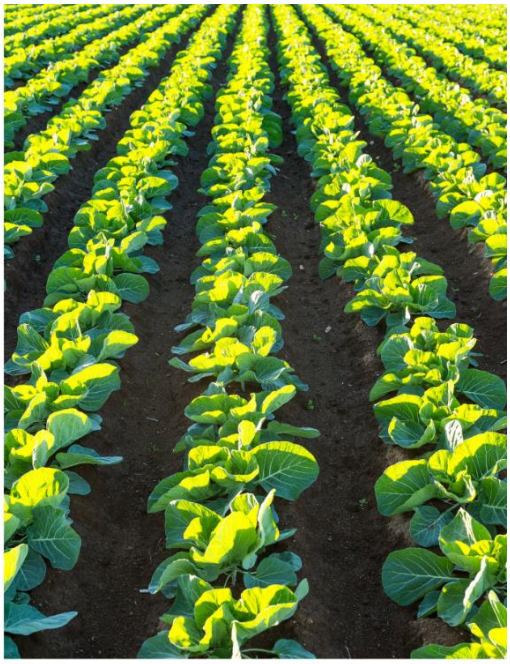
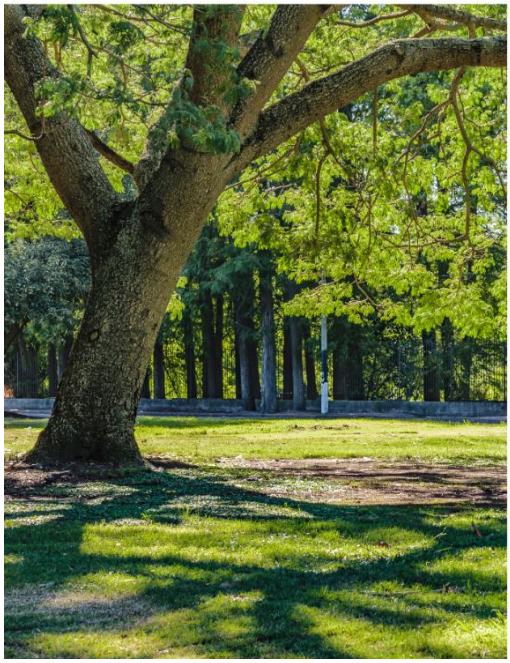
Marion County
OREGON
Health & Human Services





The Marion County Climate & Health Adaptation Plan

July 2025 – June 2030

Creating a vibrant, healthy, and prepared Marion County community that is resilient to periods of extreme heat, extreme cold, and poor air quality.

Table of Contents

Version 1.1: Released 6/30/2025

Acknowledgements

We are very grateful and thankful to everyone involved in the creation of this plan! We could not do this without your support, collaboration, and dedication to the community.

Authors & Meeting Coordinators
Michael Keuler, Environmental Health Resilience Coordinator, Marion County Health & Human Services
Rachel Levine, Public Health Intern, Marion County Health & Human Services

Community Collaborative Planning Group
Aalicea Dominguez, Executive Assistant, Shangri-La
Alisha Smith, Assistant Executive Director, Recovery Outreach Community Center (ROCC)
Amador Aguilar, Director, ENLACE Cross-cultural Community Development Project
Anthony Cisneros, Director of Operations, Creating Opportunities
Aver Yakubu, Program Director, Nurturely
Bobbi Kidd, Climate Action Lead, Cherriots
Camilia Cummings, Seed of Faith Ministries
Chelsea Blank, Conservation Planner, Marion Soil And Water Conservation District
Cheryl Cisneros, Executive Director, Creating Opportunities
Christina Bunnell, Emergency Preparedness Administrator, Salem Health
Christy Davis, Director, Silver Falls Library District
Debbie Cabrales, Executive Director, Centro de Servicios Para Campesinos
Emily Mewbourn, Health & Safety Systems Liaison, Mid-Willamette Valley Homeless Alliance
Evelyn McCoy-Harris, Chief Operation Officer, Seed of Faith Ministries
Greg Walsh, Emergency Management Director, Marion County Emergency Management
Gretchen Hall-Wunderlich, Environmental Health and Safety Specialist, Salem Keizer Public Schools
Heidi Miller, Senior Community Program coordinator, Center 50+
Irene Konev, Principal Owner, Konev Consulting LLC
Ivonne Mora-Hernandez, Social Services Emergency Liaison, ODHS OREM
Jackie Leung, Executive Director, Micronesian Islander Community
Jade Palmer, Volunteer Coordinator, Isaac's Room
Jeff Carlson, Safety and Compliance Manager, Consumers Power Incorporated
Jeff Gilbert, Regional Emergency Coordinator, ODHS/OREM
Jim Trett, Mayor/Emergency Preparedness Commissioner, City of Detroit
John Kubasak, Community Relations, Marion County Health & Human Services
JohnMark Townsend, Housing Services Director, Oregon Human Development Corporation
Josiah Almeyda, Program Coordinator, Marion County Emergency Management
Julianah Douglas, Climate Action Plan Manager, City of Salem
Justin Brunson, Executive Director, Recovery Outreach Community Center (ROCC)
Karin Perkins, Marion CDDP Program Manager, Marion County Health & Human Services
Keith Veit, Assistant Fire Chief, Silverton Fire District
Kelley Morehouse, Sustainable Silverton
Kiara Yoder, Health Systems Manager, Marion & Polk Early Learning Hub

Kiki Dohman, Commuter Options Program Coordinator, Cherriots
Kim Dwyer, Santiam Service Integration Coordinator, Santiam Service Integration/Santiam Hospital & Clinics
Kim Hunt, Advisory Council & Public Affairs Specialist, NorthWest Senior & Disability Services
Lisette Cervantes, Public Health Emergency Preparedness Coordinator, Marion County Health & Human Services
Lorenzo Koonce, Seed of Faith Ministries
Melinda Butterworth, Associate Professor of Environmental Science, Willamette University
Melissa Gable, Communications Coordinator, Marion County Health & Human Services
Micahia Mitchell-Turner, Seed of Faith Ministries
Michael Welsh, EHS Manager, Sherwin Williams dba EPS
Michaela Poling, Equity & Community Engagement Coordinator, Integrated Services Network
Milan Davis, City of Salem
Nicole Iroz-Elardo, Assistant Professor of Public Health, Willamette University
Peter Buekea, Street Health Outreach Coordinator, NW Human Services - Street Outreach
Randy J Navalinski, Emergency Coordinator, Salem Area Mass Transit District - Cherriots
Sammy Basu, Professor of History and Humanities; Co-Chair, Public Health, Ethics, Advocacy, and Leadership, Willamette University
Simone Stewart, Executive Director, Silverton 50+ Center
Skye Hibbard-Swanson, Community Health Coordinator, PacificSource Community Solutions
Stephanie Stoker, Director, Integrated Services Network
Susan Crothers, Warming Center Lead, First Presbyterian Church
Susan McLauchlin, Health Promotion & Prevention Supervisor, Marion County Health & Human Services
Tamara Burkovskaia, Manager, Language Link LLC
Todd Engstrom, Chief, Silverton Police Department
Trisha Kumar, Community Health Manager, Willamette Health Council
Wade Harris, President, Seed of Faith Ministries

MCHHS Internal Core Planning Group
Alisa Zastoupil, Environmental Health Supervisor
Calista Kountz, Public Health Modernization Coordinator
Christina Bertschi, Housing Program Manager
John Kubasak, Community Relations Coordinator
Katie Mannina, Quality Improvement Coordinator
Karin Perkins, Intellectual & Developmental Disability Supervisor
Lisette Cervantes, Public Health Emergency Preparedness Coordinator
Melissa Gable, Communications Coordinator
Michael Keuler, Environmental Health Resiliency Coordinator
Rachel Levine, Public Health Intern
Naomi Hudkins, Housing Division Director
Rebecca Chavez, Public Health Modernization Supervisor
Susan McLauchlin, Health Promotion & Prevention Supervisor
Tami Cirerol, Public Health Accreditation Coordinator
Wendy Zieker, Public Health Division Director

Definitions

Air quality-related respiratory illness (AQRI): Emergency department and ambulatory care visits for respiratory illnesses associated with poor air quality. Definition includes chief complaint terms and diagnosis codes for acute bronchitis, emphysema, chronic obstructive airway disease, chronic obstructive lung disease, chronic obstructive pulmonary disease, asthma, bronchasthma, reactive airway disease, acute respiratory distress syndrome, difficulty breathing, chest tightness, dyspnea, shortness of breath and wheezing. Using this query in combination with air quality trends may further assist with surveillance efforts. (NSSPCP, 2019) ***Air quality-related respiratory illness was retitled "Non-Infectious Respiratory Illness" by Oregon ESSENCE on 5/28/25. This name change occurred after the community and county planning process had concluded. Therefore, it will continue to be referred to as AQRI throughout this plan.*

Climate hazards: Dangers from the weather or environment that can harm people's health. This includes (but is not limited to) extreme heat, extreme cold, winter storms, poor air quality, and wildfires.

Cold-related illness (CRI): Emergency department and ambulatory care visits for illnesses associated with cold weather. Definition includes chief complaint terms and diagnosis codes for direct cold exposure causing reduced temperature, hyperthermia, frost bite, and other tissue damage. Secondary harms from cold weather such as carbon monoxide exposure, slips, trips, and falls were not included in this definition. Using this query in combination with cold temperature trends may further assist with surveillance efforts. (NSSPCP, 2019)

Community stakeholders: People, groups, organizations, or businesses that have interest or concern in the community. Stakeholders can affect or be affected by the community's actions, objectives, and policies.

Emergency visits: Emergency department or urgent care visits among people residing in Marion County.

Environmental hazards: Dangers from the weather or environment that can harm people's health. This includes (but is not limited to) extreme heat, extreme cold, winter storms, poor air quality, and wildfires.

Good air quality: Air quality index (AQI) values at or below 100 are generally thought of as satisfactory. This includes the Good (green) and Moderate (yellow) AQI levels. (AirNow, 2025)

Heat index temperature: The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. (NWS, 2025)

Health surveillance: Monitoring health events and trends in a population to identify potential problems and inform public health interventions.

Heat-related illness (HRI): Emergency department and ambulatory care visits for illnesses associated with high heat weather. Definition includes chief complaint terms and diagnosis codes for exposure to excessive natural heat causing heat cramps, heat exhaustion, heat stroke,

hyperthermia, and heat related fatigue or stress. Exclusions to this definition include feeling hot, swelling, redness, pain, dental pain, hot food, and other non-temperature related heat related terms. Using this query in combination with heat temperature trends may further assist with surveillance efforts. (NSSPCP, 2019)

Pollen-related allergies: Emergency department and ambulatory care visits for allergies to pollen. The immune system mistakenly identifies a typically harmless substance as an intruder. This substance is called an allergen. The immune system responds to the allergen by releasing histamine and chemical mediators that typically cause symptoms in the nose, throat, eyes, ears, skin and roof of the mouth. (AAAAI, 2025)

Poor air quality: Air quality index (AQI) values above 100 are unhealthy: first for certain sensitive groups of people, then for everyone as AQI values get higher. This includes the following levels of concern: Unhealthy for Sensitive Groups (orange), Unhealthy (red), Very Unhealthy (purple), and Hazardous (maroon). (AirNow, 2025)

Priority populations: Groups of people and communities vulnerable to environmental hazards who may be prioritized for improved health outcomes due to their increased risk and poor health outcomes experienced.

Resilient: The ability to withstand or recover quickly from difficult conditions.

Social determinants of health: The conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.

Vulnerable populations and communities: People who are more likely to develop health problems because of environmental hazards. This can include (but is not limited to) older adults; infants and children; people who are pregnant; people living with chronic health conditions; people with intellectual, developmental, and physical disabilities; people experiencing homelessness; people experiencing poverty; outdoor workers; limited English proficiency (LEP) speakers.

Wind chill temperature: The wind chill temperature is how cold people and animals feel when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. Therefore, the wind makes it feel much colder. If the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill temperature, exposed skin can freeze in 30 minutes. (NWS, 2025)

"As a renter without access to an AC unit, the ability to stay cool and regulated and safe during that time [2021 heat dome] was impossible. I had to leave the area and stay with family who were in cooler environments."

~ Anonymous resident response in the Environmental Scan

Executive Summary

The following document is the 2025-2030 Marion County Climate and Health Adaptation Plan and it was created by the Marion County Health and Human Services – Public Health Division in collaboration with various organizations and leaders. This five-year plan is a collaborative project set to improve health outcomes from July 1, 2025 to June 30, 2030 to environmental hazards and to fulfill the Oregon Health Authority Program Element (PE) 51, goal #3 requirement: *"By June 30, 2025, LPHA [Local Public Health Authority] will complete a local or regional climate adaptation plan"* (see Appendix A).

Background

Located in the heart of the Mid-Willamette Valley, Marion County has a landscape that stretches from the Willamette River to the Cascade Mountains and encompasses nearly 1,200 square miles of rural, urban, forested, and agricultural landscapes. Marion County is home to a diverse population of 345,920 people and 20 cities, including Oregon's capital, Salem. Demographically, Marion County is home to people of various ages, occupations, faiths, physical and mental capabilities, languages, and many more unique characteristics.

In recent years, Marion County has faced multiple climate and environmental hazards that have caused harm and suffering in communities across the county, as well as destruction to natural environments of both urban and rural areas. Some of these events rose to a declared state of emergency due to concerns for health, well-being, and safety. Often these events increase emergency room and urgent care clinic visits, hospitalizations, and even deaths as a result of their severity. These events include record-setting heatwaves in 2021 and 2024, disruptive ice storms in 2021 and 2024, and devastating wildfires with hazardous air quality in 2020.

Recent events make clear that severe weather and environmental hazards—such as extreme heat, cold, and poor air quality—are becoming more frequent and impactful in Marion County, affecting the health and safety of residents across the county. While these events do affect everyone, some populations and communities are more vulnerable and experience worse health outcomes. While planning will encompass an all-communities approach, various vulnerable populations experiencing disproportionate health effects are prioritized, including (but not limited to):

- Older adults
- Infants and children
- Pregnant women
- People living with chronic health conditions
- People with intellectual, developmental, and physical disabilities
- People experiencing homelessness
- People experiencing poverty
- Outdoor workers
- Limited English proficiency (LEP) speakers
- People with other identified health disparities

Therefore, in the interest of protecting public health and improving community resilience, Marion County Health and Human Services conducted various assessments, brought community organizations and leaders together, and created this 2025-2030 Marion County Climate and Health Adaptation Plan.

Assessment

Marion County conducted multiple assessments in preparation for the planning phase. Between August 2023 – September 2024, Marion County Health and Human Services and Polk County Public Health contracted with Willamette University to conduct the Marion & Polk County Regional Environmental Scan Assessment for Environmental Health Resiliency. Through various assessments, this report yields local and quality information, stories, and data on how climate hazards impact vulnerable populations and service organizations. Marion County Health and Human Services also conducted three health surveillance reports through Oregon ESSENCE – Electronic Surveillance System for the Early Notification of Community-Based Epidemics. These surveillance reports highlight emergency department and urgent care visits and hospitalizations due to a heat-related illness, cold-related illness, and air quality-related illnesses.

Alongside these reports, additional assessment tools exist, including the Oregon Department of Energy's Oregon Cooling Needs Study, Oregon Climate Change Research Institute's Marion County Future Climate Report, the CDC Social Vulnerability Index, and Climate Toolbox.

Protecting and improving public health from climate and environmental hazards cannot be done by a single organization. Through the Marion-Polk County Regional Environmental Scan conducted by Willamette University, it was identified that Marion County Health and Human Services' Public Health Division is well positioned to facilitate opportunities for community partners to collaborate in planning, communication, and action. Organizations and experts from health, emergency preparedness, environmental, and service-based sectors came together to share their knowledge, experience, and expertise to improve the health and resilience of Marion County communities — especially those most vulnerable – to the most concerning climate and environmental hazards. Through assessments and prioritization, the environmental health hazards of highest concern chosen were extreme heat, extreme cold and winter storms, and poor air quality.

Partnership Building and Planning

From the Marion-Polk County Regional Environmental Scan, community partners desired to move from reactive responses to environmental hazards and threats towards more proactive planning. Marion County Health and Human Services was identified as a prime organization to oversee collaboration, planning, and engagement with a variety of organizations involved in the health and well-being of all Marion County communities – especially those that are most vulnerable. Therefore, MCHHS began the process to create the 2025-2030 Marion County Climate and Health Adaption Plan (CHAP).

Community partners and stakeholders across sectors of health, emergency preparedness, environmental, service-based organizations, and the social determinants of health were contacted to serve on the CHAP Community Collaborative Planning Group. This planning group collaborated to review data and create the mission, vision, values, initiative prioritization criteria, goals, objectives, and actions seen throughout this plan. Concurrently, MCHHS created an Internal Core Planning Group made up of leadership and staff to determine MCHHS involvement in objectives created, identify quality planning projects and goals, and plan communication efforts.

