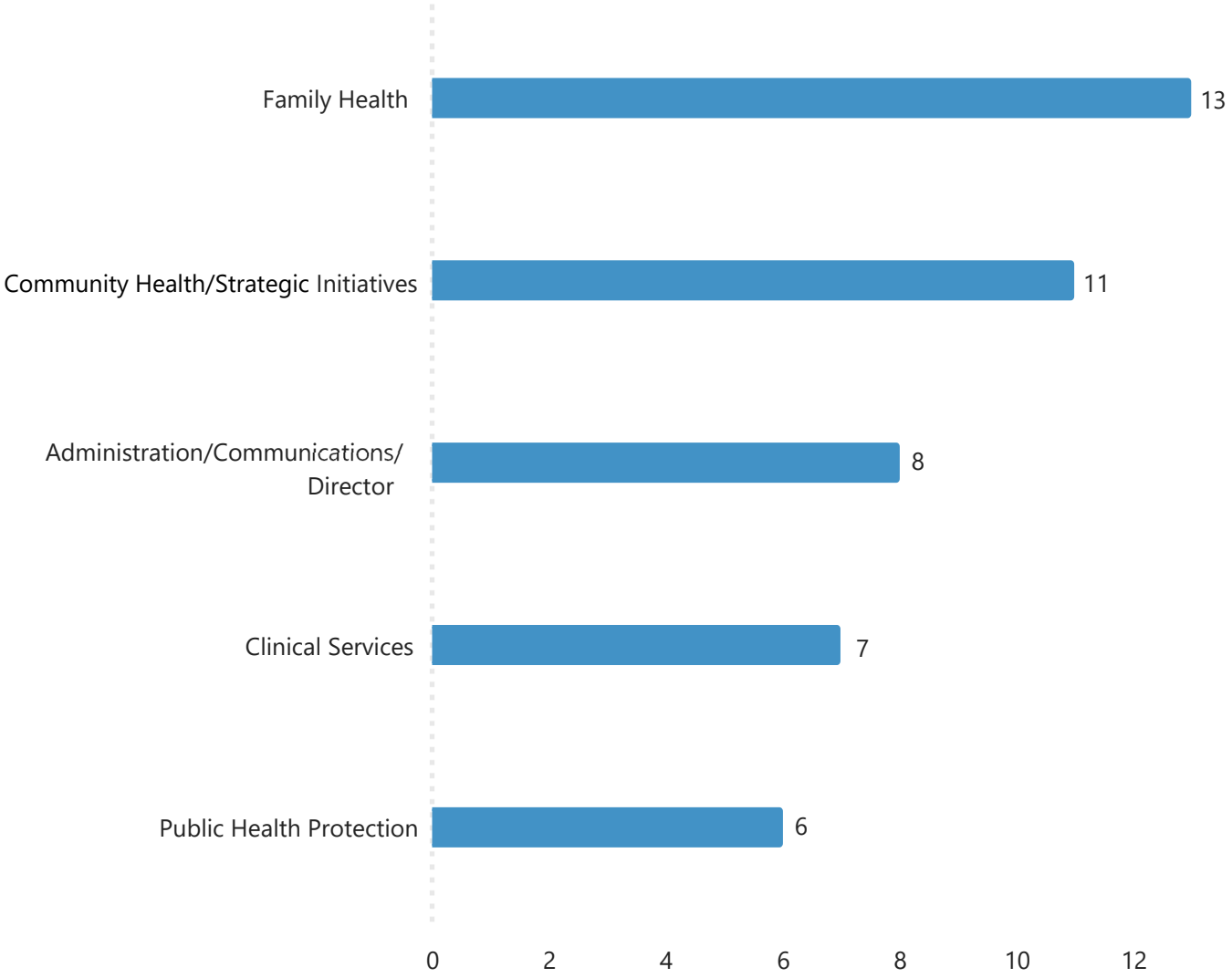
The assessment was completed by 297 of 670 staff members, which is a 44% response rate. Respondents included leadership from the following areas:

