Health, Housing & Human Services
CLACKAMAS COUNTY

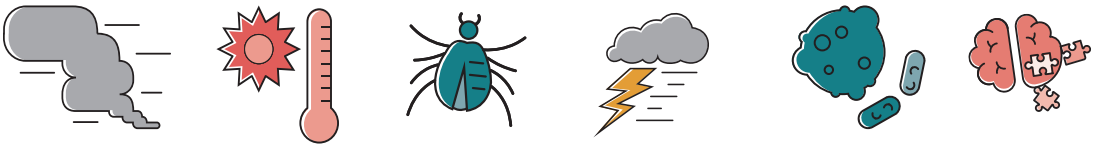
MULTNOMAH COUNTY HEALTH DEPARTMENT

WASHINGTON COUNTY OREGON

Public Health
Prevent. Promote. Protect.

2012-2022

Regional Climate and Health Monitoring Report



Summer 2023

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Acknowledgments

We would like to thank the stakeholders who shared their expertise on the intersection of climate change and mental health, the staff from the tri-county health departments and Oregon Health Authority for providing review and feedback on this report.

Introduction

Climate change and health

Climate change is a major public health concern that affects the health and well-being of people living in the region. The 2018 National Climate Assessment found that the Pacific Northwest has warmed about two degrees Fahrenheit since 1900, resulting in warmer winters, declining snow pack, and more instances of high heat, drought, and wildfires.[1] The 2023 Oregon Climate Assessment projects an average increase of five degrees Fahrenheit by 2050, and eight degrees by 2080.[2] These reports found health impacts related to heat illness, infectious diseases, drinking water quality issues, extreme weather, and mental health.

The 2023 United Nations Intergovernmental Panel on Climate Change reported that human induced climate change, including more frequent and intense extreme climate events, has caused widespread adverse impacts including losses and damages to nature and people.[3] Across regions, those most vulnerable to climate impacts, including low-income households, Black, Indigenous and People of Color (BIPOC), older adults, young children, and people experiencing houselessness, are disproportionately affected.[3] Addressing the cause of these environmental conditions and slowing future warming rates will depend on finding ways to reduce greenhouse gas emissions.[4]

Addressing the health impacts caused by climate change will require a collaborative and comprehensive approach involving public health, health care, community-based organizations, civic groups, private industry, and local and state elected officials. This approach will rely on identifying and monitoring the ways health is impacted by climate change in the region.

What is this report?

The Regional Climate and Health Monitoring Report provides data on 11 health indicators and includes population health data from the tri-county region: Clackamas, Multnomah, and Washington counties. The indicators span six areas that climate change is known to affect. Results from this report will help guide current adaptation and mitigation efforts and serve as a benchmark for ongoing measurement.

What is in the 2023 update?

This document is the third Regional Climate and Health Monitoring Report. The first report was released in 2019. This update:

- Adds two years of the most recent data from 2021-2022 for most indicators.
- Compares heat-related illness, air-quality related illness, and pollen allergy emergency department (ED) visits from 2021 to 2022 to recent years (2016-2019).
- Explores the difference in populations seeking urgent and emergency care for exposure to extreme heat and air pollution compared to all cause emergency department and urgent care visits.
- Takes a deeper look at acute climate events that occurred in our region in 2020-2022 and community mental health impacts, including:
    - Google search volume for anxiety, trauma, and mental health services during the June 2021 heat dome event.
    - Community and first responder informant interviews about mental health during acute climate events.
- Highlights impacts from the June 2021 heat dome event on deaths, and emergency department and urgent care visits.
- Changes some of the ways indicators are measured, which may result in different counts or rates than seen in previous reports.
    - Replaces National Oceanic and Atmospheric Administration (NOAA) extreme weather injuries and deaths data with Oregon vital (death) statistics data.
    - Replaces asthma-like symptom ED visits with air quality-related respiratory ED visits to capture all non-infectious respiratory visits to the emergency department.
    - Replaces general allergy ED visits with pollen allergy ED visits to capture more specific effects of increased pollen counts from climate change.

Acknowledgment of potential COVID-19 impact for 2020-2022

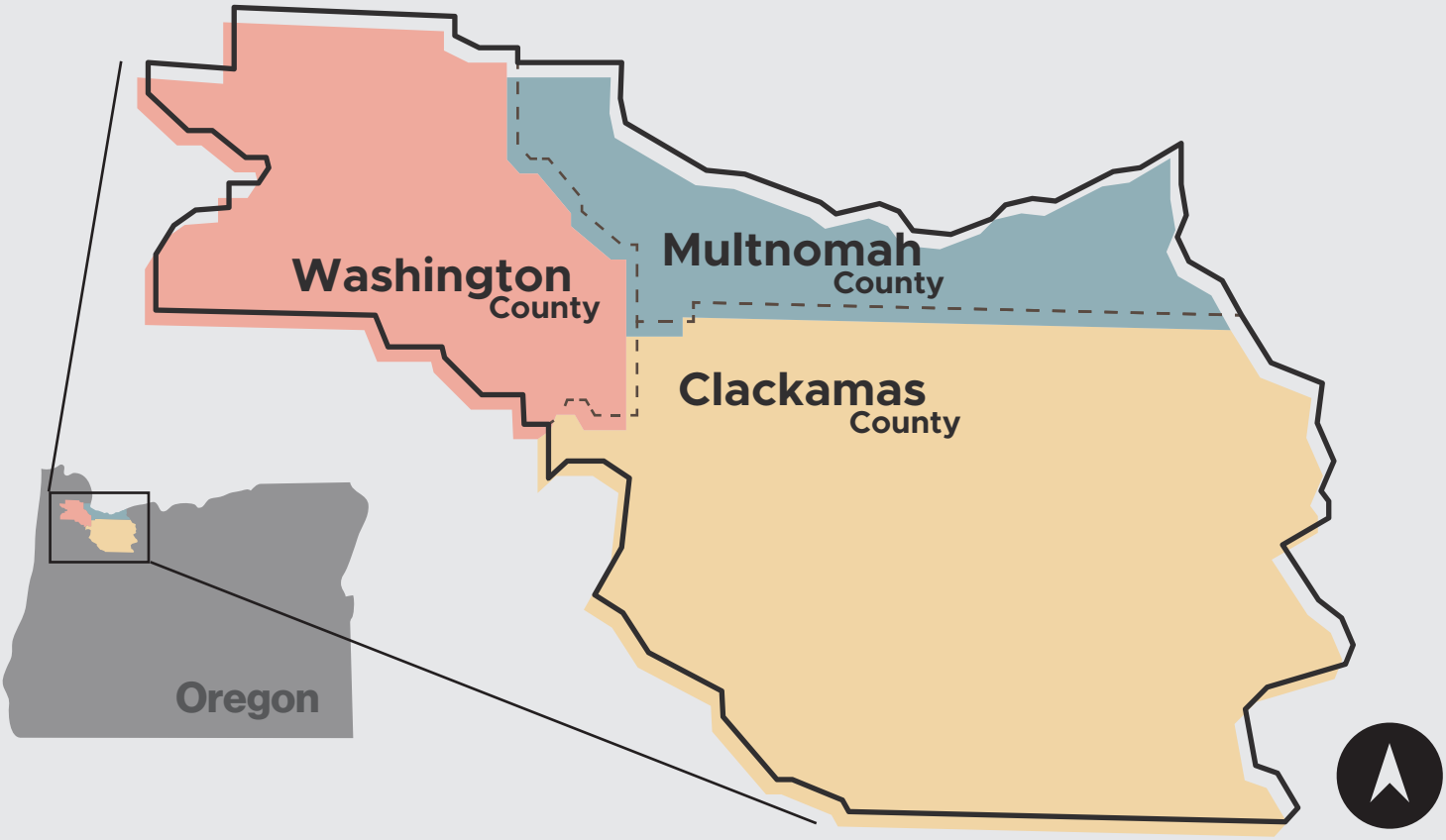
The COVID-19 pandemic changed daily life in many ways. Across the United States, all non-infectious hospitalizations in 2020 were lower than previous years.[5] Certain types of visits returned to pre-pandemic values near the end of 2020, but others, including infectious respiratory disease visits, remained low until 2021.[6] This difference may be attributed to changed behaviors, such as masking, that decreases exposure to pollen allergens and changes to the ways people interacted with the healthcare system during this time. Data in this report suggest that most indicators returned to pre-pandemic levels in 2022; however, we need more time to understand the full extent of long-term behavior changes since the start of the pandemic.

Key takeaways

This report updates baseline measurements of health conditions that are influenced by climate change with new data available from 2021 through 2022. It compiles data from multiple sources to capture a broad view of climate change and health. It also describes how more recent data compare to past years, and explores if populations seeking care at emergency departments for heat-related and air-quality related morbidity differ significantly by age, race/ethnicity, or sex compared to all emergency department visits. Key takeaways include:

- During the summer of 2021, when the region experienced a record-setting heat dome event, 94 people died, compared to a typical year where the region would expect one heat-related death.
- ED visits during the summer of 2021 more than doubled, compared to the average number of visits in past years (2016-2019). That trend continued in 2022 when there were 40% more visits than in past years. As summer temperatures increase, illness from extreme heat is a continued concern for the region.
- Since 2014, 236 people in the region have lost their lives due to extreme weather events. Most people died due to extreme heat, but 84 of those people died because of exposure to extreme cold, which is also a growing concern. The death data related to extreme cold highlights the need to better understand the impact of cold-related illness (hypothermia).
- More people visit the emergency department for air quality-related respiratory illness (including pollen allergies) than for any of the other health indicators included in the report.
- To assess mental health impacts of climate change, researchers interviewed emergency and community responders who were working during the wildfires in 2020 and the heat dome in 2021. The most prominent theme identified during these interviews was a lack of mental health providers and services. Responders said that extreme weather events compounded trauma from the COVID-19 pandemic, historic inequities and systemic racism.

The tri-county region



The tri-county metro area is diverse, encompassing wild forestland, rich farmland, numerous rivers and lakes, and rural, suburban and urban communities. Clackamas, Multnomah, and Washington counties operate as a contiguous region where community members cross county borders to work, live, attend school, and recreate. They are the three most populous counties in Oregon with more than 1.8 million people, about 43% of the state's population.[7] Since 2010, the regional population has increased by 12%.

Increases in the number of residents creates a greater burden on our transportation, health care, utility, and social service systems—services people rely on during extreme climate events and other disasters. Projected climate impacts for Clackamas, Multnomah, and Washington counties include more extreme heat days, poorer air quality days, larger wildfires, and heavier rainfall increasing the risk of floods and landslides. These changes are already affecting the health of the region's population.

Climate change and health equity

The conditions in which we live, learn, work, and play are some of the strongest predictors of our overall health and well-being. This includes access to and availability of safe and affordable housing, jobs with fair pay, quality education, health care, and safe neighborhoods. These conditions are shaped by past and present systemic racism, resulting in state and local policies designed to favor white communities. These decisions have left many racial and ethnic groups without social or political power to build intergenerational wealth and health, creating and reinforcing persistent health inequities.

The impacts of climate change on health vary significantly by individual characteristics and community conditions. Black people, Indigenous people, Latine/x people, and other people of color disproportionately experience the impacts of climate change. This is because climate change worsens existing inequalities in our communities that are often shaped by racism.