Results

As a result, 6 strategies and 43 objectives were created to improve health outcomes to extreme heat, extreme cold, and poor air quality between July 2025 – June 2030. Marion County Health and Human Services will lead, support, or monitor various implementation and action efforts highlighted in this plan. Various organizations involved in planning and implementation efforts will also work collaboratively to lead and support efforts as well. These efforts will ensure collaboration, engagement, accessibility, opportunity, and communication to support the vision, mission, and goals of this plan (see below).

Vision Statement

To create a vibrant, healthy, and prepared Marion County community that is resilient to periods of extreme heat, extreme cold, and poor air quality.

Mission Statement

To improve public health outcomes during periods of extreme heat, extreme cold, and poor air quality for all Marion County community members through emergency preparedness and resilience strategies.

Goals

By implementing environmental hazard preparedness and resilience strategies between July 2025 – June 2030, the Marion County Climate and Health Adaptation Plan seeks to:

Reduce Marion County heat-related illness emergency visits on days with a heat index of 90°F or higher by 20%.

Reduce Marion County cold-related illness emergency visits on days with a wind chill of 32°F or lower by 20%.

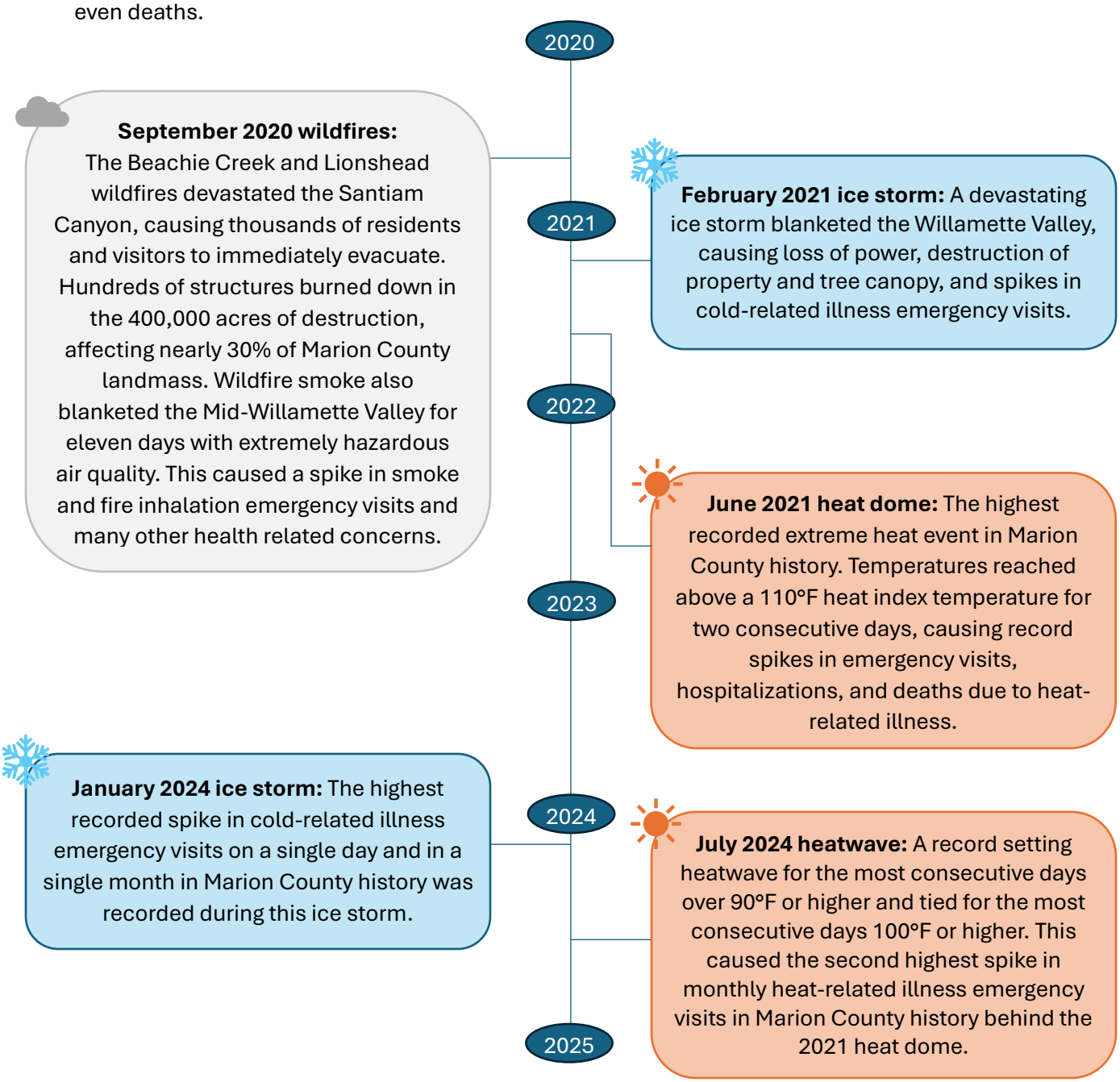
Reduce Marion County air quality-related respiratory illness emergency visits by 1%, from the 2019-2024 average of 4,964/100,000 to the plan duration average of 4,914/100,000.

Understanding: Climate Hazards are a Health Issue

Environmental Hazard Events in Marion County's Recent Past

Local historical environmental context:

In recent years, Marion County has faced multiple climate and environmental hazards that have caused harm and suffering among various communities throughout the county. Some of these events rose to declared state of emergencies due to concerns for health, well-being, and safety. Often these events increase emergency room and urgent care clinic visits, hospitalizations, and even deaths.



Extreme Heat & Heat Waves

Health Impacts

Extreme heat events can lead to severe acute and chronic health conditions if not properly treated (Schlader et al., 2022). During extreme heat events, there is often a spike in the rates of hospitalization for heat stroke and other heat-related health issues (Weilnhammer et al., 2021). Heat stroke is the most serious heat-related health issue and can cause long-term damage to the body or death if medical attention is not sought immediately (Schlader et al., 2023). Heat stroke occurs when the body is exposed to high heat for too long and reaches a temperature of 103 °F (Douma et al., 2020). At this temperature, the body loses its ability to cool down, which can result in organ damage and nervous system dysregulation (Douma et al., 2020).

The increase in rates of heat stroke morbidity (illness) and mortality (death) are due to the increase in cardiovascular stress from extreme heat (Münzel et al., 2024). Increased sweating and loss of fluids lead to increased stress on the cardiovascular system (Rosinger, 2022). Older adults are at increased risk for these heat-related health issues. This is due to their decreased ability to regulate their internal temperature (Rosinger, 2022). Other populations at risk include small children, outdoor workers, people with a pre-existing cardiovascular disease, and low-income people (Sejo et al., 2024). Cardiovascular stress is the most common cause of mortality during extreme heat events (Ebi et al., 2021).

Prolonged exposure to extreme heat can have several other adverse long-term health outcomes. Dehydration can stress the body due to water loss and an imbalance of electrolytes (Chapman et al., 2020). Being chronically exposed to high heat can lead to long-term damage and other health problems. Dehydration can cause long-term damage to the kidneys, bladder, and even the heart (Ebi et al., 2021). Prolonged exposure to extreme heat can put people at an increased risk for developing a cardiovascular disease later in life (Ebi et al., 2021).

Urban heat island effect

The urban heat island effect is a phenomenon where urban areas absorb more heat and stay warmer longer than other, more rural, areas (Piracha & Chaudhary, 2022). This is because urban areas are often covered by large amounts of concrete and pavement which absorb a lot of heat. This heat is then slowly released throughout the night, continuing to warm urban areas. Also, many urban areas lack adequate tree canopy and do not have adequate shade cover, making the urban heat island worse. The urban heat island effect causes heat waves to be even more intense in urban areas. In addition to increasing heat related health risks, the urban heat island effect is also associated with worse air pollution and health outcomes (Piracha & Chaudhary, 2022). Some densely built parts of Marion County, such as Salem, Keizer, and Woodburn, retain more heat due to the prevalence of concrete and pavement and limited natural shade. These areas are more likely to experience higher temperatures during heat events, which can increase the risk of heat-related illness, especially for older adults, young children, and those with medical vulnerabilities.

Increasing tree canopy cover and urban green spaces is one strategy that can reduce the impacts of the urban heat island effect (Hwang et al., 2023). Green spaces don't absorb and store heat the same way that concrete does. Expanding tree canopy and shade infrastructure in these heat-prone zones can reduce surface temperatures, ease pressure on emergency response systems, and lower

energy costs associated with cooling. These are cost-effective public safety strategies that benefit all residents (Hwang et al., 2023).

Figure 1: This map shows satellite captured data of Salem and Keizer, Oregon. It compares high heat surface temperatures (red = high heat, blue = low heat) to tree canopy coverage (dark green = high tree canopy, no color = low to no tree canopy). Generally, higher tree canopy coverage and waterways reduce surface temperatures.

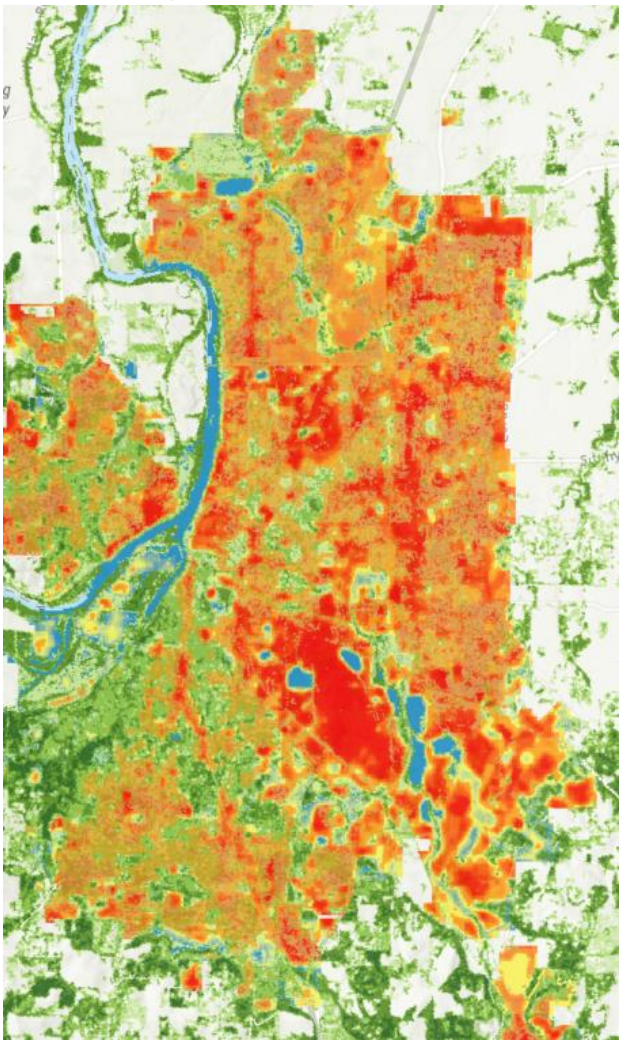


Figure 2: This map shows satellite captured data of Salem and Keizer, Oregon. It compares high concrete/impervious surface areas (dark grey = high concrete) to tree canopy coverage (dark green = high tree canopy, no color = low to no tree canopy). Generally, tree canopy coverage is lower at areas with more concrete and less tree canopy coverage.

These images were created in ArcGIS using satellite data from the Trust for Public Land (Trust for Public Land, 2024) and National Land Cover Database (National Land Cover Database, 2025).

Heat-Related Illness Statistics

In the past six years, daily emergency visits for heat-related illness have dramatically increased alongside increases in daily heat index maximum temperatures (Figure 3 and Table 1 below). **Between 2019-2024, the heat-related illness cases at or above 90°F heat index were 3.7/day.** The effects can be felt overnight as well. Emergency visits for heat-related illness occur 42 times more often on days following overnight heat index minimum temperatures that remain at or above 65°F compared to days when overnight temperatures drop below 65°F.

Figure 3: Emergency Visits for Heat-Related Illness per day by Heat Index Temperature among Marion County Residents, 2019-2024, OR ESSENCE, NOAA

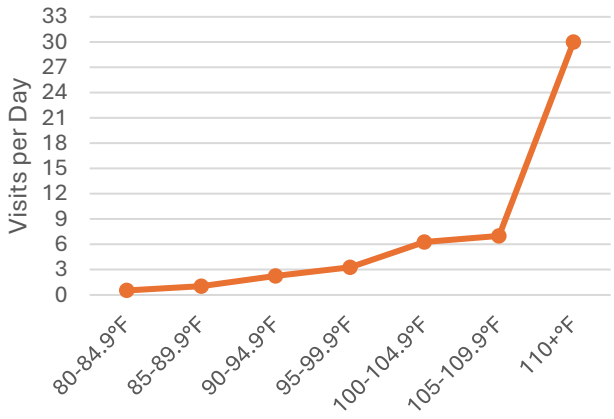


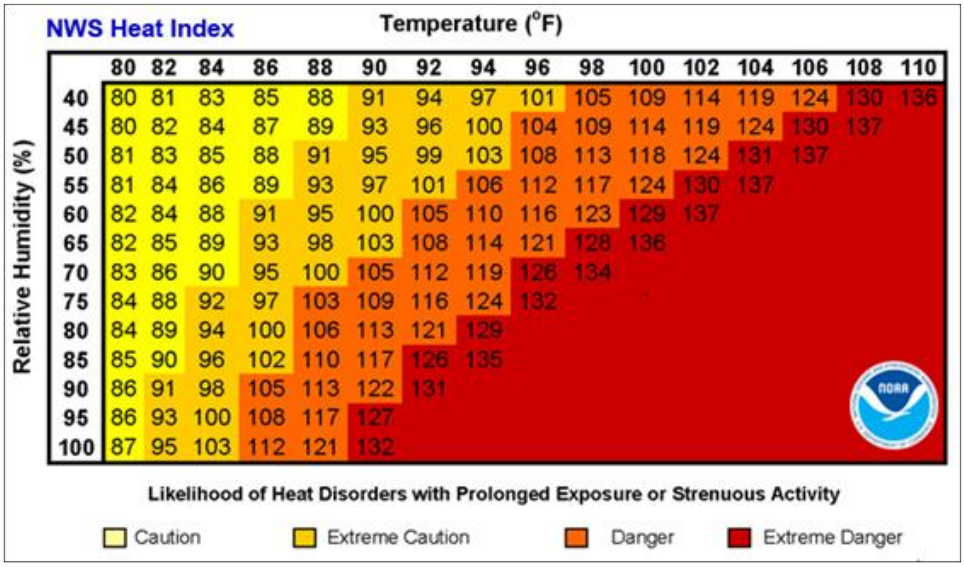
Table 1: Heat-Related Illness that occurred in each heat index degree range, 2019-2024, OR ESSENCE, NOAA

Range	Days	Visits / Day
80-84.9°F	235	0.5
85-89.9°F	107	1
90-94.9°F	53	2.2
95-99.9°F	20	3.3
100-104.9°F	**11**	**6.3**
105-109.9°F	**1**	**7**
110°F +	**2**	**30**

Why use heat index temperatures instead of air temperature to determine health impacts?

The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. (NWS, 2025)

Table 2:



Heat-related illnesses have increased in the past four years as the number of heat index days have increased above caution, extreme caution, and danger heat index zones (Figures 4 and 5). The following graphs show the number heat index days in the heat index categories and heat-related illness per year.

Figure 4: Number of Caution or Higher Heat Index Days (80°F or Higher) in Salem, OR, NOAA

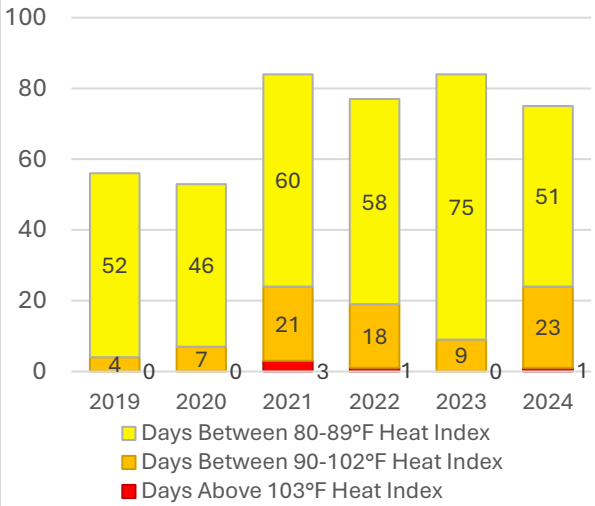
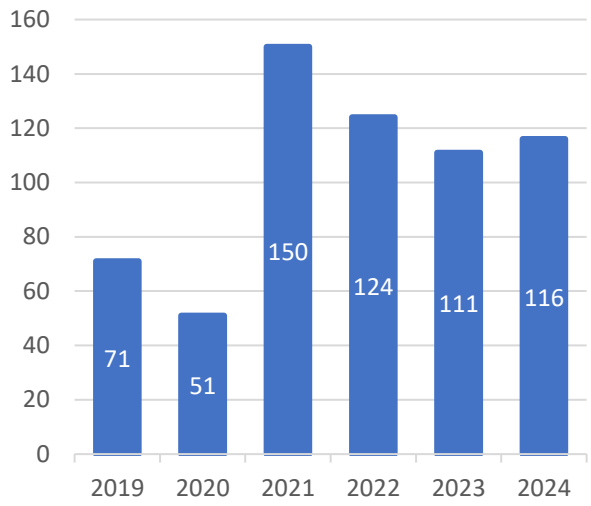


Figure 5: Heat-Related Illness Emergency Visits in Marion County, OR, ESSENCE, NOAA



"[During the heat dome] we could not do any manual labor outside, especially related to farm work. Crops were damaged significantly, impacting many individuals' livelihood... [of] smaller agricultural business owners, especially immigrant Russian owned farms."