Public Health and Human Services Responses

Human Services Service Area Responses



Public Health Service Area Responses



Programs within each public health service area:

Family Health – Maternal & Child Health, Child & Teen Check-ups, WIC, Family Home Visiting, Adolescent Health/Outreach/Operations

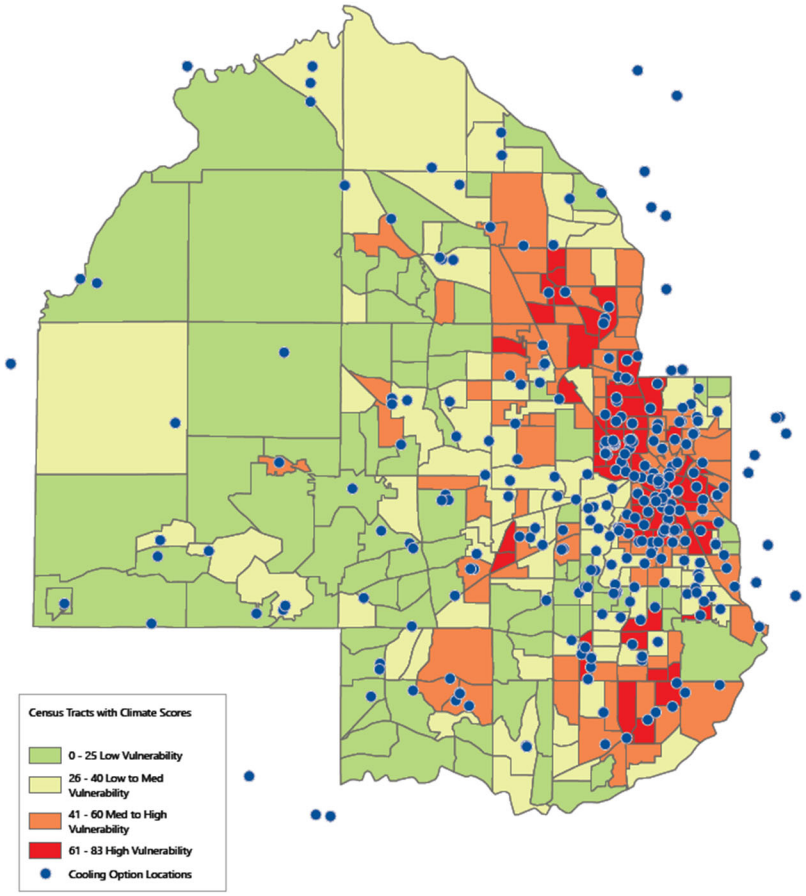
Community Health & Strategic Initiatives – Health Promotion, Strategic Initiatives, Community Health Improvement Project

Administration/Communications/Director

Clinical Services – Public Health Clinic, Red Door Clinic, Health Care for the Homeless

Public Health Protection – Environmental Health, Epidemiology, ImmuLink, Health Evaluation & Data Assessment, Emergency Preparedness & Response, EMS, Ryan White

Appendix D: Cooling Options Climate Analysis Map



Hennepin County Public Health worked with GIS Analysts to develop a custom score for climate vulnerability by census tract. The score is based on six variables:

- Social vulnerability index: 40% weighting
- Land surface temperature 2022 dataset: 20% weighting
- Air conditioning dataset: 10% weighting
- Asthma prescription drug users: 10% weighting
- Tree canopy: 10% weighting
- Population density: 10% weighting

Census tracts with a higher score have a higher climate vulnerability. Analysts then overlayed the existing cooling option locations within the county. Cooling options include a variety of public spaces that can provide relief from the summer heat, including libraries, shopping malls, government buildings, and recreation and community centers.

Together these map layers provide planners with insights into which areas of the county are more vulnerable, due to their high climate vulnerability and distance from existing cooling options. This tool demonstrates Hennepin County's effort to understand who is most impacted by extreme heat and plan to address the disproportionate impacts.