For low-income communities and communities of color, power and resource imbalances have created unhealthy living, working, and learning conditions that put people at greater risk for exposure, including extreme weather, air pollution, and flooding, limiting their ability to recover from climate change events.[8]

Policy changes and public health interventions cannot alter traits like life stage or physical and cognitive ability. However, these changes can address social conditions at the root cause of inequities, such as housing affordability or working environments.[9]

It is essential that low-income communities, communities of color and other historically disenfranchised communities participate in climate adaptation planning as they best understand their needs and full range of health impacts.

Unequal impacts

Throughout this report, the groups most impacted, either due to individual or community vulnerability, are outlined for each health impact area.

Key definitions

Health equity
Everyone has a fair opportunity to live a long, healthy life. It implies that health should not be compromised or disadvantaged because of an individual or population group's race, ethnicity, gender, income, sexual orientation, neighborhood, or other social condition.
Baltimore Public Health Commission, 2017

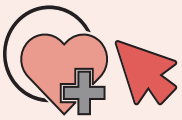
Systemic racism
Racism is codified into our laws and institutions, which were created on a foundation of the ideology of white supremacy; it upholds systems, structures, and policies that were created to advantage white people while neither serving nor benefiting people of color.
Multnomah County, Declaring Racism a Public Health Crisis

Climate change vulnerability
The degree to which people are at risk from the impacts of climate change based on the intersection of individual and community characteristics and considers how well they can cope with those impacts.
Public Health Institute, 2015

Climate change resilience
The ability to survive, recover from, and even thrive in changing climatic conditions.
Public Health Institute, 2015

Urban heat island
A neighborhood or part of a city that tends to get much warmer in the summer than other neighborhoods or surrounding rural landscapes due to differences in the landscape like unshaded roads and buildings.
National Integrated Heat Health Information System

Reporting methods



Indicator selection

Indicators for this benchmark were selected by a panel of local public health professionals based on guidance from national organizations, literature review, regional relevance, data availability, and previous climate change work in Oregon. Table 1 below shows each indicator in this report and the database from which it was sourced.

Benchmark period

The study period for this report is from 2012 through 2022 for all indicators except emergency department visits (heat-related illness, air-quality related respiratory illness, and pollen allergy symptoms), heat hospitalization, and extreme weather-related deaths. The data collection range for emergency department visits and heat hospitalization is 2016- 2022 due to changes in data collection methodology in the Oregon Health Authority (OHA) Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE) system. The data collection range for extreme weather-related deaths is 2014-2022.

Data presentation

For each environmental area, we provide a description of how climate change creates conditions that affect health and we describe the groups that are most vulnerable to those impacts. These narratives are based on academic literature and local data sources.

As in past reports, each indicator has a section called **"What is happening in the region?"** This consists of regional counts for each indicator in Clackamas, Multnomah, and Washington counties and presents a total for the entire tri-county region. Rates are reported per 100,000 population, as well as a count for the region and each county. Rates with counts of five or fewer events for individual counties or for the region are not reported due to possible reliability issues and identifiability. Rates are calculated with data from the 5-year U.S. Census American Community Survey. Rates for 2022 may change because we have used 2021 denominators. The American Community Survey 5-year population estimates for 2022 will not be released until December 2023; therefore, rates will be updated in future reports.

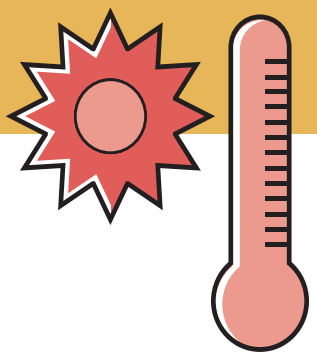
In this third edition of the report, we look at significant changes over time for heat-related illness, air-quality related respiratory illness, and pollen allergy ED visits. We have also added excess visits for 2021 and 2022 compared to visits from 2016-2019. To compare ED visit rates in 2021 and 2022 with previous years (2016-2019), we calculated the annual proportion of indicator specific visits among all ED visits and used these to calculate relative risk, the 95% confidence interval and p-value. Results from 2020 are excluded from comparisons due to the impact of modified behavior during the pandemic on visit counts. For pollen allergy-related visits, seasonality of ED visits was explored through time series anomaly analysis to determine changes over time.[10]

For heat-related illness, air-quality related respiratory illness, and pollen allergy visits, the new section **"Who is impacted?"** compares the proportions or percentages of race/ethnicity, sex, and age groups of specific causes of an ED visit with the proportion or percentages of those population groups in ED visits by all causes. We compared these two proportions or percentages to explore who is most impacted by acute climate change events while accounting for other factors that impact all cause ED visits. To identify groups with statistically significant different representation, we applied a chi-squared test.

We acknowledge that surveillance systems have historically contained limited racial, ethnic, and gender categories, making it difficult to identify certain populations, as well as exclude reliable measures of housing status.[11] We strive to report data in a way that avoids identifying individuals and we also recognize the need for changes in the way data are collected and reported so that we are better able to understand and address inequities across our communities.

Category	Indicator	Data source	Time period
Extreme heat	Heat-related emergency department and urgent care (ED) visits	Oregon Health Authority (OHA), Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE)	2016-2022
	Heat-related hospitalizations	Oregon inpatient hospital discharge data	2012-2021
	Heat-related deaths	OHA, vital statistics, Oregon death certificates	2012-2021
Extreme weather	Extreme weather-related deaths	OHA, vital statistics, Oregon death certificates	2014-2022
Air quality	Air-quality-related ED visits	OHA, ESSENCE	2016-2022
	Pollen allergy ED visits	OHA, ESSENCE	2016-2022
Vector-borne disease	West Nile virus	OHA, Public Health Division	2012-2022
	Lyme disease	OHA, Public Health Division	2012-2022
Communicable disease	Salmonellosis	OHA, Public Health Division, Oregon Public Health Epidemiologist User System (ORPHEUS)	2012-2022
	Campylobacterosis	OHA, Public Health Division, ORPHEUS	2012-2022
	Tuberculosis	OHA, Public Health Division, ORPHEUS	2012-2022

Climate and health indicators



Extreme heat

Climate change and health connection

Exposure to higher temperatures is one of the more direct impacts related to extreme weather driven by climate change. Extreme heat events can cause loss of internal temperature regulation and conditions including heat cramps, heat exhaustion, heat stress, heat stroke, and death.[12] Researchers estimate that extreme heat causes more deaths annually than all other weather events combined[13], and that investments to mitigate temperature increases can reduce heat-related deaths.[14] Climate scientists project that most communities in Oregon will experience an increase of more than 30 days over 86°F by mid-century.

The Pacific Northwest has seen an increase in average annual temperatures of 1.5°F compared to the first half of the 20th century, and a further increase of 4-9°F is expected by the end of this century.[13] In 2016, the Portland region saw 13 days over 90°F. Since then, it is typical to see over 20 days of 90°F in a summer. In 2021, there were 24 days over 90°F and in 2022 there were 29.

Unequal impact

Heat exposure and the ability to adapt to that exposure are dependent on social and environmental conditions. In a comprehensive study of health impacts from heat, the U.S. Global Change Research Program synthesized evidence on populations most at risk.[14] The study found evidence that the following groups face higher risk from extreme heat:

- Adults over the age of 65
- People experiencing houselessness
- People with chronic medical conditions that reduce thermoregulation (like heart disease or poor blood circulation)
- People with few social connections and limited social networks
- Children
- Pregnant people
- People living, working, or going to school in an urban heat island
- People from some racial and ethnic groups affected by structural environmental racism with limited access to protective factors (e.g. homeownership)
- Outdoor workers (construction, road crews, farm workers)
- People with mental, behavioral, or cognitive disorders that are exacerbated by heat, or who rely on medications that interfere with thermoregulation
- People with no access to cooling systems at home

Air conditioning is protective from heat exposure, but access is uneven and about 20% of households in the region do not have any form of air conditioning.[15, 16]

Indicator 1

Heat-related emergency department and urgent care visits

This indicator measures the number of times people visited an emergency department or urgent care clinic (ED) for symptoms of heat-related illness (HRI) resulting from prolonged exposure to hot weather, dehydration, and lack of acclimation during summer months (May- September).

What is happening in the region?

Visits were higher in 2021 and 2022 than in previous years. (Figure 1). While the pattern of visits remains mostly consistent over time, the 2021 heat dome event resulted in a much greater number of visits than in other years. There were approximately 31 visits per 100,000 people in the region during 2021.

Figure 1. Heat-related ED visit counts, May-Sept, 2016-2022

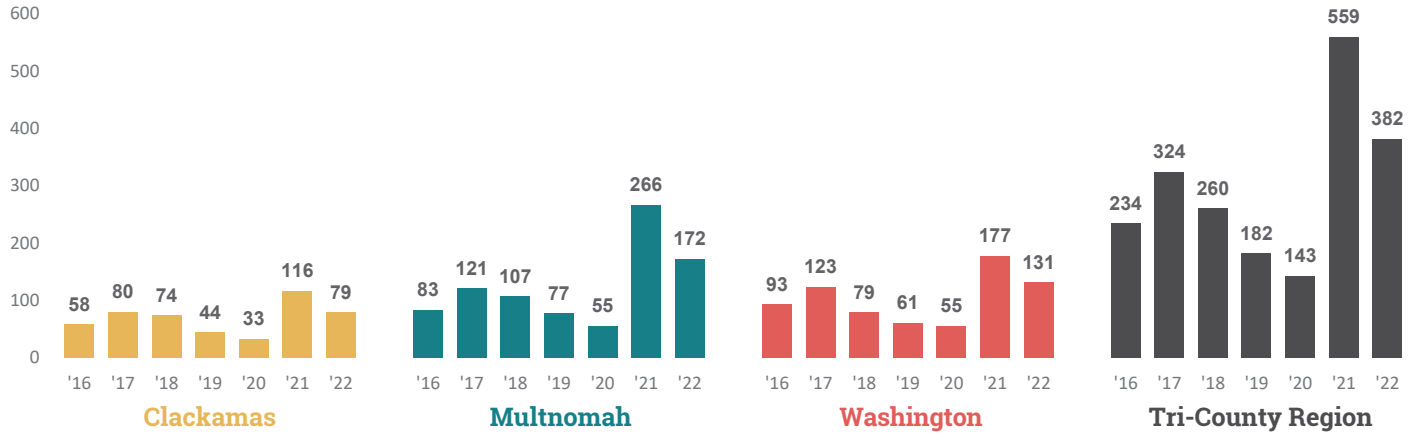
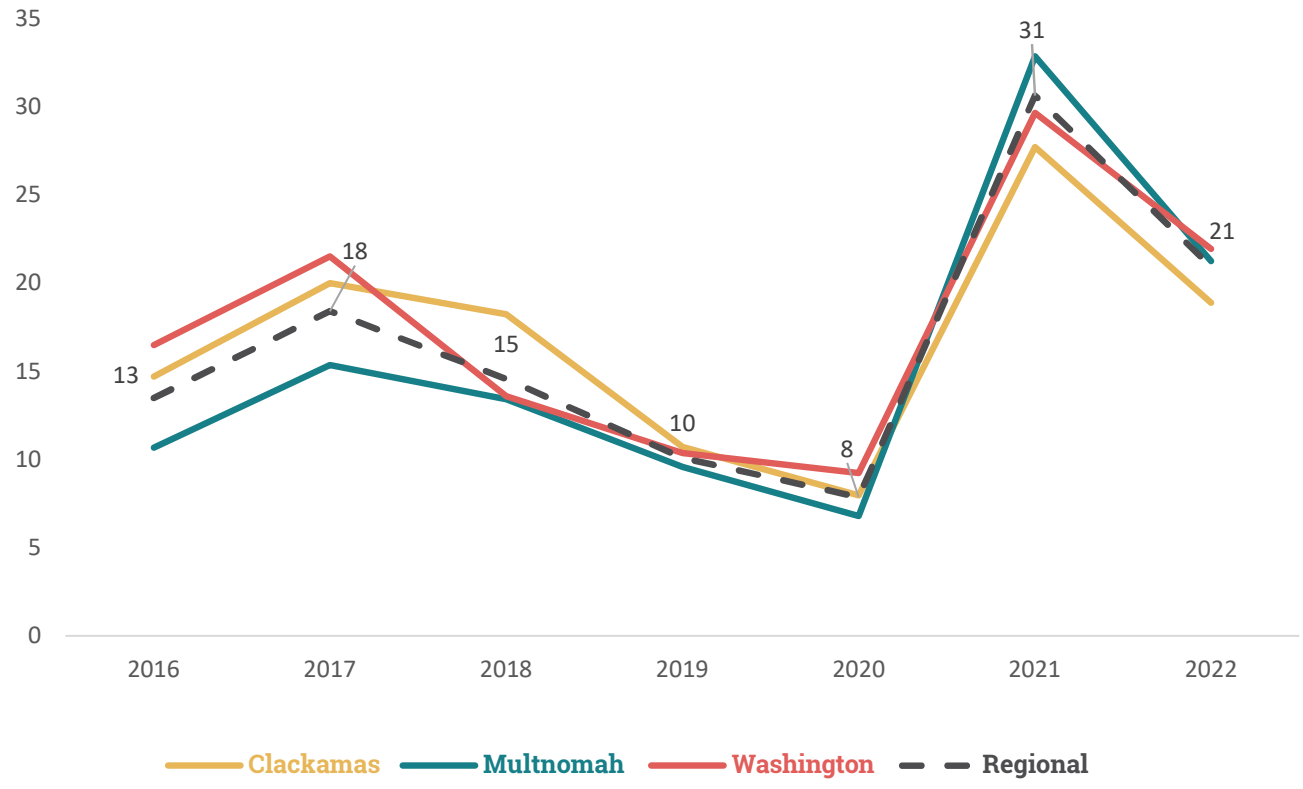