~ Anonymous resident response in the Environmental Scan

Heat-related illness disproportionately impacts some people more severely. Oregon public health ESSENCE data shows that emergency visits occur at higher rates for people identified as homeless and older adults (Figures 6 and 7). High-risk individuals also include pregnant women, infants, children, people with chronic conditions or without air-conditioning, outdoor workers, and athletes (CDC, 2025). For more data, see the Marion County Heat-Related Illness Surveillance Report. (Keuler et al, 2024)

Figure 6: Heat-Related Illness Emergency Visits by Identified Housing Status in Marion County, 2019-2024, OR ESSENCE

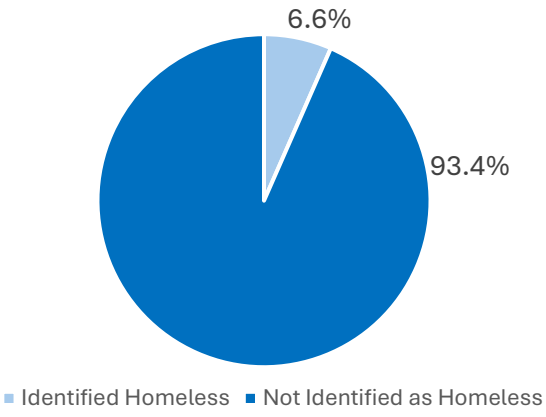
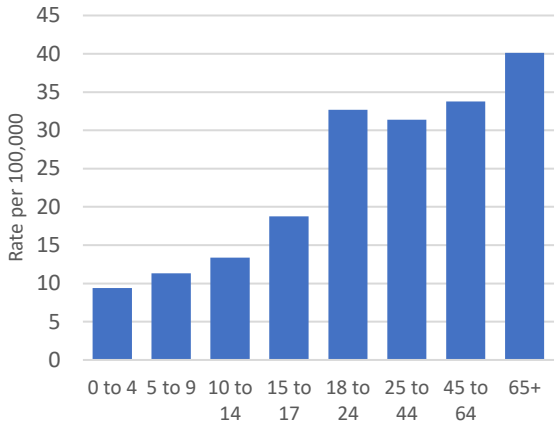


Figure 7: Rate of Heat-Related Illness Emergency Visits by Age in Marion County per 100,000, 2019-2024, OR ESSENCE, US Census



Future Projections

Between 1971-2000, the historical average for heat index days 90°F or above was 8.6 days/year. According to the Climate Toolbox, if low emissions occur between 2010-2039, the heat index days 90°F or above in Salem, Oregon are projected to increase 7.0 days/year on average compared to the historical average (UC Merced, 2025). Between 2010-2024, the average heat index days at or above 90°F was 13.1 days/year. While the 4.6 days/year average increase remains below the projection, the current trend continues to increase every several years as shown in Table 3. (NOAA, 2025)

Table 3: Recent Heat Index Day Averages 90°F or Higher, NOAA

	Average	Increase compared to the historical average
2010-2014	9.4	0.8
2015-2019	13.4	4.8
2020-2024	16.4	8.0
2010-2024	**13.1**	**4.6**

Extreme Cold & Winter Storms

Health Impacts

Extreme cold can cause many negative health outcomes and cold-related illnesses such as hypothermia, frostbite, and death (Weilnhammer et al., 2022). Hypothermia occurs when the body loses more heat than it can produce and internal temperature drops to 95°F (Seltenrich, 2015). When the body's core temperature is too low, arteries and veins start to narrow. This narrowing puts increased stress on the cardiovascular system (Seltenrich, 2015). Some people are especially vulnerable to hypothermia, including older adults, young children, people with chronic illnesses, and people with substance use disorder. They are more vulnerable because they have a decreased ability to regulate their internal body temperature (Rossinger, 2022).

Like extreme heat, extreme cold can also cause stress and damage to the body. Prolonged stress on the cardiovascular system can damage organs, and especially the brain (Seltenrich, 2015). Decreased blood flow throughout the body can cause muscle weakness, confusion, and heart disease. When people living with heart disease are exposed to extreme cold, symptoms can worsen (Weilnhammer et al., 2022).

Winter Storms

Extreme cold events, such as ice storms, can be dangerous in other ways. Ice storms can cause significant damage to infrastructure, leading to secondary impacts on people's health. During severe ice storms, many people may lose power and turn to backup generators or alternative heat to stay warm. However, using generators, or other heating methods indoors can cause carbon monoxide to build up (Adefeso et al., 2020). High indoor levels of carbon monoxide can cause several adverse health outcomes, including death (Degelia et al., 2016). Power loss can also put people at an increased risk of foodborne illnesses. Without energy to power appliances such as refrigerators or freezers, food is at an increased risk of spoilage (Lin et al., 2021).

Ice storms can make travel more dangerous by creating icy, hard-to-navigate roads. This hazard causes an increase in motor vehicle accidents, resulting in harm to both drivers and pedestrians (Black & Mote, 2015). Also, sidewalks and other areas are more difficult to walk on due to the ice. Icy sidewalks cause an increase in falls and injuries (Gevitz et al., 2017). For some people, such as the older adults, falls can cause serious injuries or even be fatal (Gevitz et al., 2017).

> *"I couldn't go anywhere [during the 2021 ice storm], and I couldn't get the prescription delivered, and I ended up getting really, really sick and just having to tough it out."*
>
> *~ Anonymous older adult resident response in the Environmental Scan*

Cold-Related Illness Statistics

In the past six winter seasons, monthly emergency visits for cold-related illness have dramatically increased when a winter storm event occurred (Figure 8). These rates also increase as the wind chill temperature decreases (Figure 9 and Table 4). **During cold weather months (October – April) between 2019-2025, the cold-related illness emergency visits occurring at or below a 32°F wind chill temperature were 1.6/day.**

Figure 8: Monthly Cold-Related Illness Emergency Visits in Marion County, OR ESSENCE

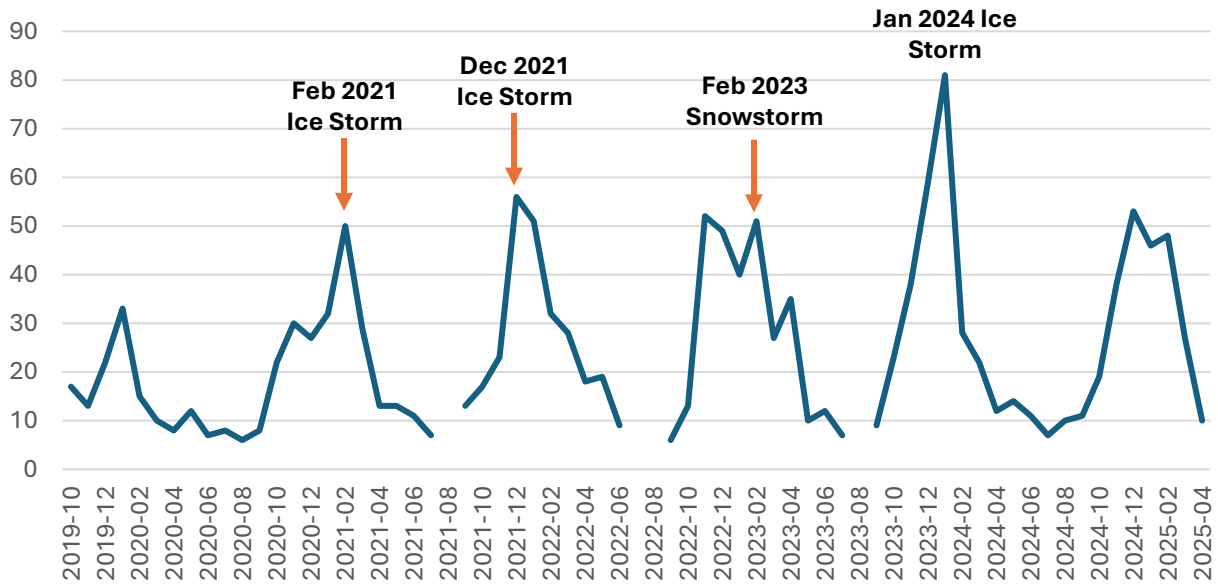


Figure 9: Cold-Related Illness Emergency Visits per day by Wind Chill Temperature Range in Marion County, Oct-April, 2019-2025, OR ESSENCE, NOAA

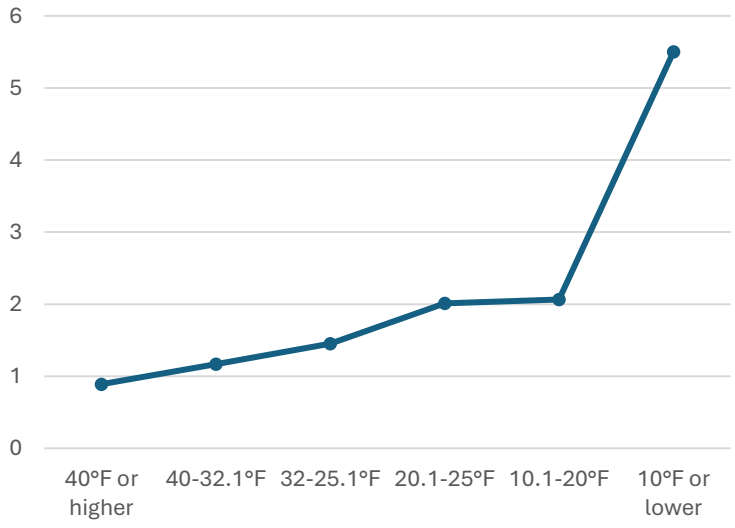


Table 4: Cold-Related Illness Emergency Visits in each Wind Chill Temperature Range, Oct-April, 2019-2025, OR ESSENCE, NOAA

Range	Days	Cases / Day
40.1°F or higher	235	0.8
32.1-40°F	107	1.2
25.1-32°F	53	1.4
20.1-25°F	**20**	**2.0**
10.1-20°F	**11**	**2.1**
10°F or lower	**1**	**5.5**

Why use wind chill temperatures instead of air temperature to determine health impacts?

The wind chill temperature is how cold people and animals feel when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually, the internal body temperature. Therefore, the wind makes it feel much colder. (NWS, 2025)

Table 5:

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

weather.gov

Cold-related illnesses have increased over the past six years dispite cold days (Figures 10 and 11). The following graphs show the number wind chill days and cold-related illness emergency visits.

Figure 10: Number of Wind Chill Temperature Days in Salem, Oct-April, 2019-2025, NOAA

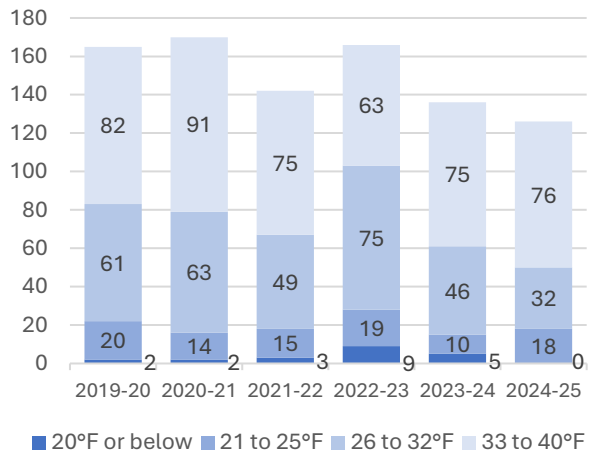
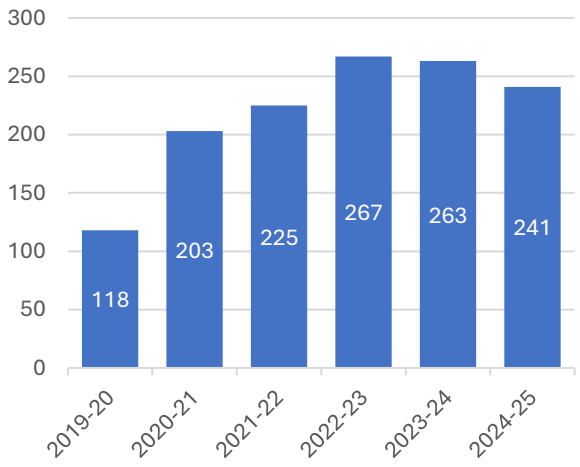


Figure 11: Cold-Related Illness Emergency Visits, Oct-April in Marion County, OR, ESSENCE



Cold-related illness disproportionately impacts some people more severely. Oregon ESSENCE data shows that emergency visits occur at higher rates for people identified as homeless and older adults (Figures 12 and 13). High-risk individuals also include pregnant women, infants, people with chronic conditions, and outdoor workers (NWS, 2025). For more data, see the Marion County Cold-Related Illness Surveillance Report. (Keuler et al, 2024)

Figure 12: Percentage of Cold-Related Illness Emergency Visits by Identified Housing Status in Marion County, Oct-April, 2019-2025, OR ESSENCE

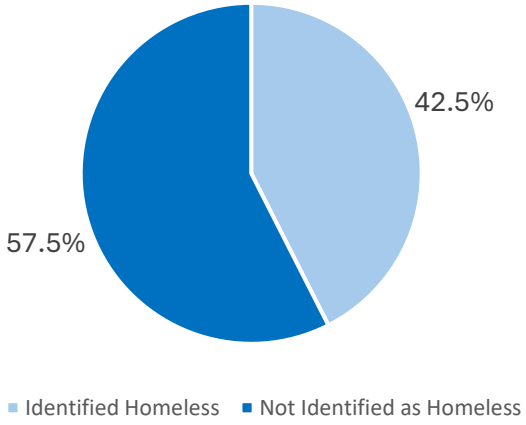
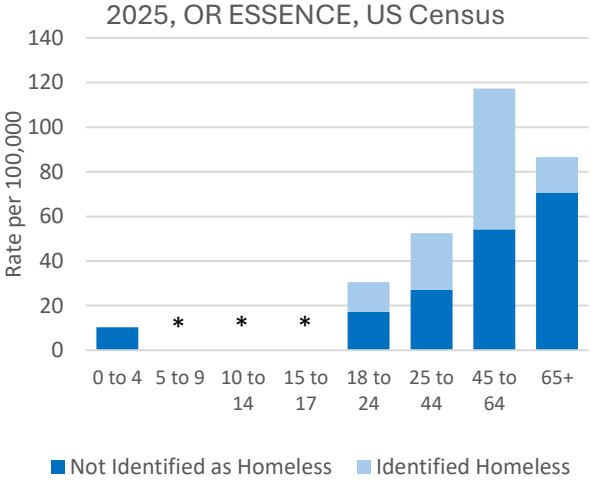


Figure 13: Rate of Cold-Related Illness Emergency Visits by Age and Identified Housing Status in Marion County per 100,000, Oct-April, 2019-2025, OR ESSENCE, US Census



"" Data is supressed due to low numbers*

Future Projections

Between 1971-2000, the historical average minimum temperature in Salem, Oregon was 42.9°F. According to the Climate Toolbox, if low emissions occur between 2010-2039, the average minimum temperatures in Salem, Oregon are projected to increase 1.7°F. Between 2010-2024, the average minimum temperature was 45.2°F. This 2.3°F temperature increase already exceeds the projection during this time period. (NOAA, 2025)

"[During the 2021 ice storm, clients] didn't have electricity for one week and they were not able to go to buy food because they had to work before the ice and they were not able to pay their bills. So with our organization, we started to help with gift cards to at least help with some of those bills."

~ Anonymous community leader response in the Environmental Scan

Poor Air Quality

Health Impacts

The Air Quality Index (AQI) is a scale that is used to quantify and describe the air quality in a given area (Olstrup et al., 2019). The AQI is based on the measure of 5 major air pollutants. These air pollutants are ground level ozone (O3), particle pollution (PM2.5 and PM10), carbon monoxide (CO), sulfur dioxide (SO2), and nitrogen dioxide (NO2) (Olstrup et al., 2019). The AQI scale includes six main categories used to describe air quality: Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy, and Hazardous.

Overall, the majority of days in recent years in Marion County have had good air quality index readings, with periods of time where poor air quality is experienced. Between 2019-2024, 79.8% of all hourly air quality readings at the Oregon State Hospital in Salem, Oregon were "Good," 19% were "Moderate," and only 1.2% were "Unhealthy for Sensitive Groups" or worse. (Oregon DEQ, 2025)

When discussing air quality and hazardous AQI levels, high PM2.5 levels are a major health concern. PM2.5 is particulate matter pollution often caused by wildfires. During the Beachie Creek and Lionshead fires in September 2020, the Santiam Canyon, Silverton, and Salem and the surrounding area experienced some of the worst air quality in the world for over a week. Between September 8-17, 2020, the AQI recorded in Marion County reached "Hazardous" for 10 days straight. This means that the air quality was poor enough to pose a health risk to everyone in the area. Wildfire smoke and PM2.5 can travel long distances in the wind. This means that people may experience negative health outcomes even if they don't live near the site of the fire.

During periods of high AQI levels, people without proper filtration or protection may experience negative health impacts (Chen et al., 2024). Hazardous levels of AQI can impact everyone, even those without a pre-existing health problem (Borchers Arriagada et al., 2019). Immediate and short-term exposure to hazardous levels of air pollution can cause problems such as respiratory irritation and coughing (Chen et al., 2024). During wildfires, or other acute exposures to PM2.5, there is a noticeable increase in hospitalizations due to cardiovascular problems (Haikerwal et al., 2015).

Poor air quality can also cause serious health problems for people who are exposed over long periods of time, such as months or even years (Chen & Hoek, 2020). Long-term exposure to poor air quality can cause health problems such as asthma, cardiovascular disease, and lung cancer (Münzel et al., 2024). Poor air quality can also intensify the health problems of people with pre-existing respiratory and cardiovascular conditions (Chen et al., 2024). This increase in cardiovascular problems and other negative health outcomes is seen mostly in older adults and other people with pre-existing health conditions. (Haikerwal et al., 2015).

> *"[We had] financial difficulties [during the wildfires] after the price gouging that we encountered on the air purifier we had to purchase in order to help my elderly mother with the air so that she would be able to breathe better."*
>
> *~ Anonymous resident response in the Environmental Scan*

Air Quality-Related Respiratory Illness Statistics

Between 2019-2024, emergency visits for air quality-related respiratory illness fluctuated despite poor air quality days (Figure 14). In 2024, these numbers dramatically increased (Figure 15). **The 2019-2024 average of air quality-related respiratory illnesses was 4,964/100,000 people**. Emergency visits due to asthma and pollen-related allergies have also increased in recent years (Figure 16).

Figure 14: Days with Poor Air Quality Recorded at the Oregon State Hospital in Salem, Oregon DEQ

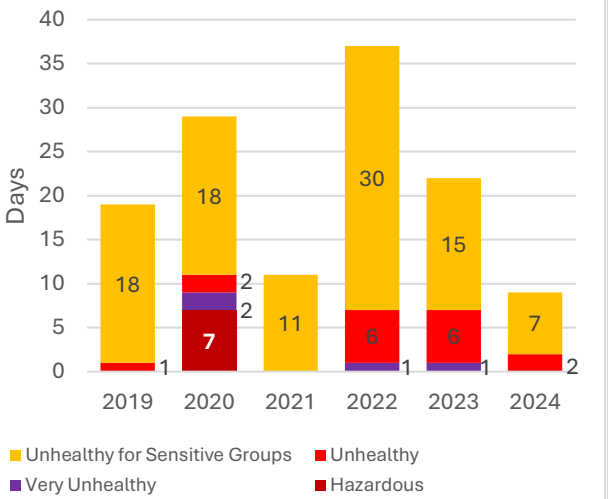


Figure 15: Air Quality-related Respiratory Illness Emergency Visits in Marion County, OR ESSENCE

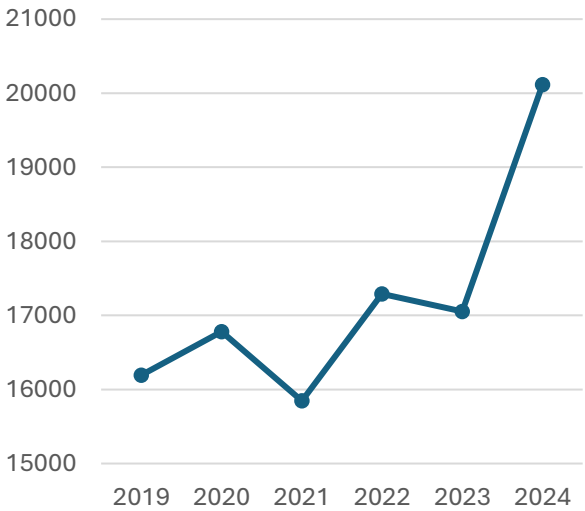
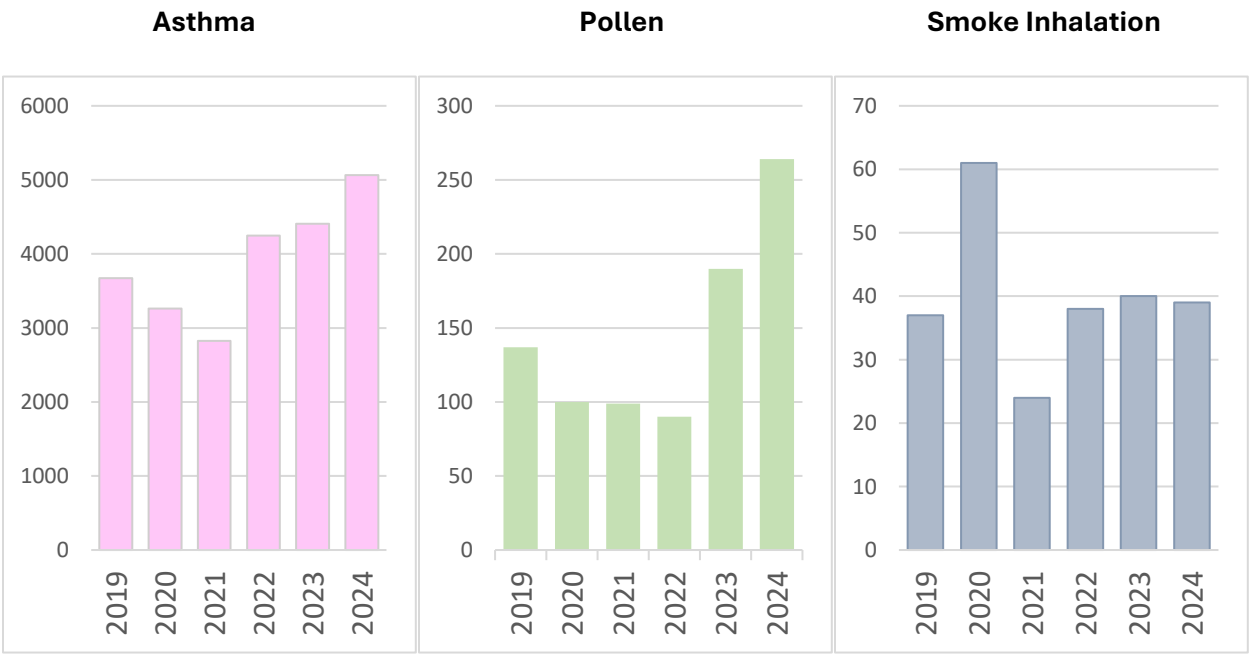


Figure 16: Emergency Visits by Air Quality Metric in Marion County, OR ESSENCE



Why use the Air Quality Index to consider health impacts?

The U.S. Air Quality Index (AQI) is a national tool for communicating about outdoor air quality and health. The higher the AQI value, the greater the level of air pollution and the greater the public health concern. (AirNow, 2025)

Table 6: AQI Basics for Ozone & Particle Pollution, AirNow

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Air-quality related respiratory illness disproportionately impacts some people more severely. Oregon ESSENCE data shows that emergency visits occur at higher rates for infants, toddlers, and older adults (Figures 17 and 18). High-risk individuals also include pregnant women, people with chronic heart or lung conditions, and low-income individuals (EPA, 2025). For more data, see the Marion County Air Quality & Illness Surveillance Report. (Keuler et al, 2024)

Figure 17: Percentage of Emergency Visits for Air Quality-Related Respiratory Illness by Identified Housing Status, 2019-2024, OR ESSENCE

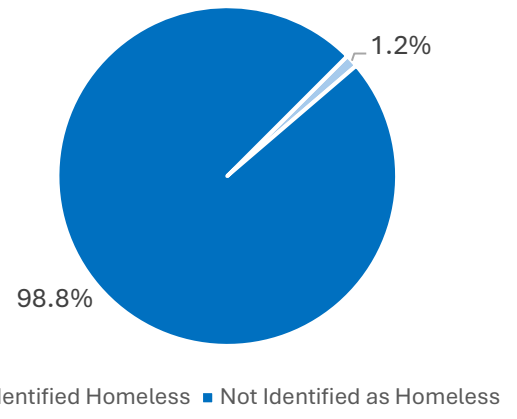
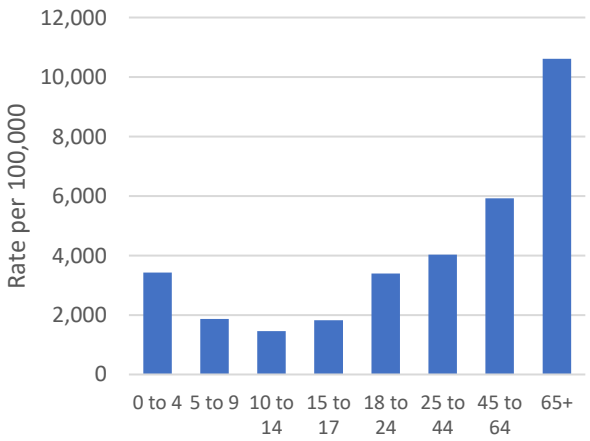


Figure 18: Rate of Air Quality-related Respiratory Illness Emergency Visits by Age in Marion County per 100,000, 2019-2024, OR ESSENCE, US Census



Improving Health and Community Resilience

Environmental conditions, or the quality and state of the environment, are an inescapable part of daily life that can impact health. Severe weather can have devastating effects on health, including direct injury and death, in addition to causing infrastructure damage and environmental degradation. People affected by weather disasters are at an increased risk of long-term effects, including mental health consequences and new or worsening chronic conditions. Severe weather can also put increased pressure on the health care system by increasing the number of people who require medical care, impeding access to care, and damaging health care infrastructure.

The impacts of extreme weather events and environmental hazards have been and will continue to affect people who live, work, learn, and play in Marion County. Hot summers, heat waves, extreme cold, snow and ice storms, wildfires, wildfire smoke, and poor air quality threaten the short-term and long-term health of all communities in Marion County. However, these environmental hazards will especially impact people and communities most vulnerable to them.

To support the people of Marion County in living healthy, purposeful lives, Marion County Health and Human Services (MCHHS) seeks to strengthen the health resilience of its communities. To improve the health of individuals and communities requires a collaborative, community-driven approach. Local public health authorities cannot do this work alone. The Marion-Polk Regional Environmental Scan Assessment, conducted by the Willamette University research team, identified that Marion County Health and Human Services (MCHHS) is well-positioned to convene community-serving organizations and agencies to collectively plan and implement adaptation and resilience efforts.

Between January and May 2025, more than 65 planning members (county employees and community partners) representing various sectors and agencies met to create realistic solutions to complex community health problems caused by extreme heat, extreme cold, winter storms, poor air quality, and wildfire smoke. Inspired to improve health outcomes and reduce suffering caused by environmental conditions, these organizations and MCHHS employees came together to create this 2025-2030 Marion County Climate and Health Adaptation Plan that will run from July 1, 2025 through June 30, 2030. Through collaboration, planning, and collective action, MCHHS will help build a more resilient community to fulfill our department's vision: creating a vibrant community in Marion County, where all people have opportunities to live healthy, purposeful lives.

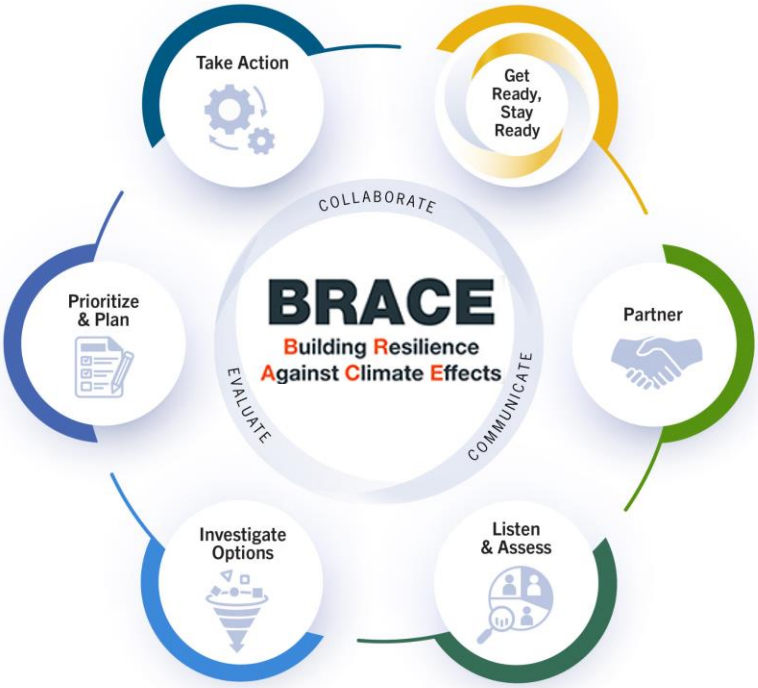
> *"[During the 2020 wildfires], the smoke level, like the air quality level, was beyond unhealthy. Our biggest challenge was getting transportation arranged for our seniors who did not have transportation and some did not have a place to go."*
>
> *~ Anonymous community leader response in the Environmental Scan*

Process to Create the Climate and Health Adaptation Plan

Planning Framework

Marion County Health and Human Services (MCHHS) used the CDC BRACE framework (Building Resilience Against Climate Effects) as a guide to create a climate and health adaptation plan that is responsive to community needs. This includes:

1. Get Ready, Stay Ready
2. Partner
3. Listen & Assess
4. Investigate Options
5. Prioritize & Plan
6. Take Action



To increase the level of community involvement, impact, trust, and communication flow, MCHHS used the CDC Community Engagement Spectrum to select an appropriate collaboration metric with community partners and leaders across various sectors. "Collaborate" was selected as the engagement metric.

Increasing Level of Community Involvement, Impact, Trust, and Communication Flow

Outreach	*Consult*	*Involve*	*Collaborate*	*Shared Leadership*
Some Community Involvement *Communication flows from one to the other, to inform* Provides community with information. Entities coexist. Outcomes: Optimally, establishes communication channels and channels for outreach.	*More Community Involvement* *Communication flows to the community and then back, answer seeking* Gets information or feedback from the community. Entities share information. Outcomes: Develops connections.	*Better Community Involvement* *Communication flows both ways, participatory form of communication* Involves more participation with community on issues. Entities cooperate with each other. Outcomes: Visibility of partnership established with increased cooperation.	*Community Involvement* *Communication flow is bidirectional* Forms partnerships with community on each aspect of project from development to solution. Entities form bidirectional communication channels. Outcomes: Partnership building, trust building.	*Strong Bidirectional Relationship* Final decision making is at community level. Entities have formed strong partnership structures. Outcomes: Broader health outcomes affecting broader community. Strong bidirectional trust built.

Reference: Modified by the authors from the International Association for Public Participation.

Assessment and Partnership Building

BRACE Framework Step – 1. Getting Ready, 2. Partner, and 3. Listen and Assess

To begin the planning process, Marion County Health and Human Services conducted two separate assessment projects to gain greater clarification of how environmental hazards and threats impact Marion County communities. First, Marion County Health and Human Services began reviewing surveillance data to understand the burden of environmental hazards on hospital systems and capture how some vulnerable populations are affected. Data from these assessments are highlighted in the Understanding: Climate Effects are a Health Issue section of this plan and explained in more detail in the Heat Related Illness, Cold Related Illness, and Air Quality & Illness Surveillance Reports. Additionally, Marion County Health and Human Services partnered with Polk County Public Health to contract a local university or consulting firm to conduct an environmental scan. The purpose was to understand how Marion and Polk County community members have been affected by environmental hazards, and to learn what various organizations are doing to reduce vulnerability and increase resilience and adaptation.

In March 2023, Willamette University was selected as the contracted organization. Between August 2023 and December 2024, the University's research team conducted the 2024 Marion & Polk County Regional Environmental Scan Assessment for Environmental Health Resiliency, which included a variety of assessments.

Willamette University conducted various assessments to answer the following research question topics related to environmental health hazards and threats (EHHTs):

- What programs and policies exist for EHHTs for vulnerable populations?
- What data and research do we have?
- How are we communicating EHHTs, especially to vulnerable populations?
- What are the strengths, weaknesses, opportunities, and threats among community and government programs and efforts?

Research methods included conducting an online survey in English, Spanish, and Russian (567 responses), community member and unhoused interviews (29 interviewed), stakeholder interviews (72 interviewed), focus groups with vulnerable communities (5 total), media and communication analysis, and a policy, literature, and data review. While environmental hazards affect all communities, some populations with preexisting vulnerabilities and risks are impacted more. The researchers ensured a focus on various vulnerable communities to capture these experiences and understand current community preparedness, resilience, and response. (Iroz-Elardo, 2024)

The Environmental Scan produced many findings, including recommendations for the next steps to inform the 2025-2030 Marion County Climate and Health Adaptation Plan (CHAP). First, the community surveys showed that the most concerning environmental hazards impacting the Marion and Polk community were extreme heat, extreme cold, and poor air quality. Second, stakeholder interviews revealed an interest in proactively collaborating to improve the resilience and health of community members. These opportunities include partnership and collaboration, funding, communication, education and learning, planning and preparedness, and engagement with specific community groups. These findings provide the basis for choosing the priority goals and intentionally collaborating with community organizations. (Iroz-Elardo, 2024)

On November 19, 2024, MCHHS and Willamette University presented the data findings from surveillance reports and the Environmental Scan with community partners and leaders involved in the project and began the collaborative process of creating this plan.