Figure 2. Heat-related ED visit rates per 100,000, May-Sept, 2016-2022



There were 309 more visits in 2021 and 132 more visits in 2022 than expected based on recent years (2016-2019). Both in 2021 and 2022, the proportion of ED visits that were due to heat-related illness has remained significantly higher than in previous years (2016-2019). This difference is especially pronounced in Multnomah County. The heat dome event greatly contributed to the higher levels of ED visits in 2021 when we observed twice as many heat-related illness visits as recent years; however, in 2022, regional rates remained 41% higher than in previous years.

Figure 3. Excess heat-related illness ED visit counts 2021-2022 compared to 2016-2019

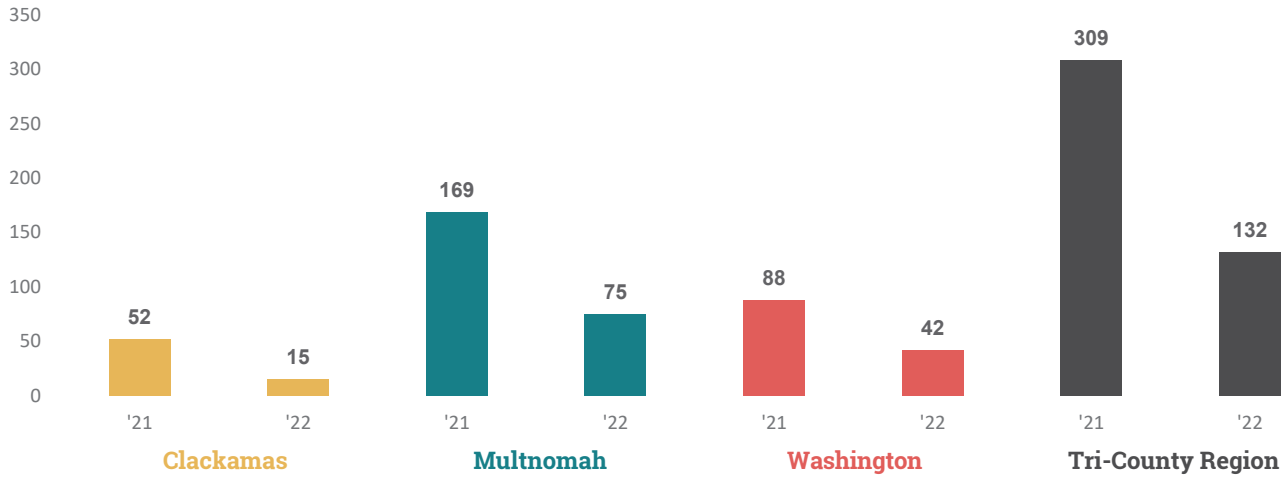
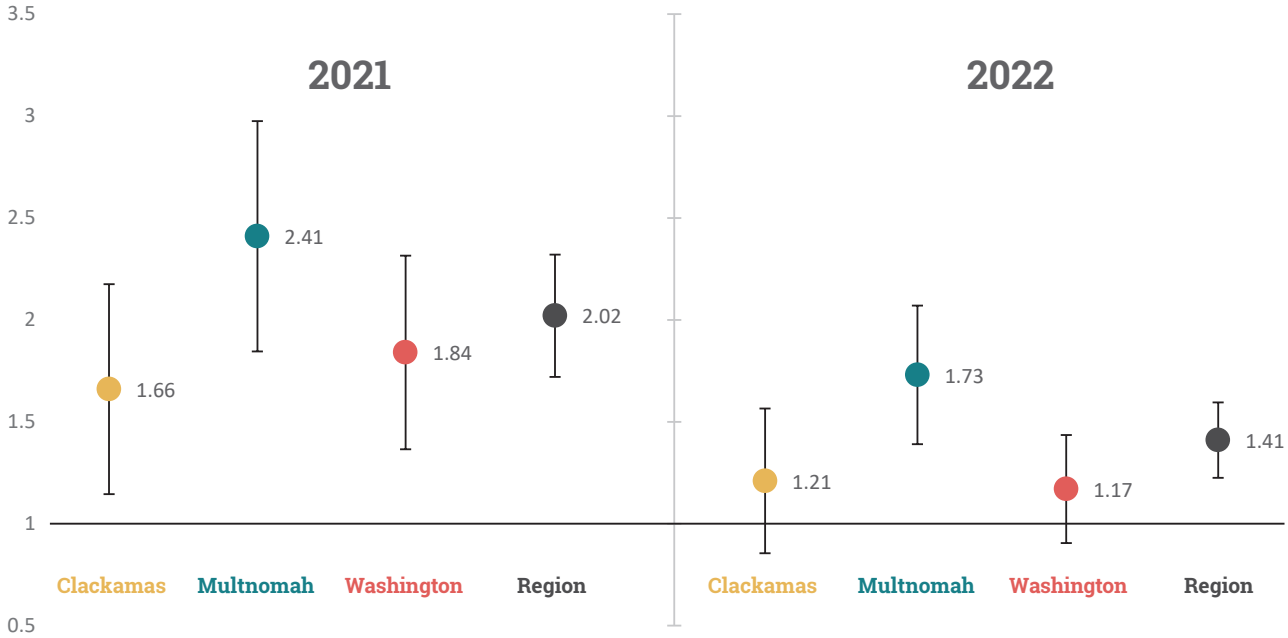


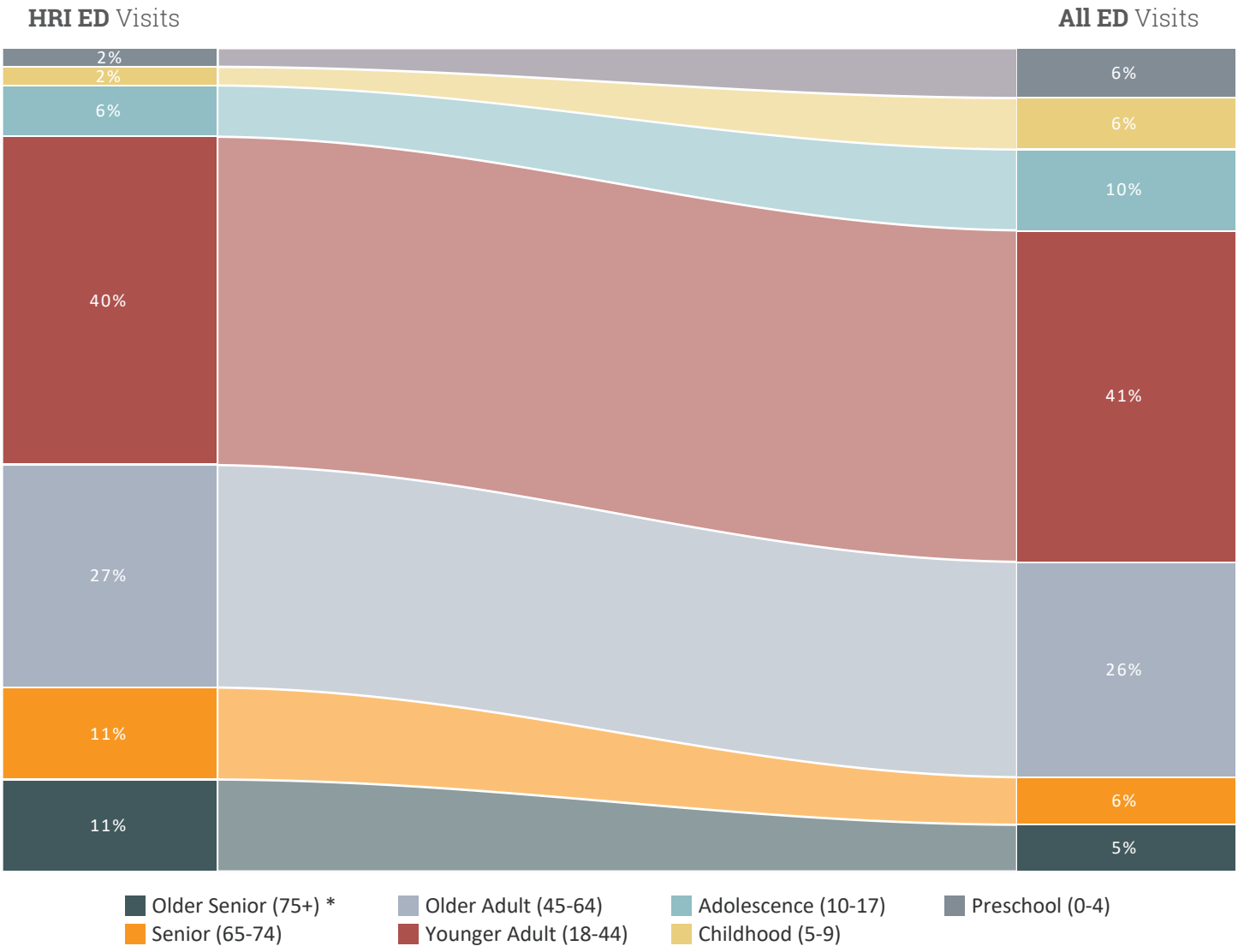
Figure 4. Risk of heat-related illness ED visits among all ED visits compared to 2016-2019



Who is impacted?