Collaboration and Planning

BRACE Framework Step – 4. Investigate Options, 5. Prioritize & Plan, 6. Take Action

In January 2025, two planning groups were created and met monthly through May 2025. These two planning groups worked in tandem to inform and support each other throughout the planning process.

CHAP Internal Core Planning Group Meetings

The MCHHS Internal Core Planning Group met to determine which MCHHS programs would be involved in the Climate and Health Adaptation Plan, identify communication needs, and identify which quality planning initiatives the department has the capacity to support. During these meetings, MCHHS planning members brainstormed values and approved the vision, mission, and primary goals for the CHAP.

MCHHS's main roles in this plan are to oversee its completion, monitor and analyze public health data, lead in environmental hazard preparedness and resilience communications, and encourage collaboration among community partners and stakeholders.

In this plan, MCHHS intends to be involved in objectives in one of three ways:

1. **Lead**: MCHHS will take the lead on the objective, overseeing collaborations, actions, and evaluations are completed within the projected timelines.
2. **Support:** MCHHS will support other organizations and community stakeholders to accomplish objectives and actions. The nature of the support role will be indicated on the objective and may include a minor leadership role on action items. This could include (but is not limited to) support in assessment, planning, implementation, communication, resources, finances, staff, volunteers, or writing assistance for grant funding.
3. **Monitor**: MCHHS intends to monitor all adaptation objectives identified in this plan to improve health resilience, regardless of involvement. For this involvement type, MCHHS has no direct role to accomplish objectives or actions. MCHHS may assist in convening partners and stakeholders if improved collaboration is needed.

"The stress [during the 2021 ice storm] of maintaining heat and refrigerators/freezers in the home was extremely high. Also, stress was increased due to fear of water pipes bursting from freezing."

~ Anonymous resident response in the Environmental Scan

CHAP Community Collaborative Planning Group Meetings

The Marion County Community Collaborative Planning Group was comprised of a wide array of community stakeholders and leaders from across Marion County, representing sectors such as healthcare, emergency management, environmental, and service-based organizations and experts. The planning group met to create vision and mission statements, goals and objectives, create initiatives that are community-driven and collaborative, and identify actionable steps they can support or lead to bring ideas to reality. Planning group members also had the opportunity to provide input through Smartsheets between meetings. Each meeting was evaluated, and improvements were made to the process for subsequent meetings. The following actions occurred during the planning meetings.

January Meeting

At the first Community Collaborative Planning Group meeting, data was reviewed from the surveillance reports, the Marion-Polk Regional Environmental Scan, future projections, and the heat and social vulnerability indices from the Oregon Department of Energy and the Centers for Disease Control and Prevention. Using the Environmental Scan, three main environmental hazards affecting community health were identified: extreme heat, extreme cold, and poor air quality.

After reviewing data, the planning group brainstormed values, which are the values represented in this plan. They also brainstormed potential initiative (objective) ideas to improve adaptation and resilience to environmental hazards through a whiteboard activity, and through a rated card activity adapted from the 25/10 Crowd Sourcing activity from Liberating Structures. Ratings helped initially prioritize initiative ideas for consideration.

Between meetings, Smartsheets were shared with planning group partners to support continued brainstorming of values and initiative (objective) ideas. A vision, mission statement, and primary goals were drafted based on the values and initiative ideas brainstormed.

Photo: Planning group members brainstorm initiatives to improve climate and health adaptation and resilience on January 13, 2025.

February Meeting
At the second Community Collaborative Planning Group meeting, planning group members were invited to help revise and finish the vision and mission statement. They reviewed how to create SMART goals and objectives (specific, measurable, attainable, relevant, and timebound) and then reviewed the draft SMART goals created. Recommended edits were discussed during the meeting.

By the start of this meeting, planning group members had submitted a total of 240 initiatives, 75 initiatives currently occurring and 165 new initiative ideas. To evaluate initiative ideas, planning members ranked evaluation criteria proposed in the BRACE Prioritization Criteria Matrix Worksheet. Six criteria were chosen: three health outcome metrics and three feasibility metrics. Planning members then conducted a SWOC analysis (discussion of strengths, weaknesses, opportunities, and challenges) of one recurring initiative strategy: enhancing resilience hubs and shelters.

Between meetings, the Mission and Vision statements were voted on with discussed changes, and strategies and objectives were created to begin prioritizing through Smartsheets.

March Meeting
At the third Community Collaborative Planning Group meeting, planning group members were asked to begin creating action items for each of the initiatives, now titled objectives. Planning group members were asked to choose one of three strategy breakout rooms most relevant to them: Resilience Resource Distribution, Resilience Hubs and Shelters, or Communications.

Each room's discussion was facilitated by MCHHS staff. Planning members recommended action items needed to complete the objective, and were asked to help create specific timelines. Additionally, planning group members were requested to take a lead or supportive role to accomplish the actions and objectives, when possible.

After brainstorming action items, planning members were asked to prioritize and score objectives in a survey. Participants were asked to rate the specific objective on a scale of 0-3 according to the following criteria: 0 = being no prioritization or availability and 3 = being high prioritization or availability. The criteria chosen by planning members were:

1. Health disparity reduction
2. Overall health impact
3. Effectiveness/Plausible outcomes
4. Funding
5. Resources
6. Available Organization, Staff, and Volunteer time

Between meetings, planning members were asked to score the remaining objectives. The data collected from these surveys was used to calculate a total health rating, total feasibility rating, and a total prioritized score. The prioritization rating was calculated by taking the numerical responses and weighting each question based on how important the criteria was determined to be by the planning group.

April Meeting
At the fourth Community Collaborative Planning Group meeting, members were asked to continue creating action items for objectives. Planning group members were asked to choose one of three

strategy breakout rooms most relevant to them: General Preparedness and Resilience, Heat Exposure Reduction, and Top-Prioritized Objectives.

Each room's discussion was led by MCHHS staff. Their role was to facilitate discussion, capture action items needed to complete the objective, and identify organizations who could lead or support the objective and action items.

Between meetings, the MCHHS Environmental Health Resiliency Coordinator scheduled 1-on-1 meetings with planning group members to fine-tune plan details. This effort included capturing action items, planning which partners could lead or support objectives and actions, adding timelines to all objectives and actions, and discussing evaluation metrics to measure success of efforts.

May Meeting

At the fifth Community Collaborative Planning Group meeting, members reviewed the draft 2025-2030 Marion County Climate and Health Adaptation Plan. Questions were addressed and edits were made to objectives. After the meeting, the Community Collaborative Planning Group was asked to provide final edits they would recommend to the plan.

Photo: Planning group members discuss collaboration together and review the draft 2025-2030 Marion County Climate and Health Adaptation Plan on May 6, 2025.

"I don't know if we have enough [outlined pre-planning for emergencies] with the vulnerable populations, as we're seeing those vulnerable populations change and seeing those needs be adapted.

~ Anonymous community leader response in the Environmental Scan

Improving Health Outcomes – Statements, Values, and Goals

Members of the Community Collaborative Planning Group and the Internal Core Planning Group were asked to help create the vision and mission statements of the 2025-2030 Marion County Climate and Health Adaptation Plan.

Vision Statement

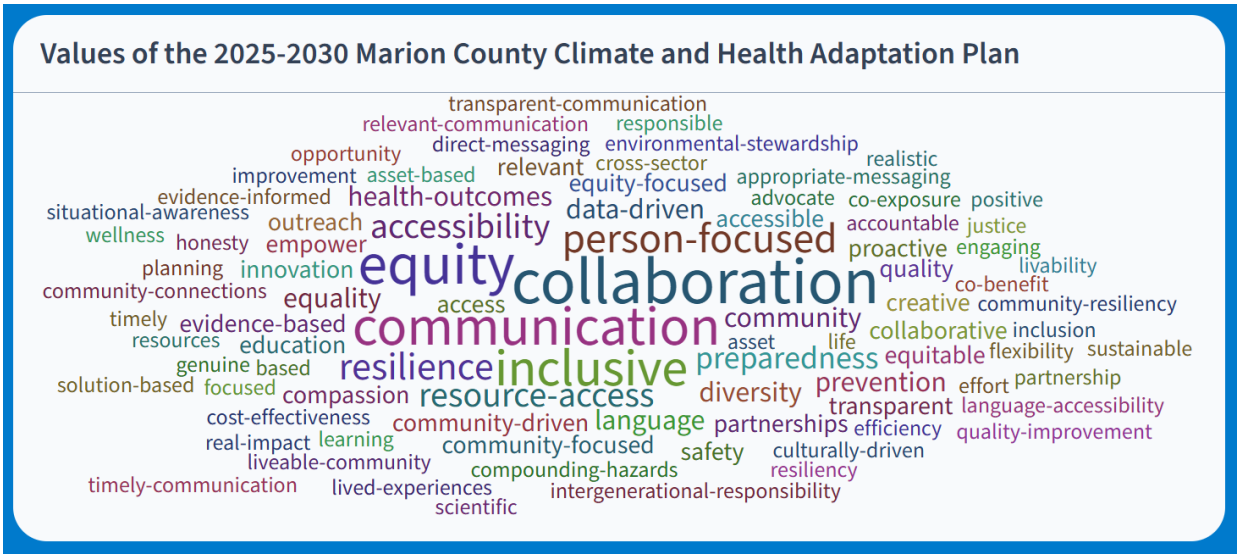
To create a vibrant, healthy, and prepared Marion County community that is resilient to periods of extreme heat, extreme cold, and poor air quality.

Mission Statement

To improve public health outcomes during periods of extreme heat, extreme cold, and poor air quality for all Marion County community members through emergency preparedness and resilience strategies.

Values

Members of the Community Collaborative Planning Group and the Internal Core Planning Group were asked to identify the values of the 2025-2030 Marion County Climate and Health Adaptation Plan. Common themes among members of the planning groups emerged and are captured in the word cloud below.



The definition of the top 5 selected values:

- **Collaboration:** We will build collaborative efforts with organizations, community leaders, and communities to address specific health needs of priority populations.
- **Health Equity:** We are committed to making sure all residents—regardless of background or circumstances—have access to the information, tools, and services they need to protect

and improve their health. This includes ensuring accessibility during environmental emergencies so that everyone can stay safe and well.

- **Communication:** We will strive to meet health communication needs regardless of language, ability, and education level throughout this plan.
- **Inclusive:** Our plan is designed to serve all communities in Marion County by ensuring that services and information are accessible to people of all backgrounds, including (but not limited to) those with different languages, abilities, education levels, and housing situations.
- **Resilience:** Through the efforts highlighted in this plan, we will build Marion County residents' ability to stay healthy from extreme heat, extreme cold, winter storms, poor air quality days, and wildfire smoke.

Goals

By implementing environmental hazard preparedness and resilience strategies between July 2025 and June 2030, the Marion County Climate and Health Adaptation Plan seeks to:

Reduce Marion County heat-related illness emergency visits on days with a heat index of 90°F or higher by 20%. *This would be an average change from 3.7/*day *to 3.0/day between July 2025 – June 2030*.

Reduce Marion County cold-related illness emergency visits on days with a wind chill of 32°F or lower by 20%. *This would be an average change from 1.6/day to 1.3/day between July 2025 – June 2030*.

Reduce Marion County air quality-related respiratory illness emergency visits by 1%, from the 2019-2024 average of 4,964/100,000 to the plan duration average of 4,914/100,000.

To accomplish these goals, this plan seeks to support adaptation efforts and improve health outcomes for all Marion County community members. However, as discussed in previous sections, some communities have been disproportionately impacted by extreme heat, extreme cold, and poor air quality. Therefore, vulnerable populations who have experienced poor health outcomes or are at risk of developing poor health outcomes will be prioritized through objectives in this plan.

When creating goals and objectives for the plan, MCHHS used the SMART goals framework. This framework ensures that our goals are Specific, Measurable, Achievable, Relevant, and Time bound.

Strategies and Objectives:

Marion County Health & Human Services (MCHHS) and planning group partners developed various objectives to increase community adaptation and resilience to environmental and climate hazards. Objectives are the initiatives that will be accomplished to achieve the goals. These objectives are divided into strategies. The following table highlights the involvement level of a MCHHS program in the objective:

Lead	Support	Monitor
A MCHHS program will take the lead on the objective, overseeing collaborations, actions, and evaluations are completed within the projected timelines.	A MCHHS program will support other organizations and community stakeholders to accomplish objectives and actions. Support may include a role in assessment, planning, implementation, communication, resources, staff, volunteers, or writing assistance for grant funding.	MCHHS has no direct role to accomplish this objective. MCHHS will monitor progress of this objective through updates from lead and support organizations. MCHHS may assist in convening partners and stakeholders if improved collaboration is needed.

Strategies and Objectives	MCHHS Program Involvement level
A. Resource Acquisition & Distribution	
1. Increase environmental hazard health resources	
1.1. Increase resource distribution to priority populations and low-income households who do not qualify for Health-Related Social Needs (HRSN's)	Support
1.2. Increase air-conditioning access to older adults	Support
1.3. Increase air-conditioning access in rental homes	Support
1.4. Assess personal emergency equipment and medication stockpiling	Monitor
1.5. Educate the public about best practice uses of resilience resource devices	Support
1.6. Assess and recommend radon testing to at-risk communities	Monitor
1.7. Recommend energy efficiency improvements in homes	Support
2. Enhance current environmental hazard health resources efforts	
2.1. Enhance Health-Related Social Needs (HRSN) access and distribution	Monitor
2.2. Support Salem Center 50+ Fix-It Brigade	Support

B. Resilience Hubs & Shelters		
1.	Increase resilience hubs	
1.1.	Ensure resilience hubs and shelters have proper air filtration	Monitor
1.2.	Create the Santiam Resilience Center	Monitor
1.3.	Assess Resource Hub Needs	Support
1.4.	Create neighborhood resilience hubs	Monitor
1.5.	Create the Detroit Resilience Center	Monitor
2.	Enhance current resilience hubs & shelters	
2.1.	Promote the free Cherriots Paratransit and LIFT service for impaired individuals to warming and cooling centers	Support
2.2.	Support shelter volunteers	Monitor
2.3.	Explore appropriate shelter opening thresholds for low temperature (32-34°F), high temperature (95°F), and air quality (AQI)	Support
2.4.	Free Public Transit to Hubs & Shelters for Poor Air Quality Day	Support
2.5.	Promote Creating Opportunities' free training for volunteers and staff working with people with disabilities	Support
2.6.	Create a Housing Hub	Support
C. Community Heat Exposure Reduction		
1.1.	Conduct a heat mapping assessment	Support
1.2.	Increase shade infrastructure	Monitor
1.3.	Educate Marion County on shade infrastructure benefits	Support
1.4.	Support CareCorps (Issacs Room) high school student environmental improvement projects	Support
1.5.	Support Growing Oaks at Willamette University	Monitor
D. Communications		
1.	Improve communication with the public and organizations	
1.1.	Ensure a wide reach with communications	Lead
1.2.	Develop a Climate and Health Adaptation Plan Communication Plan	Lead
1.3.	Develop a Community Champions network	Lead
2.	Increase collaboration among current communication efforts	
2.1.	Encourage Marion-Polk Alerts during outreach efforts	Lead
2.2.	Enhance power outage communications	Monitor
E. General Emergency Preparedness Initiatives		
1.1.	Host CHAP planning and implementation meetings (Continuum of Practice) throughout the duration of the plan	Lead
1.2.	Increase the number of organizations with resilience and response plans	Support
1.3.	Support Shangri-La power back-up generators	Support
1.4.	Conduct a mobility challenged campaign	Support
1.5.	Funding and grants: Create and maintain a grants committee to research and support funding opportunities for all objectives	Lead

1.6.	Host a Preparedness and Resilience Summit	Support
1.7.	Add a pollen monitor in Salem	Support
1.8.	Outreach to CERT programs to understand needs	Support
F. MCHHS Quality Planning for Select Programs		
1.1.	Enhance access to health services during disasters	Lead
1.2.	Messaging system improvements	Lead
1.3.	Conduct an exercise or training on extreme heat public safety power shutoffs	Lead
1.4.	Create staff safety training(s) for environmental hazards preparedness	Lead
1.5.	Track long-term outcomes for the MCHHS Housing Services voucher program	Lead

Objective Key

Throughout the strategy section, objectives consider multiple factors. Objectives will consider which goals they relate to, vulnerable populations at risk of experiencing poor health outcomes, category types, and the health and feasibility of being accomplished. Colors and icons are used to help identify goals and scored health and feasibility impact levels. The goal icons represent which goal(s) the objective targets.

The health and feasibility ratings are divided into equal quartiles based on scores from planning group members. They were determined by using the following criteria listed by importance: (1) Overall health impact, (2) Health disparity reduction, (3) Effectiveness/Plausible outcomes, (4) Funding, (5) Resources, and (6) Available Organization, Staff, and Volunteer time.

Goals Affected

Heat-Related Illness Reduction

Cold-Related Illness Reduction

Air quality-Related Respiratory Illness Reduction

Voted Health & Feasibility Rating

High Health & Feasibility Impact

Above-Average Health & Feasibility Impact

Below-Average Health & Feasibility Impact

Low Health & Feasibility Impact

If your organization would like to support accomplishing objectives in this plan, contact MCHHS Health Promotion & Prevention Services at MCHDPrevention@co.marion.or.us.

Strategy A: Resource Acquisition & Distribution

1. Sub-Strategy: Increase Environmental Hazard Health Resources

A.1.1. Increase resource distribution to priority populations and low-income households who do not qualify for Health-Related Social Needs (HRSN's)

Rationale: Low-income populations often lack the resilience resources necessary to keep themselves safe from extreme heat events. Providing resources, such as AC, heaters, and air purifiers, could help protect vulnerable low-income households from negative health outcomes (Lane et al., 2023).

Context: Marion County Health and Human Services provided $12,500-$25,000 mini-grants to organizations to implement actions for improvement between June 2025 and December 2026.

Objective: By June 30, 2030, supporting organizations will seek to support, acquire, and distribute funds and resources to service organizations to improve energy efficiency, weatherization, heat pumps, air-conditioning, heating, air purification, air filtration, minifridges, generators, and other resilience materials to appropriate priority populations and low-income households.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Low-income	Resources	

Supporting Organizations: Centro de Servicios Para Campesinos, Creating Opportunities, Glava's House, Konev Consulting, PacificSource, Willamette University, MCHHS

A.1.2. Increase air conditioning access to older adults

Rationale: Older adults are more susceptible to physical and cognitive impairment from extreme heat. Extreme heat can be very disabling and irritating for older adults, especially for those who may not have access or transportation to cooler areas. (Hansen et al., 2011)

Objective: By June 30, 2030, supporting organizations will increase access and maintenance to air-conditioning in older adult homes and communities by acquiring grants, promoting incentives, and working with installers.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Older adults	Resources	

Supporting Organizations: Salem Center 50+, Silverton 50+ Center, MCHHS, PacificSource

A.1.3. Increase air-conditioning access to rental homes

Rationale: Low-income populations often lack the resilience resources necessary to keep themselves safe from extreme heat events. Providing resources, such as AC could help protect vulnerable low-income households from negative health outcomes (Lane et al., 2023)

Objective: By June 30, 2030, supporting organizations will promote the ODOE Oregon Rental Homes Heat Pump Program and Heat Pump Purchase Program to renter/apartment managers homes. (www.oregon.gov/energy/Incentives/Pages/HP3.aspx)

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Low-income	Resources; Facilities	

Supporting Organizations: Salem-Keizer Public Schools, Willamette University, Centro de Servicios Para Campesinos, MCHHS

A.1.4. Assess personal emergency equipment and medication stockpiling

Rationale: During some natural disasters or extreme health events, people may not have access to necessary medication. A potential method to combat accessibility issues would be to allow people to have an increased stockpile of their medications prior to these extreme weather events (Angelis et al., 2023).

Objective: By June 30, 2030, Willamette University will assess laws around increasing emergency equipment and/or medication before an environmental emergency.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Older adults People with pre-existing medical conditions	Assessment; Planning; Policy	

Supporting Organizations: Willamette University, Shangri-La, Creating Opportunities, Seed of Faith

A.1.5. Educate the public about best-practice uses of resilience resource devices

Rationale: During ice storms or other natural disasters, people may rely on backup generators and indoor heaters. Without proper safety measures, people may put themselves at high risk of carbon monoxide poisoning. (Adefeso et al., 2020)

Context: Marion County Health and Human Services provided $12,500-$25,000 mini-grants to organizations to implement actions for improvement between June 2025 and December 2026.

Objective: By June 30, 2030, organizations that distribute resilience resources and materials will educate those receiving the materials about best-practice uses and safety measures.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Resources; Education; Training	

Supporting Organizations: Centro de Servicios Para Campesinos, OHDC, Creating Opportunities, Glava's House, Konev Consulting, PacificSource, Willamette University, Marion County Emergency Management, MCHHS

A.1.6. Assess and recommend radon testing to at-risk communities

Rationale: Exposure to radon is one of the leading causes of lung cancer in the world; however, many people don't test for radon in their homes. Radon accumulates in indoor areas if not properly ventilated, so people are at an increased risk during times they are staying inside more often with poor ventilation, such as an ice storm or poor air quality days (Stanifer et al., 2022).

Objective: By June 30, 2030, supporting organizations will map radon levels at schools and recommend neighborhoods with increased levels to test and install radon mitigation units to improve indoor air quality when needing to be indoors due to another environmental hazard.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Resources; Education	

Supporting Organizations: Salem-Keizer Public Schools

A.1.7. Recommend energy efficiency improvements in homes

Rationale: Energy efficient appliances and buildings use less energy which means lower energy costs for owners and renters. Many people who could benefit from this objective might not have access to these resources or may not be educated on where to get them and how to install or use them (Olatunde et al., 2024).

Objective: By June 30, 2030, supporting organizations will promote the Home Energy Score program through ODOE through their organizations to reduce energy usage and improve home energy efficiency.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Low-income	Education	

Supporting Organizations: Salem-Keizer Public Schools, Consumers Power Incorporated (and all power utility companies), Marion County Emergency Management; MCHHS

2. Enhance current environmental hazard health resources efforts

A.2.1. Enhance Health-Related Social Needs (HRSN) access and distribution

Rationale: Low-income populations are some of the most vulnerable to extreme weather and often lack the resources necessary to keep themselves healthy and safe. Increasing access to HRSN helps keep people healthy and safe during extreme weather events (Sejo et al., 2024).

Objective: By June 30, 2030, supporting organizations will improve access and distribution of resources such as air conditioners, heaters, air-filtration devices, mini-refrigerators, and portable power supply units for better health during periods of extreme heat, cold, and poor air quality.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Low-income People with pre-existing medical conditions Older adults	Resources	

Supporting Organizations: Centro de Servicios Para Campesinos, Seed of Faith, PacificSource, Integrated Services Network, MCHHS

A.2.2. Support Center 50+ Fix-It Brigade

Rationale: Older adults often have a decreased ability to regulate their internal temperature, so installing ACs helps keep them safe. Many older adults are also unable to install or upkeep AC units on their own, but having support from a community organization would help eliminate this barrier (Rosinger, 2022).

Objective: By June 30, 2030, the Salem Center 50+ Fix It Brigade program will increase volunteers, services, and collaborations with other organizations to provide fix and install resilience devices (air-conditions, HVAC systems, etc.) for older adults unable to do the work themselves.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Older adults Low-income	Resources; Outreach; Utility related	

Supporting Organizations: Salem Center 50+, MCHHS

Strategy B: Resilience hubs and shelters

1. Increase resilience hubs

B.1.1. Ensure resilience hubs and shelters have proper air filtration

Rationale: Having access to air purification is essential on poor air quality days. Even short-term exposure to poor air quality can cause numerous acute and chronic health outcomes (Chen et al., 2024).

Objective: By June 30, 2030, supporting organizations will seek funding and resource opportunities to ensure resilience hubs and emergency shelters have proper air filtration for good indoor air quality.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Facilities	

Supporting Organizations: Silver Falls Library, Recovery Outreach Community Center, First Presbyterian Church, Seed of Faith, ODHS Office of Resilience and Emergency Management (OREM), CHAP Grants Committee, Marion County Emergency Management, MCHHS

B.1.2. Create the Santiam Resilience Center

Rationale: A resilience center that addresses the needs of people during extreme weather events could help prevent a wide range of negative health effects (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, the Santiam Hospital plans to develop the Santiam Resilience Center in Stayton, Oregon that would serve as a resilience hub for co-located partners, to meet the day-to-day needs of the Santiam Canyon Community, as well as act as a center for disasters, cooling, heating, and air quality.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Rural residents	Facilities	

Supporting Organizations: Santiam Hospital, Service Integration Team's, Cherriots, CHAP Grants Committee

B.1.3. Assess resilience hub needs

Rationale: By assessing the needs of the resource hubs, we can better determine what needs are unmet (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, supporting organizations will perform a gap analysis and map out all current resilience hubs, day centers, and shelters to assess services they provide (warming, cooling, air purification), and gaps in coverage that may exist geographically and by population.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Assessment; Education	
Supporting Organizations: Willamette University, City of Salem, Mid-Willamette Valley Homeless Alliance (MWVHA), Marion County Emergency Management, MCHHS			

B.1.4. Create neighborhood resilience hubs

Rationale: Resilience hubs are a great way to help mitigate the impacts of extreme weather events, such as extreme heat, cold, and poor air quality, especially among more vulnerable populations (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, supporting organizations will encourage community members to establish resilience hub locations in neighborhoods throughout Marion County, focusing on areas with high percentages of socially vulnerable individuals.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Collaboration & Partnership	
Supporting Organizations: ENLACE, Salem Center 50+, Salem-Keizer Public Schools, Mid-Willamette Valley Homeless Alliance			

B.1.5. Create a Detroit Resilience Center

Rationale: Resilience hubs are a great way to help mitigate the impacts of extreme weather events, such as extreme heat, cold, and poor air quality, especially among more vulnerable populations (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, the City of Detroit plans to create a cooling, warming, and purified air center with backup power generation in Detroit, Oregon.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Rural residents	Facilities	
Supporting Organizations: City of Detroit, Detroit Lake Foundation, Recovery Outreach Community Center			

2. Enhance current resilience hubs and shelters

B.2.1. Promote free Cherriots Paratransit and LIFT service for impaired individuals to warming and cooling centers

Rationale: People with disabilities may not have the resources at home to live comfortably during an extreme weather event. Having free transportation to warming and cooling centers for disabled individuals would increase accessibility and their overall health and well-being (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, Cherriots will educate the public about, and increase ridership, in free Cherriots Lift service for impaired individuals to and from warming and cooling centers in the Salem-Keizer urban growth boundary.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People with physical, intellectual, or developmental disabilities	Personnel; Policy; Funding; Transportation	
Supporting Organizations: Cherriots, Creating Opportunities, MCHHS			

B.2.2. Support shelter volunteers

Rationale: The limited number of volunteers available at resource centers are often over worked and aren't properly trained. An increase in funding and training to support resilience hub volunteers would benefit the people who depend on the resilience hubs (Stuart et al., 2020).

Objective: By June 30, 2030, supporting organizations seek to improve support and training for volunteers to reduce stress and burden.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Training; Personnel	
Supporting Organizations: Recovery Outreach Community Center, ODHS Office of Resilience and Emergency Management (OREM), First Presbyterian Church, Willamette University, City of Salem, Northwest Human Services			

B.2.3. Explore appropriate shelter opening thresholds for low temperature (32-34°F), high temperature (95°F), and air quality (AQI)

Rationale: Opening shelters before it reaches freezing temperatures outside may reduce negative health impacts (Akhanemhe et al., 2025).

Objective: By August 30, 2026, Willamette University will research what the increased demand, expected health impacts, and economic impacts would be if emergency shelters and resilience hubs changed their opening thresholds for low temperature (32-34°F), high temperature (95°F), and air quality (AQI).

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People experiencing homelessness	Assessment	
Supporting Organizations: Willamette University, MCHHS			

B.2.4. Research possibility of free public transit to hubs and shelters for poor air quality day

Rationale: Low-income populations who are impacted by extreme weather events may not have the resources, such as AC or air purifiers, to keep themselves safe. Offering free transportation to resilience hubs would provide people with the resources they need to stay safe (Ciriaco & Wong, 2022).

Objective: By June 30, 2030, Cherriots seeks to create an economic impact on offering free public transit rides near open day centers and resilience hubs during "unhealthy" or worse air quality days. Cherriots currently provides free rides to and from warming and cooling centers.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Low-income	Transportation	
Supporting Organizations: Cherriots, MCHHS			

B.2.5. Promote Creating Opportunities' free training for volunteers and staff working with people with disabilities

Rationale: Offering free training to staff and volunteers who work closely with people with disabilities would improve the overall quality of care for those in need (Hemm et al., 2015).

Objective: Until June 30, 2030, Creating Opportunities will offer and provide free trainings to volunteers and staff working with people with disabilities.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People with physical, intellectual, or developmental disabilities	Training; Education	
Supporting Organizations: Creating Opportunities, Shangri-La, Integrated Services Network, MCHHS			

B.2.6. Create a Housing Hub

Rationale: A centralized “hub” for information surrounding housing would make it easier for unhoused individuals to access information.

Objective: By June 30, 2030, the Mid-Willamette Valley Homeless Alliance will create a "hub" that all housing providers could use to announce new programs, resources, and/or request collaboration from partners.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People experiencing houselessness Low-income	Education; Outreach; Collaboration & Partnership; Resource Distribution	
Supporting Organizations: Mid-Willamette Valley Homelesss, MCHHS			

Strategy C: Community Heat Exposure Reduction

1. Reduce Community Heat Exposure

C.1.1. Conduct heat mapping assessment

Rationale: Creating a heat map of Marion County would help us better understand which areas have a higher heat burden and therefore require more attention to reduce extreme heat events (Maragna et al., 2020).

Objective: By June 30, 2030, Willamette University and other supporting organizations seek to conduct a high-resolution heat map to understand locations across Marion County with a higher heat burden.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Assessment; Environmental Actions	

Supporting Organizations: Willamette University, Northwest Human Services, City of Salem, Cherriots, MCHHS

C.1.2. Increase shade infrastructure

Rationale: Increased shade infrastructure, through an increase in tree canopy and shade structures, would help reduce the urban heat island effect and UV exposure overall (Piracha & Chaudhary, 2022).

Objective: By June 30, 2030, supporting organizations will seek funding, new collaborations, and projects to increase shade infrastructure, such as tree canopy and shaded urban design, to reduce heat exposure and UV protection in heat-vulnerable locations.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Planning; Collaboration; Environmental Actions	

Supporting Organizations: Salem Urban Forestry, Cherriots, CHAP Grants Committee

C.1.3. Educate Marion County on shade infrastructure benefits

Rationale: Educating the public on shade infrastructure benefits would help them be more accepting and supportive of efforts to reduce the urban heat island effect (Derkzen et al., 2017).

Objective: By June 30, 2030, supporting organizations will educate Marion County on shade infrastructure benefits by identifying proper outreach efforts and supporting organizations already providing sustainability and education.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Education; Environmental Actions	
Supporting Organizations: Nurturely, City of Salem, MCHHS			

C.1.4. Support CareCorps (Issacs Room) high school student environmental improvement projects

Rationale: Increasing the number of trees in high heat areas would help reduce extreme heat events, especially in high-heat areas (Wang & Akbari, 2016).

Objective: By June 30, 2030, CareCorps will increase collaboration with supporting organizations to plant trees in high-heat areas. CareCorps/Issac's Room leads high school students in conducting environmental student projects during the summer.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Collaboration & Partnership; Personnel; Environmental Actions	
Supporting Organizations: Salem-Keizer Public Schools, City of Salem Urban Forestry, CareCorps, Willamette University Growing Oaks, MCHHS			

C.1.5. Support Growing Oaks at Willamette University

Rationale: Growing Oaks is a student-led grant project at Willamette University dedicated to restoring the native Oregon White Oak population. Planting trees, such as oaks, in urban areas would help reduce the impact of the urban heat island effect (Wang & Akbari, 2016).

Objective: By June 30, 2030, Growing Oaks, a student-led grant project at Willamette University focused on planting Oregon white oaks, will increase collaboration with supporting organizations and city parks departments to plant trees in high-heat areas.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Collaboration & Partnership; Personnel; Environmental Actions	
Supporting Organizations: Willamette University Growing Oaks, CareCorps, Salem-Keizer Public Schools			

Strategy D: Communications

1. Improve communication with the public

D.1.1. Ensure wide reach with communications

Rationale: To support the success of the objectives in the Climate and Health Adaptation Plan, it's important that everyone impacted receives communication about objectives and educational content. Ensuring that underserved and vulnerable populations receive communication help guarantee they are included and supported (Kreslake et al., 2016)

Context: Components of these communications include:

1.2.4 Bilingual radio & TV collaboration

- Collaboration with tv and radio stations would help spread awareness and alerts to Spanish, Ukranian, Russian, and other non-English-speaking populations (Teo et al., 2019)

Objective: Throughout the duration of this plan, Marion County Health and Human Services will ensure various outreach and communication platforms and efforts occur to vulnerable populations with the assistance of supporting organizations.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Collaboration & Partnership; Communication; Education; Outreach	

Supporting Organizations: MCHHS, Centro de Servicios Para Campesinos, Language Link, Konev Consulting, Northwest Human Services, ENLACE, Marion County Emergency Management.

D.1.2. Develop a Climate and Health Adaptation Plan Communication Plan

Rationale: A communication program created specifically to address the needs of vulnerable populations during extreme weather events would help reduce the observed negative health impacts associated with these events (Sheehan et al., 2017).