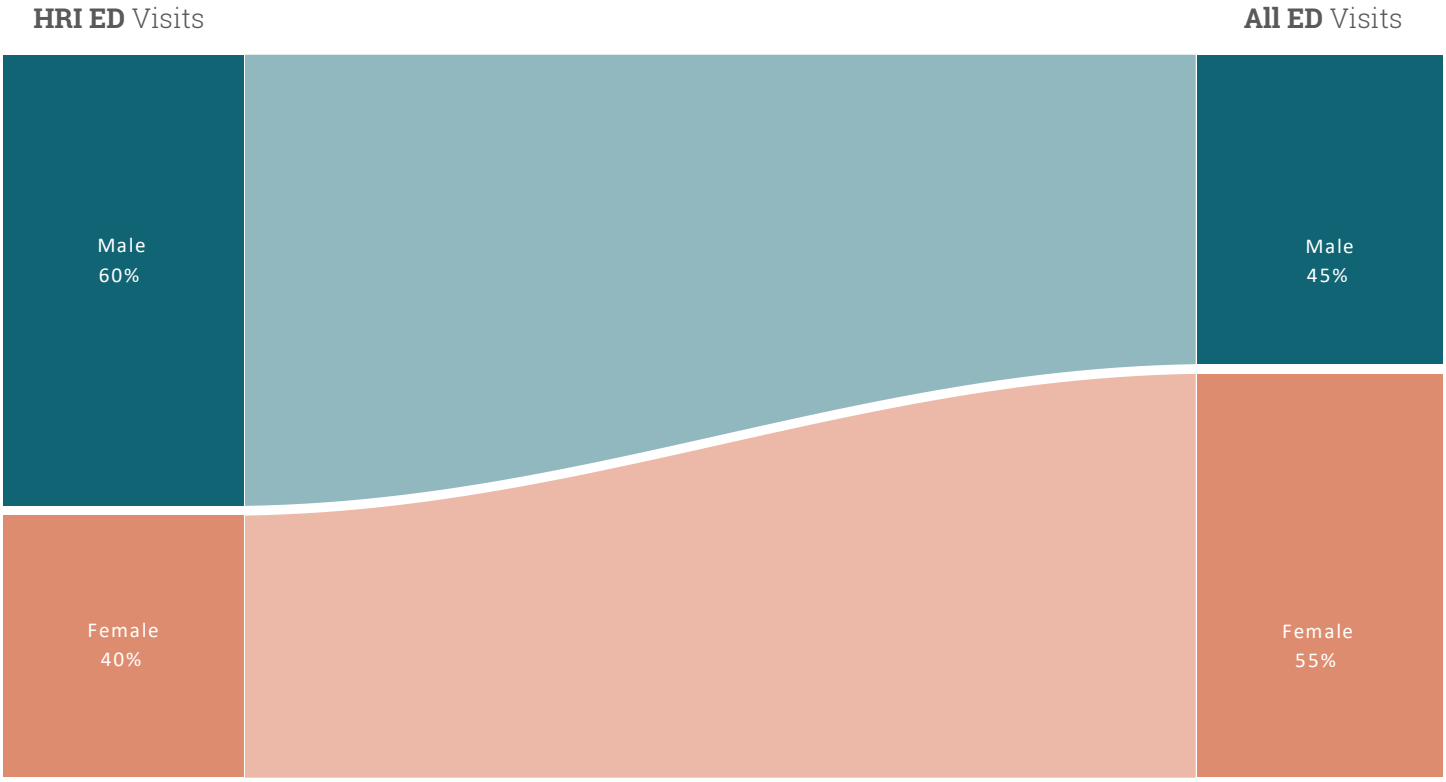
A greater percent of people over the age of 65 (figure 5) and males (figure 6) visited the emergency department for heat-related illness than for all other types of emergency department visits. Social isolation, occupation, air conditioning access, and houselessness are not systematically recorded for ED visits, but are established risk factors that should be explored in future reports.[17,18] Information about these characteristics is not consistently reported in existing data sources but may be explored by surveying people who visit the ED.

Figure 5. Distribution of heat-related illness (HRI) and all emergency department and urgent care visits by age group, 2016-2022



** Statistically significant difference of proportions across indicator specific and all cause visits*

Figure 6. Distribution of heat-related illness (HRI) and all emergency department and urgent care visits by gender, 2016-2022



Data details

This indicator was collected from a statewide data system (ESSENCE)[19] for analyzing visits to emergency departments and urgent care clinics (ED). This indicator documents visits for heat stress during the warm season — May through September — for the years 2016 through 2022. Complete data became available beginning in the 2016 season, meaning that comparisons to earlier years are not reliable. Records are for visits, not patients, meaning that one person could be counted multiple times if they visited the emergency department more than once for the same complaint or for different complaints. For this reason, we compare sex, age, and race characteristic distributions for all emergency department visits. We also use rates of all ED visits as a denominator in our relative risk calculations to account for potential changes in facility reporting over time. The number of urgent care clinics that report visits fluctuates over time. Missing or incomplete records could result in undercounting.

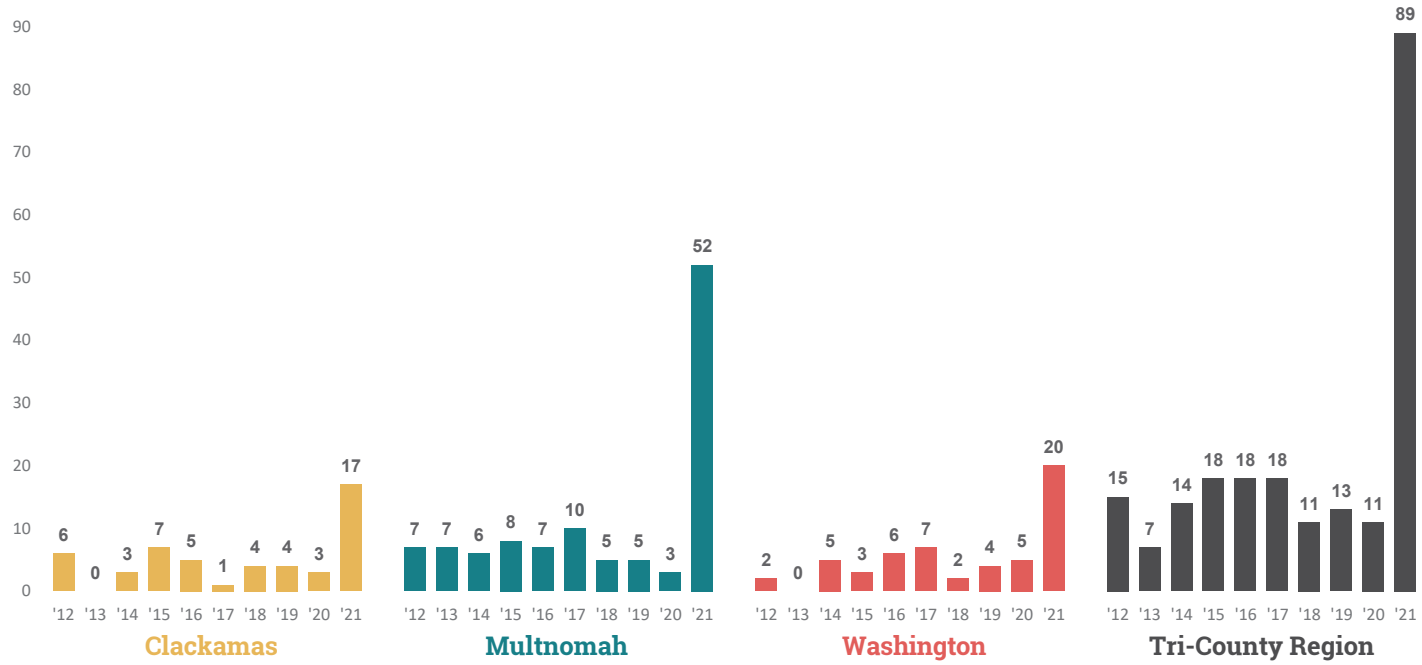
Indicator 2

Heat-related hospitalizations

What is happening in the region?

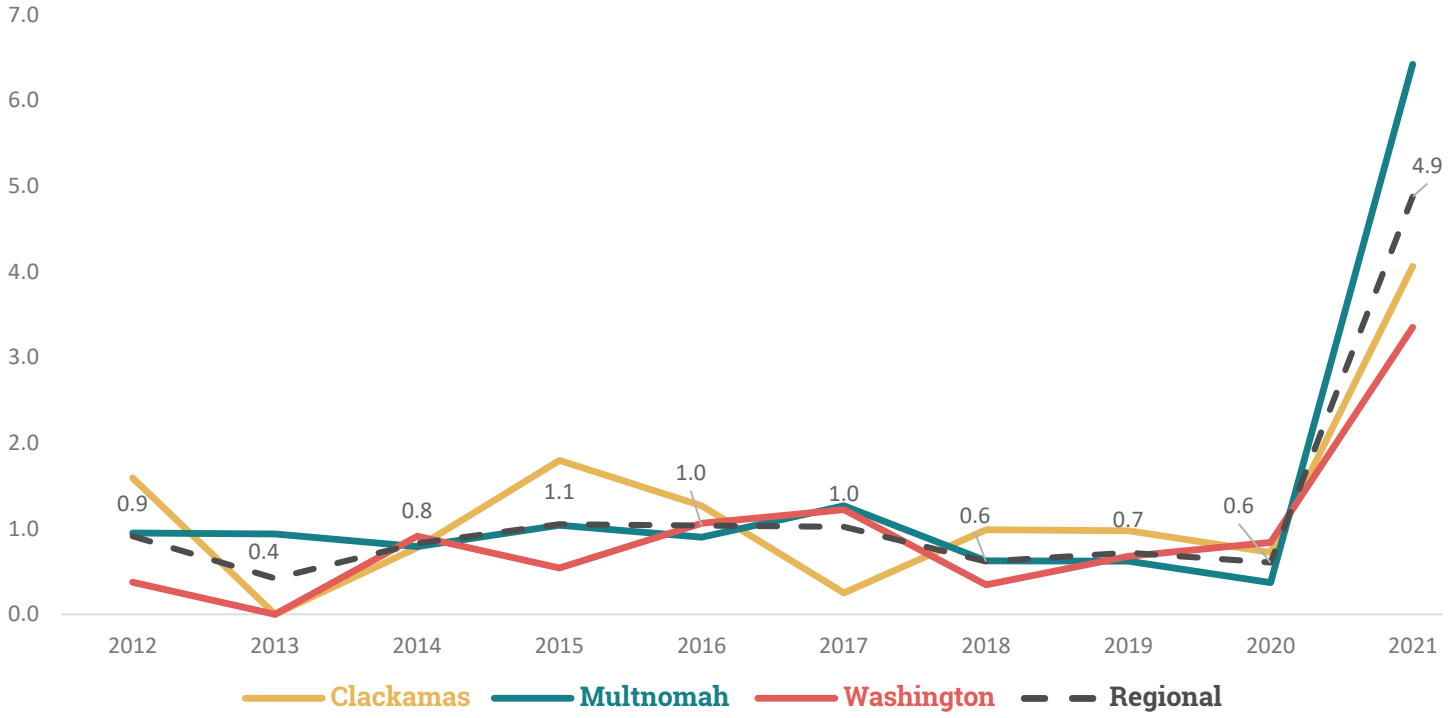
Between 2012-2019 there were an average of 14 heat-related illness hospitalizations in the region each year. By comparison, in the summer 2021 when the heat dome occurred, 89 people were hospitalized for heat-related illness. Regionally, about five people per 100,000 were admitted for a heat-related illness in 2021, compared to about one person per 100,000 between 2016-2019.