Context: Marion County Health and Human Services provided $12,500-$25,000 mini-grants to organizations to implement some actions for improvement between June 2025 and December 2026. Components of this communication plan include:

1.1.3 Be 2 Weeks Ready Campaign

- Increasing the reach of The Oregon Office of Emergency Management's Be 2 Weeks Ready program would help get more people prepared for climate disasters (Ryan et al., 2020)

1.1.4 Update the MCHHS Crisis and Emergency Risk Communication (CERC) Plan

- Having a set of ready-to-use messages for extreme weather events would allow for fast and easy communication. Getting extreme weather event messages to residents in an efficient manner could help reduce negative health impacts (Haupt, 2021)

1.1.5 Host Spanish and Russian language heat-health information and listening sessions

- Hosting educational sessions in Spanish and Russian helps ensure that there are fewer barriers to staying safe during extreme heat events (Teo et al., 2019)

1.1.6 Host Spanish and Russian language air quality-health information and listening sessions

- Hosting educational sessions in Spanish and Russian helps ensure that there are fewer barriers to staying safe during extreme heat events (Teo et al., 2019)

1.1.7 Identify Climate-Environmental Health Ambassadors

- Having designated community members who can communicate and collaborate with their neighbors helps to identify and address specific needs for each community (Sobelson et al., 2015)

Objective: By June 30, 2030, Marion County Health and Human Services will develop and implement an environment hazard preparedness outreach and education program focused on vulnerable populations. This program would be accomplished using a MCHHS Crisis and Emergency Risk Communication (CERC) Plan, hosting events, listening sessions, and utilizing various communication channels. Environmental hazard and health communications will be accomplished by completing the following:

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Communication; Education; Outreach	

Supporting Organizations: MCHHS, Salem-Keizer Public Schools, Northwest Human Services, Centro de Servicios Para Campesinos, ENLACE, Language Link, Glava's House, Konev Consulting, Willamette University, Salem Center 50+, Nurturely, Oregon LEAD, Marion County Emergency Management.

D.1.3. Develop a Community Champions network

Rationale: A Community Champions network would help expand communications about resources and emergency notifications to reach vulnerable populations (Sobelson et al., 2015)

Objective: By July 1, 2026, Marion County Health and Human Services will build a collaborative community champions network to share health information, resources, emergency notifications, translations, funding opportunities, and collaboration to increase emergency and public messaging reach.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Communication; Collaboration & Partnership	

Supporting Organizations: MCHHS, the Climate and Health Adaptation Plan Community Collaborative Planning Group.

2. Improve communication with organizations

D.2.1. Encourage signups for Marion-Polk Alerts during outreach efforts

Rationale: Emergency alerts and warnings conducted by the county and city would help alert people about extreme weather events and help them stay safe (Ryan et al., 2020).

Objective: Throughout the duration of this plan, Marion County Health and Human Services will incorporate Marion-Polk Alert sign-ups in the communication plan to all communities through various communication channels.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Communication Outreach	
Supporting Organizations: MCHHS, Marion County Emergency Management			

D.2.2. Enhance power outage communications

Rationale: Older adults are more susceptible to cognitive impairment from extreme heat. Extreme heat can be very disabling and irritating for older adults, especially for those who may not have access or transportation to other, cooler, areas (Hansen et al., 2011)

Objective: Throughout the duration of this plan, supporting organizations capable of contacting high-risk adults and residents about backup batteries for medical equipment and medication will collaborate during power outages.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	Older adults People with pre-existing conditions and/or physical disabilities	Outreach; Utility related	
Supporting Organizations: Salem Center 50+, Shangri-La, Integrated Services Network, utility companies providing public safety power shutoff outage maps.			

Strategy E: General Preparedness and Resilience

1. General preparedness and resilience

E.1.1. Host CHAP planning and implementation meetings (Continuum of Practice) throughout the duration of the plan

Rationale: Having regularly scheduled meetings to discuss the Climate and Health Adaptation Plan keeps everyone informed and updated on current actions. These meetings would help ensure that the objectives are being carried out and allow for problem identification (Reckien et al., 2018)

Objective: Marion County Health and Human Services will host quarterly 2025-2030 Marion County Climate and Health Adaptation Plan planning and implementation meetings continually throughout the duration of this plan. These meetings will discuss action items, problem solve implementation issues, share resources, and support appropriate organizations to apply for funding to help implement the initiatives (objectives) and achieve goals.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Assessment & Research; Communication; Education; Outreach; Training; Planning; Collaboration & Partnership; Resource Distribution; Facilities; Personnel; Environmental Actions; Funding; Policy; Enforcement; Utility related; Transportation	

Supporting Organizations: MCHHS, the Climate and Health Adaptation Plan Community Collaborative Planning Group

E.1.2. Increase the number of organizations with resilience and response plans

Rationale: Having a response plan in place for emergencies helps organizations keep people safe and improves overall disaster preparedness (Ryan et al., 2020).

Objective: Throughout the duration of this plan, supporting organizations will develop institutional or organizational resilience and response plans, such as heat, wildfire, flooding, and extreme precipitation response plans for places such as resilience hubs and shelters, hospitals, schools, workplaces, small businesses, and incarceration centers

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Outreach; Training; Planning	
Supporting Organizations: Marion County Emergency Management, Salem-Keizer Public Schools, Shangri-La, First Presbyterian Church, Creating Opportunities, Integrated Services Network, Willamette University, MCHHS			

E.1.3. Support Shangri-La Backup Power Generators

Rationale: When the power goes out, Shangri-La has an efficient system get backup power generation to them. Shangri-La can provide technical assistance in power generator distribution operations and seek grant funding to support their efforts.

Objective: Throughout the duration of this plan, the CHAP Grants Committee will review and notify Shangri-La of grant opportunities. Shangri-La will also provide technical assistance to any organizations needing technical assistance in resource operation distribution.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Funding	
Supporting Organizations: Shangri-La, MCHHS, CHAP Grants Committee			

E.1.4. Conduct a mobility challenged campaign

Rationale: In emergencies that require evacuation, there needs to be a plan to help those who can't evacuate or move easily for whatever reason (Alam et al., 2022)

Objective: By December 31, 2025, Cherriots will conduct the "In an Emergency, When Told to Run…What About Those Who CAN'T RUN?" campaign for evacuating people with mobility challenges, their pets and service animals.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People with physical, intellectual, or developmental disabilities	Transportation	
Supporting Organizations: Cherriots, Shangri-La, Integrated Services Network, Creating Opportunities, MCHHS			

E.1.5. Funding and grants: Create and maintain a grants committee to research and support funding opportunities for all objectives

Rationale: Creating a CHAP Grants Committee that regularly meets to discuss grants and funding opportunities would help ensure that initiatives implemented in the CHAP have adequate funding.

Objective: Throughout the duration of this plan, supporting organizations will create a CHAP Grants Committee and meet regularly to research grant and funding opportunities to accomplish and enhance all objectives, recommend grants to organizations to apply, review grant applications, plan grant writing trainings, and write letters of support.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Funding	

Supporting Organizations: MCHHS, Seed of Faith, Mid-Willamette Valley Homeless Alliance, Centro de Servicios Para Campesinos, First Presbyterian Church, and Salem-Keizer Public Schools, Santiam Hospital

E.1.6. Host a Preparedness and Resilience Summit

Rationale: Hosting an annual Climate Resilience Summit to inform all county municipal, CBO/NGO, FBO, state partners would help keep everyone informed about climate resilience (Chan et al., 2022)

Objective: By June 30, 2030, Marion County Emergency Management will host a Preparedness and Resilience Summit for county government, city government, non-profit organizations, community-based organizations, and private organizations to train, create resilience and response plans, collaborate, and network on emergency preparedness and environmental resilience.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Training; Planning; Collaboration & Partnership	

Supporting Organizations: Marion County Emergency Management, MCHHS

E.1.7. Add a pollen monitor in Salem

Rationale: High levels of pollen can cause negative health outcomes for those with chronic respiratory conditions, such as asthma, and allergies (Schmidt, 2016)

Objective: By June 30, 2030, Marion County Health and Human Services and Willamette University will assess necessary steps to bring a pollen monitor to Salem and collaborate with necessary entities for installation and data monitoring.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:

	People with pollen allergies and other respiratory conditions	Assessment & Research; Collaboration & Partnership	
Supporting Organizations: MCHHS, Willamette University, CHAP Grants Committee			

E.1.8. Outreach to CERT programs to understand needs

Rationale: The Community Emergency Response Team (CERT) program educates volunteers about disaster preparedness for the hazards that may occur where they live. The CERT program offers a consistent, nationwide approach to volunteer training and organization that professional responders can rely on during disaster situations, allowing them to focus on more complex tasks.

Objective: By June 30, 2030, supporting organizations will outreach to and support the needs of Community Emergency Response Teams (CERT) programs.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Funding	
Supporting Organizations: Shangri-La, CHAP Grants Committee, MCHHS			

Strategy F: MCHHS - Internal Quality Planning Projects

1. MCHHS Quality Planning

F.1.1. Enhance access to health services during disasters

Rationale: People with pre-existing health conditions are especially vulnerable during extreme weather events. Increasing their access to health services would help reduce negative health outcomes (Lindsay et al., 2023)

Objective: By June 30, 2030, Marion County Health and Human Services will do a gaps analysis of the ESF-8 Health response in the Natural Hazard Mitigation Plan to enhance access to health services in disasters and emergencies, especially for populations with existing health needs.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Planning; Personnel	
Supporting Organizations: MCHHS			

F.1.2. Messaging system improvements

Rationale: During an emergency, having an up to date and accurate list of communications improves everyone's safety and well-being. Having a variety of contact points allows for easier communication and helps ensure that the message is received. (MacIntyre et al., 2019)

Objective: By June 30, 2030, Marion County Health & Human Services will assess communication procedures, policies, and develop a system to ensure messaging and resource lists supporting this plan are accurate, updated, and available in a variety of methods.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Communication	
Supporting Organizations: MCHHS			

F.1.3. Conduct an exercise or training on extreme heat public safety power shutoffs

Rationale: Extreme heat waves may cause an overstressed power grid, resulting in power loss. Power outages can be devastating for people's health, so it's important for organizations to be prepared to respond effectively. (Singhee et al., 2016)

Objective: By June 30, 2030, Marion County Public Health Emergency Preparedness will conduct a department tabletop exercise to simulate an overstressed electrical grid due to extreme heat, or larger exercise in collaboration with emergency management, utility providers, and community partners.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Training; Planning; Collaboration & Partnership	
Supporting Organizations: MCHHS			

F.1.4. Create staff safety training(s) for environmental hazards preparedness

Rationale: Training staff on how to be prepared and safe during extreme weather events could improve their health outcomes as well as the health outcomes of those they serve. (Ward et al., 2024)

Objective: By June 30, 2030, Marion County Health and Human Services will create and conduct ongoing staff safety trainings on heat, cold, air quality, home weatherization, and energy conservation.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	All	Education; Training	
Supporting Organizations: MCHHS			

F.1.5. Track long-term outcomes for the MCHHS Housing Services voucher program

Rationale: Tracking the outcomes for unhoused individuals allows organizations to assess if their objectives and actions are improving housing outcomes. (Philips & Sullivan, 2024)

Objective: By June 30, 2030, MCHHS-Housing will create a process improvement to identify and monitor long-term success among participants in MCHHS housing programs and vouchers. This objective seeks to reduce unsheltered recidivism and prevent environmental hazard exposure.

Resilience Plan Priority Goal:	Vulnerable population:	Category Types:	Health & Feasibility Impact Rating:
	People experiencing houselessness Low-income	Assessment & Research	
Supporting Organizations: MCHHS, Mid-Willamette Valley Homeless Allance (MWVHA)			

Tracking Progress (Evaluation)

Marion County's Environmental Health Resiliency Program will monitor progress towards objectives and actions quarterly and generate an annual evaluation report. This report will highlight evaluation metrics for objectives and actions, show updated annual data trends toward the goals (heat-related illness, cold-related illness, and air quality-related respiratory illnesses), and provide narratives about success stories and gaps for the remaining duration of the plan.

This 2025-2030 Marion County Climate and Health Adaptation Plan will be reviewed annually and may be updated based on implementation progress, evaluation, and monitoring. Each evaluation report and any plan updates will provide an opportunity to reengage community partners who are essential to advancing this work in the community.

References

AirNow. (2025). Air Quality Index (AQI) Basics. *The Environmental Protection Agency website.* Accessed on 5/13/2025. https://www.airnow.gov/aqi/aqi-basics

Adefeso, I.B., Sonibare, J.A. and Isa, Y.M., 2020. Further evidence on environmental impacts of carbon monoxide from portable power generator on indoor air quality. *Cogent Engineering*, *7*(1), p.1809771.

Akhanemhe, R., Petrokofsky, C. and Ismail, S.A., 2025. Health impacts of cold exposure among people experiencing homelessness: A narrative systematic review on risks and risk-reduction approaches. *Public Health*, *240*, pp.80-87.

Alam, M.J., Habib, M.A. and Husk, D., 2022. Evacuation planning for persons with mobility needs: A combined optimization and traffic microsimulation modelling approach. *International Journal of Disaster Risk Reduction*, *80*, p.103164.

American Academy of Allergy, Asthma, & Immunology (2025). Hay Fever / Rhinitis. Accessed on 4/24/2025. https://www.aaaai.org/conditions-treatments/allergies/hay-fever-rhinitis

Angelis, A., Montibeller, G. and Kanavos, P., 2023. A structured methodology for essential medicines lists and health emergency stockpiles: experience with the Emergency Medicines Buffer Stock in the United Kingdom. *Social Science & Medicine*, *337*, p.116236.

Black, A.W. and Mote, T.L., 2015. Effects of winter precipitation on automobile collisions, injuries, and fatalities in the United States. *Journal of Transport Geography*, *48*, pp.165-175.

Borchers Arriagada N, Horsley JA, Palmer AJ, Morgan GG, Tham R, Johnston FH. Association between fire smoke fine particulate matter and asthma-related outcomes: Systematic review and meta-analysis. Environ Res. 2019 Dec;179(Pt A):108777. doi: 10.1016/j.envres.2019.108777. Epub 2019 Sep 26. PMID: 31593836.

Center for Disease Control and Prevention (CDC), 2025. People at Increased Risk for Heat-Related Illness. *Center for Disease Control and Prevention Heat Health Website.* Access on 5/29/2025. https://www.cdc.gov/heat-health/risk-factors/index.html

Chan, S., Hale, T., Deneault, A., Shrivastava, M., Mbeva, K., Chengo, V. and Atela, J., 2022. Assessing the effectiveness of orchestrated climate action from five years of summits. *Nature Climate Change*, *12*(7), pp.628-633.

Chapman CL, Johnson BD, Vargas NT, Hostler D, Parker MD, Schlader ZJ. Both hyperthermia and dehydration during physical work in the heat contribute to the risk of acute kidney injury. J Appl Physiol (1985). 2020 Apr 1;128(4):715-728. doi: 10.1152/japplphysiol.00787.2019. Epub 2020 Feb 20. PMID: 32078468; PMCID: PMC7191500.

Chen, J. and Hoek, G., 2020. Long-term exposure to PM and all-cause and cause-specific mortality: a systematic review and meta-analysis. *Environment international*, *143*, p.105974.

Chen, F., Zhang, W., Mfarrej, M. F. B., Saleem, M. H., Khan, K. A., Ma, J., ... & Han, H. (2024). Breathing in danger: Understanding the multifaceted impact of air pollution on health impacts. *Ecotoxicology and Environmental Safety*, *280*, 116532.

Ciriaco, T.G. and Wong, S.D., 2022. Review of resilience hubs and associated transportation needs. *Transportation Research Interdisciplinary Perspectives*, *16*, p.100697.

Council of State and Territorial Epidemiologists (CSTE) (2019). COLD-RELATED ILLNESS QUERY Guidance for Implementing Cold-Related Illness Syndromic Surveillance in Public Health Practice.

Degelia, S.K., Christian, J.I., Basara, J.B., Mitchell, T.J., Gardner, D.F., Jackson, S.E., Ragland, J.C. and Mahan, H.R., 2016. An overview of ice storms and their impact in the United States. *International Journal of Climatology*, *36*(8).

Derkzen, M.L., Van Teeffelen, A.J. and Verburg, P.H., 2017. Green infrastructure for urban climate adaptation: How do residents' views on climate impacts and green infrastructure shape adaptation preferences?. *Landscape and urban planning*, *157*, pp.106-130.

Douma MJ, Aves T, Allan KS, Bendall JC, Berry DC, Chang WT, Epstein J, Hood N, Singletary EM, Zideman D, Lin S; First Aid Task Force of the International Liaison Committee on Resuscitation. First aid cooling techniques for heat stroke and exertional hyperthermia: A systematic review and meta-analysis. Resuscitation. 2020 Mar 1;148:173-190. doi: 10.1016/j.resuscitation.2020.01.007. Epub 2020 Jan 22. PMID: 31981710.

Ebi, K. L., Vanos, J., Baldwin, J. W., Bell, J. E., Hondula, D. M., Errett, N. A., ... & Berry, P. (2021). Extreme weather and climate change: population health and health system implications. *Annual review of public health*, *42*(1), 293-315.

Ebi, K. L., Capon, A., Berry, P., Broderick, C., de Dear, R., Havenith, G., ... & Jay, O. (2021). Hot weather and heat extremes: health risks. *The lancet*, *398*(10301), 698-708.