Figure 7. Heat-related hospitalization counts, May-Sept, 2012-2021



There was a stark increase in the rate of heat-related hospitalizations in each county and in the region overall in 2021. The regional rate of heat-related hospitalizations in 2021 was 5.5 times higher than the average rate during 2015-2019, with Multnomah County experiencing a disproportionate rate of hospitalizations. Across all counties, there were 74 more hospitalizations due to heat in 2021 than expected.

Figure 8. Heat-related hospitalization rates per 100,000 persons, May-Sept, 2012-2021



Data details

Compiled by the Oregon Environmental Public Health Tracking Program housed within the Oregon Health Authority, this indicator documents hospitalizations for heat stress during the warm season, May through September, for the years 2012 through 2021. These records exclude out-of-state residents who may have been admitted to hospitals in Oregon, admissions to federal facilities, and transfers from other hospitals.

Indicator 3

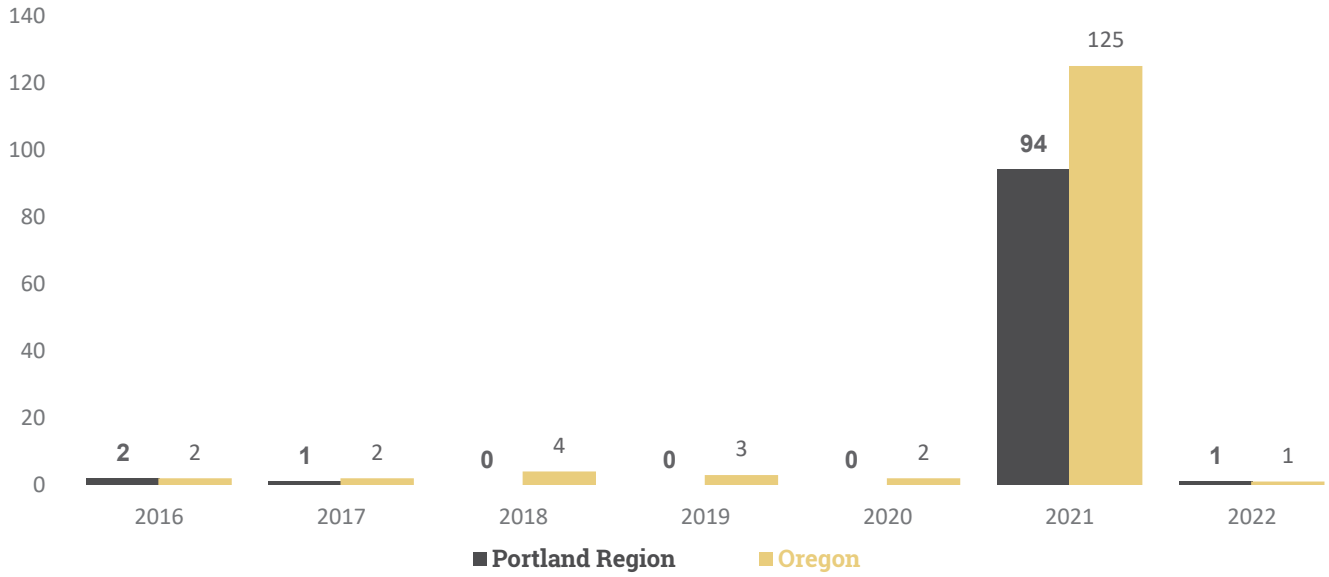
Heat-related deaths

This indicator measures deaths where heat exposure was identified as a primary cause. Exposure to extreme heat can cause serious, life-threatening health effects. Examples of heat-related deaths include those from heat stroke, heat exhaustion, or dehydration. The people were friends, family-members, and neighbors and many of their deaths could have been prevented. These data are shared to track changes over time and to guide improvements in the region's response systems and general preparedness for extreme heat events.

What is happening in the region?

In 2021 there were 94 heat-related deaths in the region. By comparison, in a typical year we would anticipate no more than one heat-related death. The rate of heat-related deaths in 2021 was 40 times what would typically be expected based on rates from 2014-2019.

Figure 9. Portland region and Oregon annual death counts, May-Sept, 2016-2022



Data details

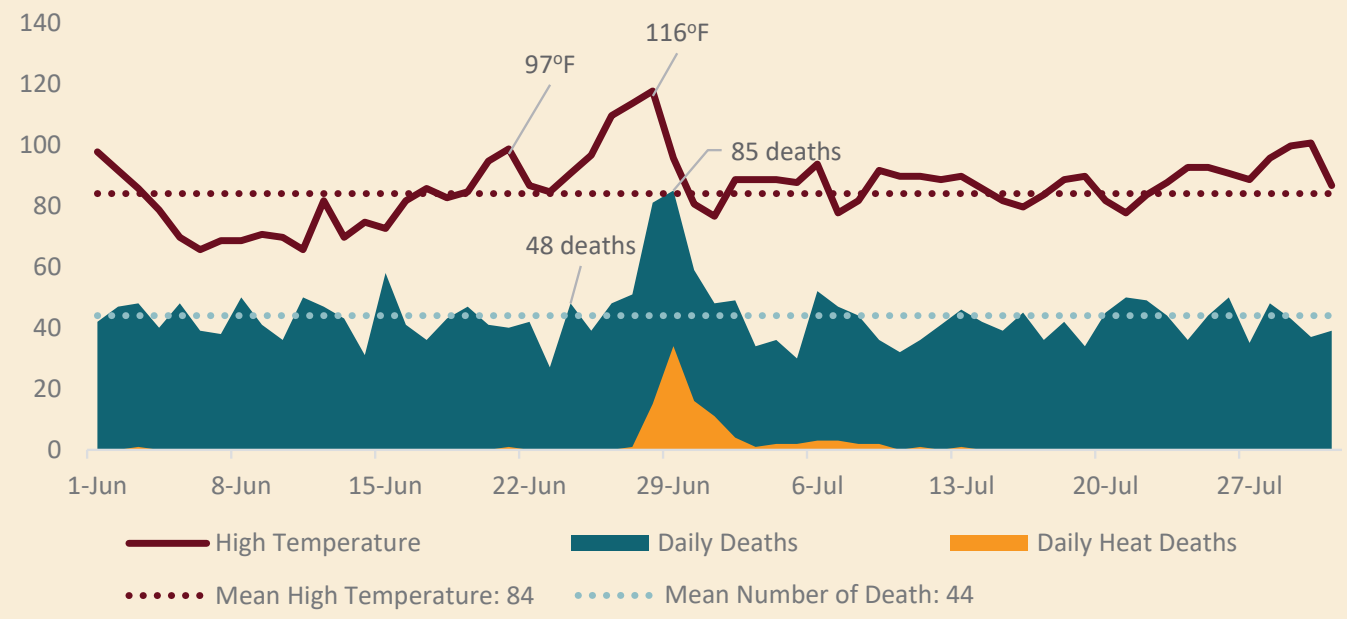
Heat-related deaths are defined in death records by ICD-10 codes T67 and X30: "Effects of heat and light" and "exposure to excessive natural heat-hyperthermia," identifying heat as the main underlying cause. The data presented here are from Oregon death records (by county where the person lived) for the years 2016 through 2022. Death certificates from 2022 are not finalized, so numbers are subject to change in future reports. The data presented here are unlikely to capture all deaths associated with extreme heat, only those with heat as a primary underlying cause.[20,21]

Spotlight
2021 Heat Dome

Our region was not prepared for the extreme heat that occurred in late June of 2021, when temperatures reached a high of 116°F. As noted by heat- related emergency department visits and hospitalizations, many people were forced to seek care due to the heat dome event. There were also many who died. To support climate planning and prevent future deaths this spotlight explores all cause deaths (i.e., deaths resulting from any cause) in relation to regional daily high temperatures during the June 2021 heat dome event. It is worth noting that on June 21, there was a high temperature of 97°F that was followed by a significantly higher than average number of all cause deaths three days later, on June 24.

While the impact of the 116°F temperatures is clear with the deaths that followed the day after, what requires more exploration is the average time between exposure to high temperatures (90-100°F) and impact on heat-related illness and deaths. Understanding this timeframe better will support climate adaptation planning and emergency response efforts. High temperatures were significantly associated with all cause deaths with an approximate 5% increase in risk for all cause death with every 10°F increase in temperature. Based on this observation, to prevent avoidable deaths, interventions to support communities before, during and after a heat wave should be explored.

Figure 10. Comparison of daily deaths and high temperatures surrounding heat dome



Data details

The data presented here are from Oregon death records for all three counties for June 1, 2021 to July 27, 2021. Death certificates from 2022 are not finalized, so numbers are subject to change.

Extreme weather events

Climate change and health connection

Extreme weather is one of the most visible consequences of climate change. Extreme weather is a broad term that encompasses severe storms and weather-related events that cause damage and destruction. Extreme weather events include thunderstorms, tornadoes, heat waves, hurricanes, hailstorms, blizzards, floods, landslides, and lightning strikes.[22]

Changing climate conditions in Oregon are expected to create more extreme weather events in the future, likely in the form of floods, heatwaves, wildfires, and summer and winter storms.[23] Damage from extreme weather events can restrict access to essential services, including clean water, food, basic sanitation, and health care.[24,25] Trauma from the loss of friends, family, community, property, and access to resources also creates stress and affects mental health. This stress can grow over time if limited resources are available for mental and physical care, recovery, and reconstruction efforts.[26]

Unequal impact

Climate change-driven extreme weather can have greater impacts on some people and communities based on their ability to prepare for, withstand, and recover from events. Learning from previous extreme weather events,[27,28] the following groups face higher risks:

- Older adults, children, people who use mobility devices, and people with disabilities who are unable to find protection from a storm or have limited access to transportation.
- People who have less capacity or fewer resources to gather supplies for extreme weather events, as well as to cover costs related to post-storm recovery.
- Communities who are isolated culturally, linguistically, or by technology barriers, like limited internet, may not have access to appropriate emergency communications.
- People who are experiencing houselessness and do not have means to shelter.
- Communities of color that have experienced historic redlining, structural exclusion, or lived in areas that have not been prioritized for public works enhancements.
- Communities that are geographically isolated or do not have backup systems for essential services like water, power, or travel routes damaged by extreme weather.

Indicator 4

Extreme weather-related deaths

This indicator measures the number of deaths directly attributed to extreme weather events that include falls from ice, storms, extreme cold, and extreme heat. Extreme weather can cause death when hazards occur suddenly, when safe shelter is unavailable, or in the presence of existing chronic conditions, such as diabetes or cardiovascular disease.

What is happening in the region?

Between 2014 and 2022, 236 people died due to extreme weather. Most or 144 people died of extreme heat (hyperthermia); 84 people died of extreme cold (hypothermia); six people died from falls from ice, and two people died from storms.

Figure 11. Extreme weather death counts, 2014-2022

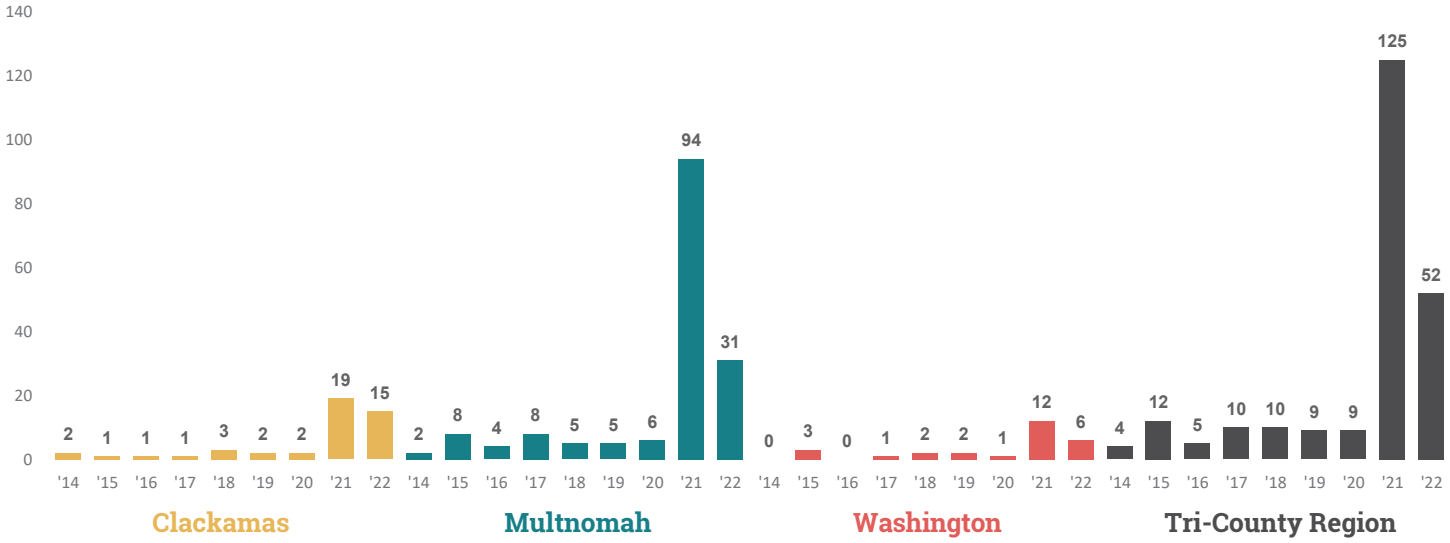
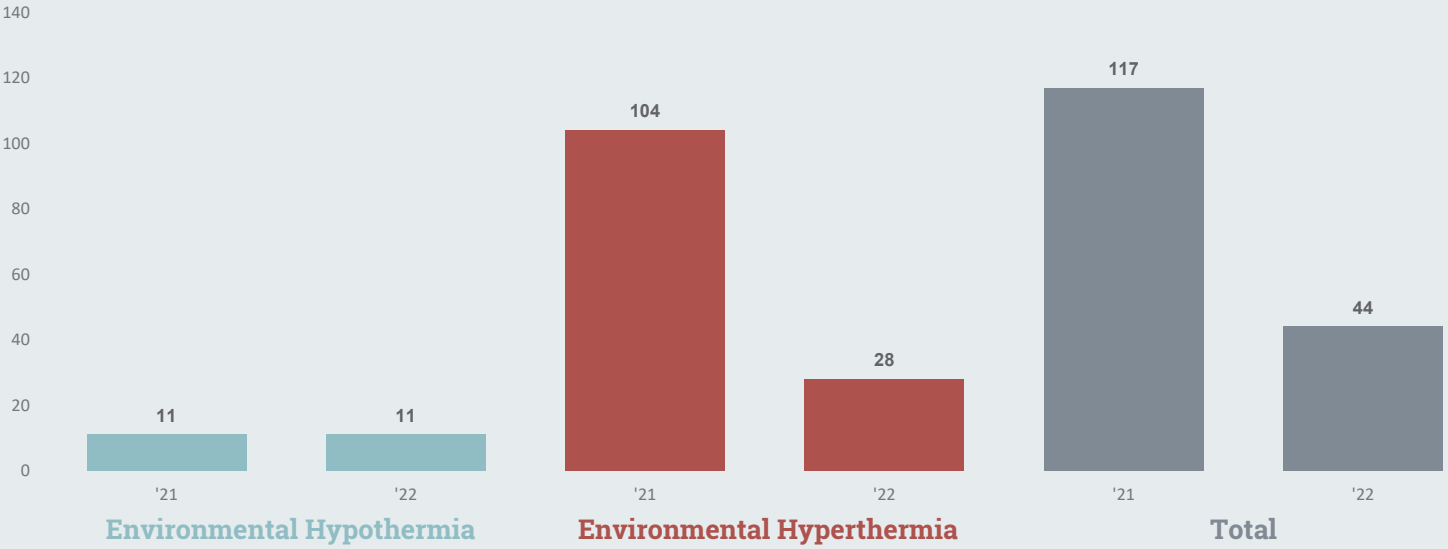


Figure 12.Excess extreme weather death counts for tri-county region , 2021-2022



Extreme heat

A majority of these deaths occurred in 2021 and 2022 and were due to extreme heat. (See previous section for details on heat-related deaths from 2021 heat dome.) In 2021, there were 117 more deaths than the average during 2016-2019. In 2022, there were 44 more deaths than the average during 2016-2019. Most of the deaths were among white men. Over 70% of these deaths occurred in Multnomah County.

Extreme cold

In 2021 and 2022, more people died from exposure to extreme cold than in previous years. In January 2017, four people died in Multnomah County during a period of freezing temperatures.

Storms, wildfires, and flashfloods

Strong winds in the greater Portland area were a factor in deaths that occurred in 2012, 2014, 2015, and 2016. One death occurred in Clackamas County in 2014 when a flash flood washed out a bridge near Ramona Falls by the Sandy River. Two deaths occurred in September 2020, when abnormally warm weather for the month, dry conditions, and high winds led to explosive expansion of wildfires, including the Riverside Fire and several smaller fires in North Clackamas that burned over 100,000 acres in Clackamas County.

Data details

Extreme weather deaths are defined in death records by ICD-10 Codes:

- T67 and X30 for "Effects of heat and light" and "Exposure to excessive natural heat-hyperthermia"
- T68 and X31 for "hypothermia, W00 for "fall from ice"
- W00: "fall due to ice and snow"
- X37: "cataclysmic storm." The data presented here are from Oregon death records for the years 2014 through 2022 (2022 is not finalized) with ICD-10 codes indicating extreme weather led to a primary underlying cause of death. The data presented here do not capture all deaths associated with extreme weather

Air quality

Climate change and health connection

Changes in air quality are strongly linked to climate change and events related to hotter, drier conditions as our region experiences more smoke from wildfires. Warmer temperatures and less high-altitude snowpack create drier, longer summers and increase the risk of wildfires.[29] This risk will likely continue to increase across Oregon, with the greatest impact in the Willamette Valley.[30] Air quality is also expected to worsen because of the increase in smoke and other harmful pollutants like smog (ground level ozone).[31]

Asthma symptoms are commonly triggered from exposure to a pollutant or allergens in the air, including smoke from wildfires, exhaust from vehicles, or pollen.[32,33] Fine particles (like PM2.5) released during wildfires and other sources increase the risk of adverse respiratory conditions, including asthma exacerbations.[34] Warmer conditions also extend the length of pollen season and the geographic area where some plants may grow.[35] Ragweed and grass pollens are common environmental triggers influenced by climate changes in the region.

Unequal impact

Due to historic housing and development policies and practices, communities of color and low-income groups are more likely to live in areas with disproportionately high exposure to air pollution, roads, and industries. This ongoing exposure can put people at greater risk for illness during acute air pollution events, like widespread wildfire smoke. Groups who face higher risk of health impacts from poor air quality include[36]:

- Outdoor workers (e.g., construction, road crews, farm workers).
- Older adults, children, and people with chronic lung conditions like asthma or chronic obstructive pulmonary disease.
- Communities of color that have experienced historic redlining, structural exclusion, or lived in areas that have not been prioritized for public works enhancements.
- Those living near high traffic areas or near industrial facilities.
- Immigrants and communities that are culturally or linguistically isolated and may not have access to emergency communications warning of poor air quality.

Indicator 5

Air quality-related respiratory illness emergency department visits

This indicator measures the number of visits to hospital emergency departments and urgent care clinics (ED) made by people with air quality-related respiratory illnesses. The indicator excludes data for respiratory illness caused by communicable disease such as COVID-19 and the common cold. Emergency visits for acute exacerbation of chronic obstructive pulmonary disease (COPD) or onset of asthma that can be aggravated by poor air quality are included.

What is happening in the region?

More people visit the emergency room for air quality-related illness than for any of the other health indicators in this report. In 2022 a total of 84,081 visits in the region were due to air quality-related illness. Previous years have had a slightly smaller number of visits. From 2016 to 2022, on average there were four visits for air-quality related respiratory illness for every 100 people residing in the region.