Environmental Protection Agency, 2025. Research on Health Effects from Air Pollution. *United State Environmental Protection Agency Website.* Access on 5/29/2025. https://www.epa.gov/air-research/research-health-effects-air-pollution

Gevitz K, Madera R, Newbern C, Lojo J, Johnson CC. Risk of Fall-Related Injury due to Adverse Weather Events, Philadelphia, Pennsylvania, 2006-2011. Public Health Reports®. 2017;132(1_suppl):53S-58S. doi:10.1177/0033354917706968

Haikerwal, A., Akram, M., Del Monaco, A., Smith, K., Sim, M. R., Meyer, M., ... & Dennekamp, M. (2015). Impact of fine particulate matter (PM 2.5) exposure during wildfires on cardiovascular health outcomes. *Journal of the American Heart Association*, *4*(7), e001653.

Hansen, A., Bi, P., Nitschke, M., Pisaniello, D., Newbury, J., & Kitson, A. (2011). Perceptions of heat-susceptibility in older persons: Barriers to adaptation. *International journal of environmental research and public health*, *8*(12), 4714-4728.

Haupt, B., 2021. The use of crisis communication strategies in emergency management. *Journal of Homeland Security and Emergency Management*, *18*(2), pp.125-150.

Hemm, C., Dagnan, D. and Meyer, T.D., 2015. Identifying training needs for mainstream healthcare professionals, to prepare them for working with individuals with intellectual disabilities: a systematic review. *Journal of Applied Research in Intellectual Disabilities*, *28*(2), pp.98-110.

Hwang B, Sou HD, Oh JH, Park CR. Cooling effect of urban forests on the urban heat island in Seoul, South Korea. PLoS One. 2023 Jul 21;18(7):e0288774. doi: 10.1371/journal.pone.0288774. PMID: 37478081; PMCID: PMC10361520.

Iroz-Elardo, N. & Butterworth, M, 2024. Marion & Polk County Regional Environmental Scan Assessment for Environmental Health Resiliency – Final Report for #HE-5459-23. Marion County Health & Human Services. Salem, Oregon.

Keuler, M., Walker, A, 2024. Marion County Air Quality & Illness Surveillance Report 2019-2023. *Marion County Health and Human Services Website*. https://www.co.marion.or.us/HLT/PH/PS/Documents/2024MarionCountyAirQualityandIllnessESSENCEReport.pdf

Keuler, M., Walker, A, 2024. Marion County Cold Related Illness Surveillance Report 2019-2023. *Marion County Health and Human Services Website*. https://www.co.marion.or.us/HLT/PH/PS/Documents/2024MarionCountyColdRelatedIllnessESSENCEReport.pdf

Keuler, M., Walker, A, 2024. Marion County Heat Related Illness Surveillance Report 2019-2023. *Marion County Health and Human Services Website*. https://www.co.marion.or.us/HLT/PH/PS/Documents/2024MarionCountyHeatRelatedIllnessESSENCEReport.pdf

Khan, Y., O'Sullivan, T., Brown, A., Tracey, S., Gibson, J., Généreux, M., Henry, B. and Schwartz, B., 2018. Public health emergency preparedness: a framework to promote resilience. *BMC public health*, *18*, pp.1-16.

Kreslake, J.M., Price, K.M. and Sarfaty, M., 2016. Developing effective communication materials on the health effects of climate change for vulnerable groups: a mixed methods study. *BMC Public Health*, *16*, pp.1-15.

Lane, K., Smalls-Mantey, L., Hernández, D., Watson, S., Jessel, S., Jack, D., ... & Olson, C. (2023). Extreme heat and COVID-19 in new York City: An evaluation of a large air conditioner distribution program to address compounded public health risks in summer 2020. *Journal of Urban Health*, *100*(2), 290-302.

Lemery, J., Balbus, J., Sorensen, C., Rublee, C., Dresser, C., Balsari, S. and Calvello Hynes, E., 2020. Training Clinical And Public Health Leaders In Climate And Health: Commentary explores training clinical and public health leaders in climate and health. *Health Affairs*, *39*(12), pp.2189-2196.

Lin, S., Zhang, W., Sheridan, S., Mongillo, M., DiRienzo, S., Stuart, N.A., Stern, E.K., Birkhead, G., Dong, G., Wu, S. and Chowdhury, S., 2021. The immediate effects of winter storms and power outages on multiple health outcomes and the time windows of vulnerability. *Environmental Research*, *196*, p.110924.

Lindsay, S., Hsu, S., Ragunathan, S. and Lindsay, J., 2023. The impact of climate change related extreme weather events on people with pre-existing disabilities and chronic conditions: a scoping review. *Disability and Rehabilitation*, *45*(25), pp.4338-4358.

MacIntyre, E., Khanna, S., Darychuk, A., Copes, R. and Schwartz, B., 2019. Evidence synthesis Evaluating risk communication during extreme weather and climate change: a scoping review. *Health promotion and chronic disease prevention in Canada: research, policy and practice*, *39*(4), p.142.

Maragno, D., Dalla Fontana, M. and Musco, F., 2020. Mapping heat stress vulnerability and risk assessment at the neighborhood scale to drive Urban adaptation planning. *Sustainability*, *12*(3), p.1056.

Münzel, T., Khraishah, H., Schneider, A., Lelieveld, J., Daiber, A., & Rajagopalan, S. (2024). Challenges posed by climate hazards to cardiovascular health and cardiac intensive care: implications for mitigation and adaptation. *European Heart Journal: Acute Cardiovascular Care*, *13*(10), 731-744.

National Land Cover Database, 2025. USA NLCD Impervious Surface Time Series. *ESRI ArcGIS*. Access 5/16/25. https://www.arcgis.com/home/item.html?id=1fdbb561c58b45c58f8f966c00c78ae6

National Land Cover Database, 2025. NLCD ALL USFS Tree Canopy Cover. *Multi-Resolution Land Characteristics Consortium*. Access 5/16/25. https://www.mrlc.gov/data?f%5B0%5D=category%3ATree%20Canopy

National Syndromic Surveillance Program Community of Practice (2019). Heat-Related Illness v2 Definition Factsheet & Technical Brief. *National Syndromic Surveillance Program Knowledge Repository*. Accessed 4/17/25. https://knowledgerepository.syndromicsurveillance.org/sites/default/files/2024-07/Heat%20Related%20Illness%20v2.pdf

National Weather Service (2025). Cold Impacts: Vulnerable Populations. *The National Weather Service website*. Accessed on 5/29/2025.https://www.weather.gov/wrn/winter-storms-sm#sp22

National Weather Service (2025). Heat Forecast Tools. *The National Weather Service website*. Accessed on 4/15/2025. https://www.weather.gov/safety/heat-tools

National Weather Service (2025). Understanding Wind Chill. *The National Weather Service website*. Accessed on 4/15/2025. https://www.weather.gov/safety/cold-wind-chill-chart

Ofremu, G. O., Raimi, B. Y., Yusuf, S. O., Dziwornu, B. A., Nnabuife, S. G., Eze, A. M., & Nnajiofor, C. A. (2024). Exploring the relationship between climate change, air pollutants and human health: impacts, adaptation, and mitigation strategies. *Green Energy and Resources*, 100074.

Olatunde, T.M., Okwandu, A.C. and Akande, D.O., 2024. Reviewing the impact of energy-efficient appliances on household consumption.

Olstrup, H., Johansson, C., Forsberg, B., Tornevi, A., Ekebom, A. and Meister, K., 2019. A multi-pollutant air quality health index (AQHI) based on short-term respiratory effects in Stockholm, Sweden. *International journal of environmental research and public health*, *16*(1), p.105.

Oneth, K.J., 2020. Readiness registries: improving the effectiveness of state access and functional needs registries.

Paal P, Pasquier M, Darocha T, Lechner R, Kosinski S, Wallner B, Zafren K, Brugger H. Accidental Hypothermia: 2021 Update. Int J Environ Res Public Health. 2022 Jan 3;19(1):501. doi: 10.3390/ijerph19010501. PMID: 35010760; PMCID: PMC8744717.

Phillips, D.C. and Sullivan, J.X., 2024. Personalizing homelessness prevention: Evidence from a randomized controlled trial. *Journal of Policy Analysis and Management*, *43*(4), pp.1101-1128.

Piracha, A., & Chaudhary, M. T. (2022). Urban Air Pollution, Urban Heat Island and Human Health: A Review of the Literature. *Sustainability*, *14*(15), 9234. https://doi.org/10.3390/su14159234

Reckien, D., Salvia, M., Heidrich, O., Church, J.M., Pietrapertosa, F., De Gregorio-Hurtado, S., d'Alonzo, V., Foley, A., Simoes, S.G., Lorencová, E.K. and Orru, H., 2018. How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28. *Journal of cleaner production*, *191*, pp.207-219.

Rosinger AY. Extreme climatic events and human biology and health: A primer and opportunities for future research. Am J Hum Biol. 2023 Jan;35(1):e23843. doi: 10.1002/ajhb.23843. Epub 2022 Nov 30. PMID: 36449411; PMCID: PMC9840683.

Ryan, B., Johnston, K.A., Taylor, M. and McAndrew, R., 2020. Community engagement for disaster preparedness: A systematic literature review. *International journal of disaster risk reduction*, *49*, p.101655.

Scanlon, L., Hobson-West, P., Cobb, K., McBride, A., & Stavisky, J. (2021). Homeless People and Their Dogs: Exploring the Nature and Impact of the Human–Companion Animal Bond. *Anthrozoös*, *34*(1), 77–92. https://doi.org/10.1080/08927936.2021.1878683

Schlader, Z.J., Davis, M.S. and Bouchama, A., 2022. Biomarkers of heatstroke-induced organ injury and repair. *Experimental physiology*, *107*(10), pp.1159-1171.

Schmidt, C.W., 2016. Pollen overload: seasonal allergies in a changing climate.

Schulte, P.A., Jacklitsch, B.L., Bhattacharya, A., Chun, H., Edwards, N., Elliott, K.C., Flynn, M.A., Guerin, R., Hodson, L., Lincoln, J.M. and MacMahon, K.L., 2023. Updated assessment of occupational safety and health hazards of climate change. *Journal of occupational and environmental hygiene*, *20*(5-6), pp.183-206.

Sejo, C., Mehta, N., Wilairat, S., Barry, M., Odden, M.C. and Chang, A.Y., 2024. Extreme Heat and Cardiovascular Mortality Among Structurally Marginalized Populations in the United States: A Scoping Review. *The Journal of Climate Change and Health*, p.100343.

Seltenrich, N. (2015). Between extremes: health effects of heat and cold.

Sheehan, M.C., Fox, M.A., Kaye, C. and Resnick, B., 2017. Integrating health into local climate response: Lessons from the US CDC Climate-Ready States and Cities Initiative. *Environmental health perspectives*, *125*(9), p.094501.

Singhee, A., Li, Z., Koc, A., Wang, H., Cipriani, J.P., Kim, Y., Kumar, A.P., Treinish, L.A., Mueller, R., Labut, G. and Foltman, R.A., 2016. OPRO: Precise emergency preparedness for electric utilities. *IBM Journal of Research and Development*, *60*(1), pp.6-1.

Sobelson, R.K., Wigington, C.J., Harp, V. and Bronson, B.B., 2015. A whole community approach to emergency management: Strategies and best practices of seven community programs. *Journal of emergency management (Weston, Mass.)*, *13*(4), p.349.

Stanifer S, Hoover AG, Rademacher K, Rayens MK, Haneberg W, Hahn EJ. Citizen Science Approach to Home Radon Testing, Environmental Health Literacy and Efficacy. Citiz Sci. 2022;7(1):26. doi: 10.5334/cstp.472. Epub 2022 Jun 2. PMID: 36845873; PMCID: PMC9949773.

Stuart, J., Kamerade, D., Connolly, S., Paine, A.E., Nichols, G. and Grotz, J., 2020. The impacts of volunteering on the subjective wellbeing of volunteers: A rapid evidence assessment.

Teo, M., Goonetilleke, A., Deilami, K., Ahankoob, A. and Lawie, M., 2019. Engaging residents from different ethnic and language backgrounds in disaster preparedness. *International Journal of Disaster Risk Reduction*, *39*, p.101245.

The Trust for Public Land, 2024. Heat Severity – USA 2023. *The Trust for Public Land*. Accessed on 5/16/2025. https://www.arcgis.com/home/item.html?id=db5bdb0f0c8c4b85b8270ec67448a0b6

University of Merced, et al. (2025). The Climate Toolbox. Accessed on 5/13/2025. https://climatetoolbox.org

Wamsler, C., 2017. Stakeholder involvement in strategic adaptation planning: Transdisciplinarity and co-production at stake?. *Environmental Science & Policy*, *75*, pp.148-157.

Wang, Y. and Akbari, H., 2016. The effects of street tree planting on Urban Heat Island mitigation in Montreal. *Sustainable cities and society*, *27*, pp.122-128.

Ward, A., Martin, S., Richards, C., Ward, I., Tulleners, T., Hills, D., Wapau, H., Levett-Jones, T. and Best, O., 2024. Enhancing primary healthcare nurses' preparedness for climate-induced extreme weather events. *Nursing Outlook*, *72*(5), p.102235.

Weilnhammer V, Schmid J, Mittermeier I, Schreiber F, Jiang L, Pastuhovic V, Herr C, Heinze S. Extreme weather events in europe and their health consequences - A systematic review. Int J Hyg Environ Health. 2021 Apr;233:113688. doi: 10.1016/j.ijheh.2021.113688. Epub 2021 Jan 30. PMID: 33530011.

Guidance for LPHA Climate and Health Adaptation Plans – July 2024

The purpose of this document is to provide guidance to LPHAs on the development of climate and health adaptation plans, which are a required deliverable of Program Element (PE) 51 Public Health Modernization. As per PE 51, LPHAs may either develop a stand-alone Climate and Health Adaptation Plan or integrate climate and health data and strategies into a community health assessment and plan (CHA and CHIP) as their deliverable, which is due June 30, 2025.

A Climate and Health Adaptation Plan is a strategy document that fosters collaboration with internal and external partners to set in motion a series of activities that are geared toward understanding and preventing or reducing anticipated climate change health impacts.

Principles:

1. **Centering health and equity.** Climate change exacerbates health inequities by worsening environmental conditions associated with poor health. These pressing complex issues share some of the same root causes and require transformational change in our communities, systems and organizations (APHA). Developing climate adaptation strategies that center equity is an important way for us to make progress toward transformation.

2. **Prioritizing engagement and relationships with communities** and populations who are disproportionately impacted by climate change. This is the most important investment that we can make toward equity in the planning process. By prioritizing communities who are disproportionately impacted we can reduce inequities while making progress toward our goal of health and well-being for all communities.

3. **Incorporating locally relevant climate and health data in decision-making.** Before identifying adaptation strategies, it's important to understand how the climate has changed in your geographic area, what changes are expected in the future, and who and what is most vulnerable to these changes. OHA is available to provide support on accessing data.

4. **Building and strengthening relationships is critical.** The plan is only as strong as the conversations, relationships and agreements among those who have a role in reducing the health impacts of climate change in your jurisdiction.

5. **Start where you are.** We recognize LPHAs are in vastly different places with this work. The rubric was designed to be flexible in terms of starting point and scale.

Guidance for LPHA Climate and Health Adaptation Plans – July 2024

OHA will use the following as a rubric to determine if a **stand-alone LPHA Climate and Health Adaptation plan** meets requirements for a PE 51 deliverable. LPHAs may also use this as a checklist to guide plan development. The due date for submission of the Climate and Health Adaptation Plan to OHA is June 30, 2025.		
	Question	**Required Content**
Listen and assess	How is climate change affecting my community's health?	Climate impacts in your jurisdiction: • Trends related to climate impacts of concern (wildfire, drought, etc.) • Summary of projections for climate impacts in the next 5-10 years
		Health risks and outcomes related to climate change: • Include primary sources of data or other info, e.g. research literature, quantitative data, qualitative data or community input
	Which populations are affected most by climate threats and hazards in your jurisdiction?	Communities most impacted by climate change in your jurisdiction: • Sources could include research literature, analysis of local health data, qualitative data and/or community input
Partner	What was your process for engaging with partners and community members?	Description of process for engaging partners in plan: • Who was engaged, methods, to inform which parts of the plan • Identify gaps where further engagement is needed
	How were populations at highest risk engaged in the planning process?	If direct engagement wasn't possible, a strategy in the plan should include engagement with partners from these populations, or who serve these populations
Identify actions, strategies	How were strategies identified and selected?	Brief description of how strategies were selected. Process could include using CDC or other guidance documents, partner input, or research literature. Strategies or actions from other related plans for your jurisdiction as well as PHAB process measures could be included. If other agencies are responsible for implementing or leading strategies, make this explicit.
	What strategies are specifically for populations at highest risk?	Strategies should include how your organization is going to engage with populations at higher risk for experiencing health impacts to climate change
Keep plan alive	How will agency and partners check in or report out on status of strategies and outcomes?	This step is about creating a mechanism for accountability, to keep the plan alive, and to adjust as conditions evolve. It is not required to form a new group; an existing group that meets regularly could take on the role of reviewing and tracking progress.