Figure 13. Air quality-related respiratory illness ED visits counts, May-Sept, 2016-2022

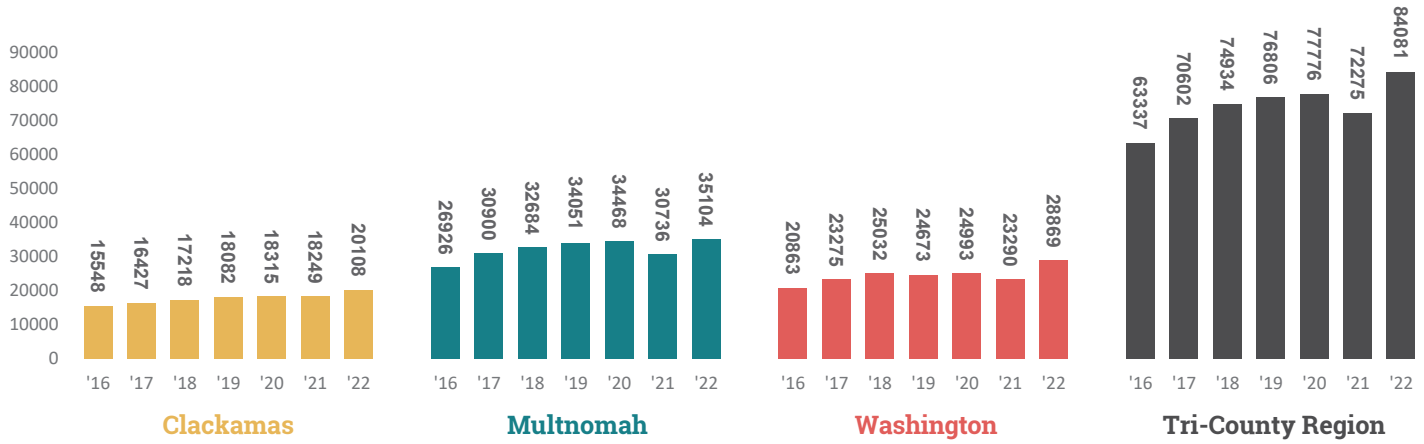
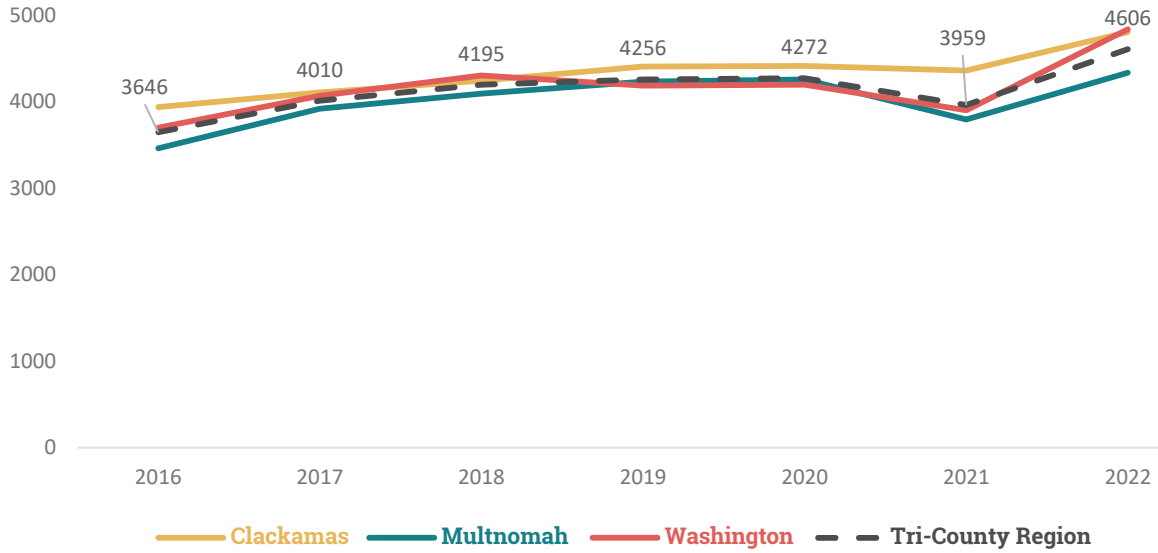


Figure 14. Air quality-related respiratory illnes rates per 100,000 persons, May-Sept, 2016-2022



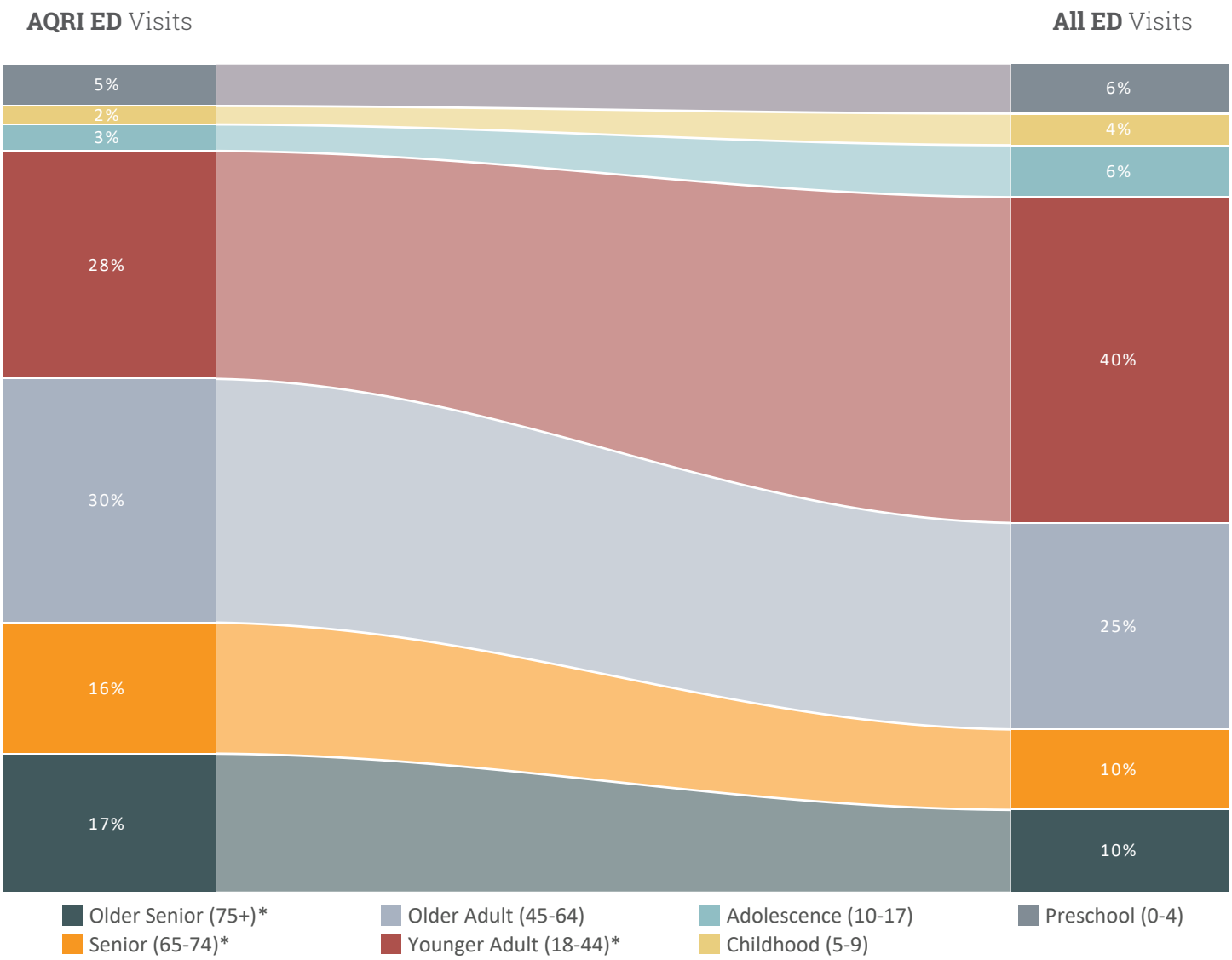
When comparing the proportion of air quality-related illness ED visits among all ED visits for 2021, the rate was significantly higher than in recent years (2016-2019) for all counties. In 2022, this proportion was 44% greater than recent years in Washington County. In Clackamas it was 35% greater and in Multnomah 7% greater than recent years. Exploring regional differences is important, as is understanding differences in exposure.

Figure 15. Risk of air quality-related respiratory ED visits among all ED visits compared to 2016-2019

Who is impacted?

There were no notable differences in distribution of sex or race and ethnicity for air quality-related visits compared to all emergency department visits; however, there were notable differences by age. The proportion of air quality related respiratory visits by people 65 and older was 13% more than the proportion for all cause emergency visits. In comparison, the proportion of visits by people ages 18 to 44 was 12% lower among air quality related respiratory visits than for all cause emergency visits. Based on these results, aging likely contributes to the risk of air quality-related respiratory illness. We will also explore how occupational and preexisting conditions contribute to the risk of air quality-related respiratory illness in future reports.

Figure 16. Distribution of air quality-related respiratory illness (AQRI) and all emergency department and urgent care (ED) visits by age group, 2016-2022



** Statistically significant difference of proportions across indicator specific and all cause visits*

Data details

This indicator was collected from a statewide data system (ESSENCE)[37] for analyzing visits to emergency departments and urgent care clinics (ED). This indicator documents ED visits for cases with any mention of an asthma-like symptom in addition to asthma or other chronic respiratory diseases as the chief complaint for the years 2016 through 2022. Complete data became available beginning in 2016, meaning that comparisons to earlier years are not reliable. Records are for visits, not patients, meaning that one person could be counted multiple times if they visited the emergency department more than once for the same complaint or for different complaints. For this reason, we compare sex, age, and race characteristic distributions with all emergency department visits. We also use rates with all ED visits as a denominator in our risk ratio calculations to account for potential changes in facility reporting over time. The number of urgent care clinics that report visits fluctuates over time. Missing or incomplete records could result in undercounting. For example, race and ethnicity data were missing in 20% of this data.

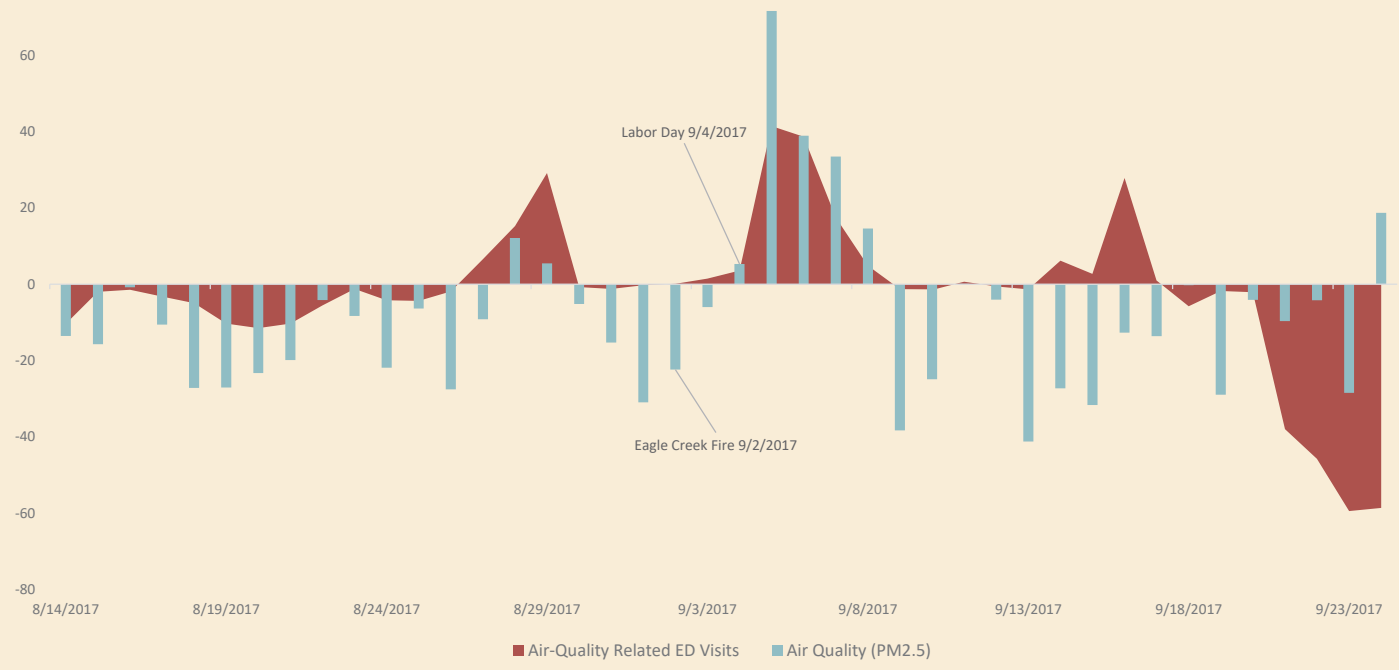
Spotlight
2018 and 2020 wildfire smoke events

In the previous report released in 2021, a graph shows a large increase in the number of asthma-related emergency department visits during the September 2020 wildfires. In this report, we see a similar pattern of increasing ED visits for all air quality-related illnesses on days when air quality is poor. This pattern continues even after accounting for seasonality and trends over time.

Following the Eagle Creek wildfire in 2017 air quality-related visits began to increase a few days after the fire began and continued to remain higher than expected for approximately one week as shown in **Figure 17**. The spike in visits during the 2020 wildfires was persistent for over a week. In both cases spikes in ED visits immediately followed spikes in fine particulate matter pollution (PM 2.5).

Wildfires close to the region have become more common in recent years. When smoke arrives, people's health is immediately impacted. It is important to communicate about smoke precautions before wildfire season begins and to enhance that messaging when wildfire smoke is headed toward the region.

Figure 17. Comparison of anomalies in the time series of daily air quality-related ED visits vs air quality (PM2.5) after removing seasonality and trend for the tri-county region



Indicator 6

Pollen allergy-related emergency department visits

This indicator measures the number of visits to hospital emergency departments and urgent care clinics (ED) made by people with symptoms of allergic disease attributed to exposure to high levels of pollen. Allergies refer to the response of the immune system to external allergens like pollen. Symptoms include sneezing, runny nose, shortness of breath, wheezing, and itchy eyes.[38]

What is happening in the region?

In 2020, there were markedly fewer pollen allergy-related ED visits as compared to previous years, likely due to behavioral changes from the COVID-19 pandemic. However, across the region, visits were higher in 2021 and 2022 than in 2020. The average rate of pollen allergy-related visits was 21 per 100,000 people in 2022, which is still lower than pre-pandemic levels that averaged 32 per 100,000 people. All counties have had fewer allergy ED visits in recent years, but annual rates in Washington County are consistently greater than those observed in Clackamas and Multnomah.

Figure 18. Pollen allergy-related ED visit counts, 2016-2022

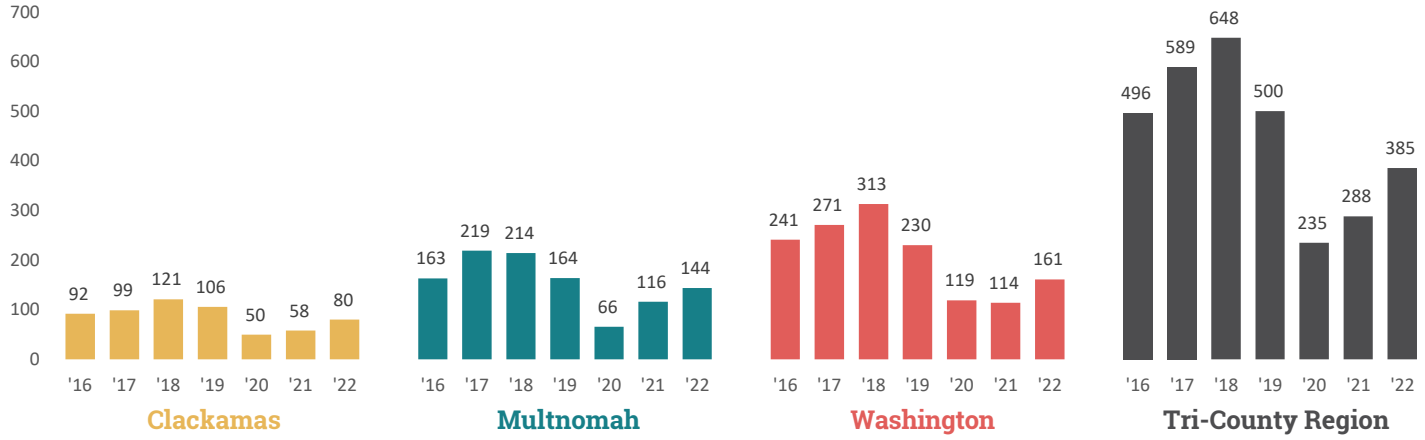
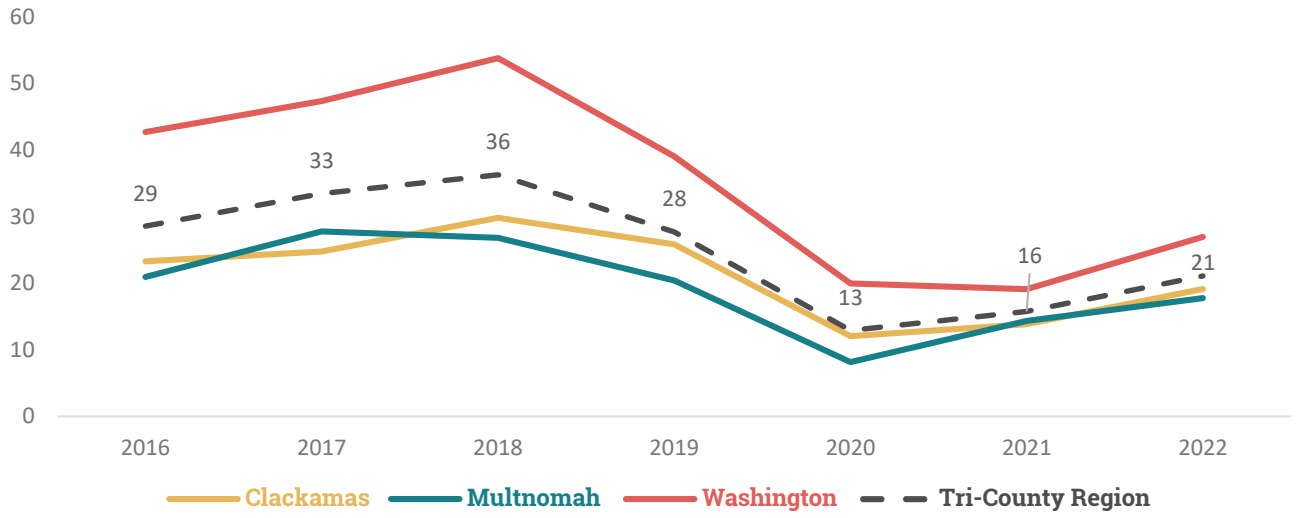


Figure 19. Pollen allergy-related ED visit rates per 100,000 persons, 2016-2022



These may be true decreases in regional ED visits over time or a result of mask use protecting against exposure to pollen or changed behaviors surrounding ED visits during the pandemic. Over time, visits for pollen allergies at EDs has coincided with springtime. To date, the length of pollen season remains consistent with previous years. We will continue to track pollen season length over time as an indicator of climate change impact on community health.

Who is impacted?

There were no differences in percent of males versus females reporting to the ED for pollen allergies when compared to all cause ED visits. Pollen-related allergy visits to the ED were much more likely to be by people ages 18 to 44 compared to visits for other reasons. Based on the high proportion of people between 18 to 44 years of age, in future reports we will explore how occupation affects this indicator. There were also differences by race and ethnicity with a greater proportion of pollen allergy-related visits by people identifying as Asian or Hispanic.

Figure 20. Distribution of pollen allergy-related and all emergency department and urgent care visits by age group, 2016-2022

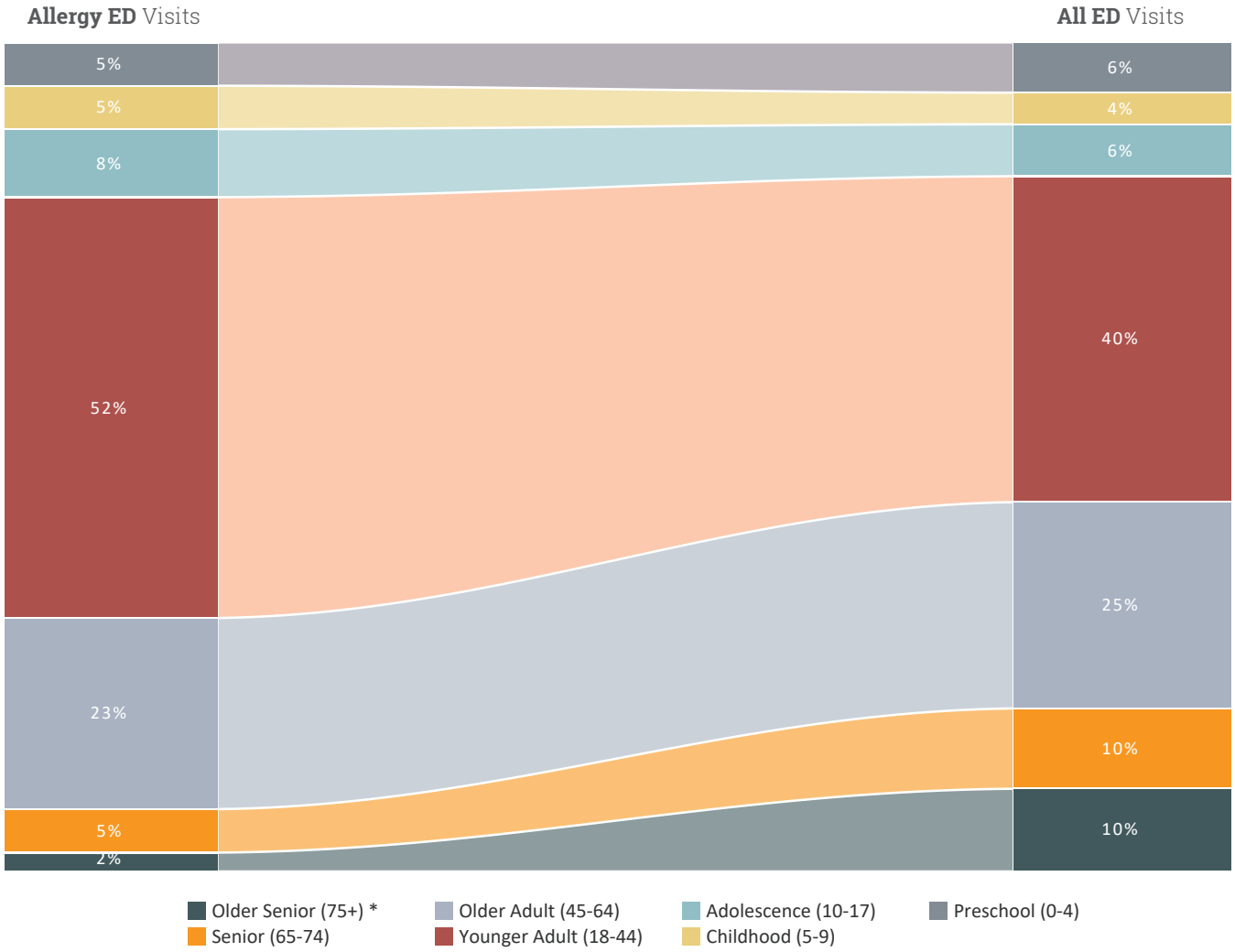
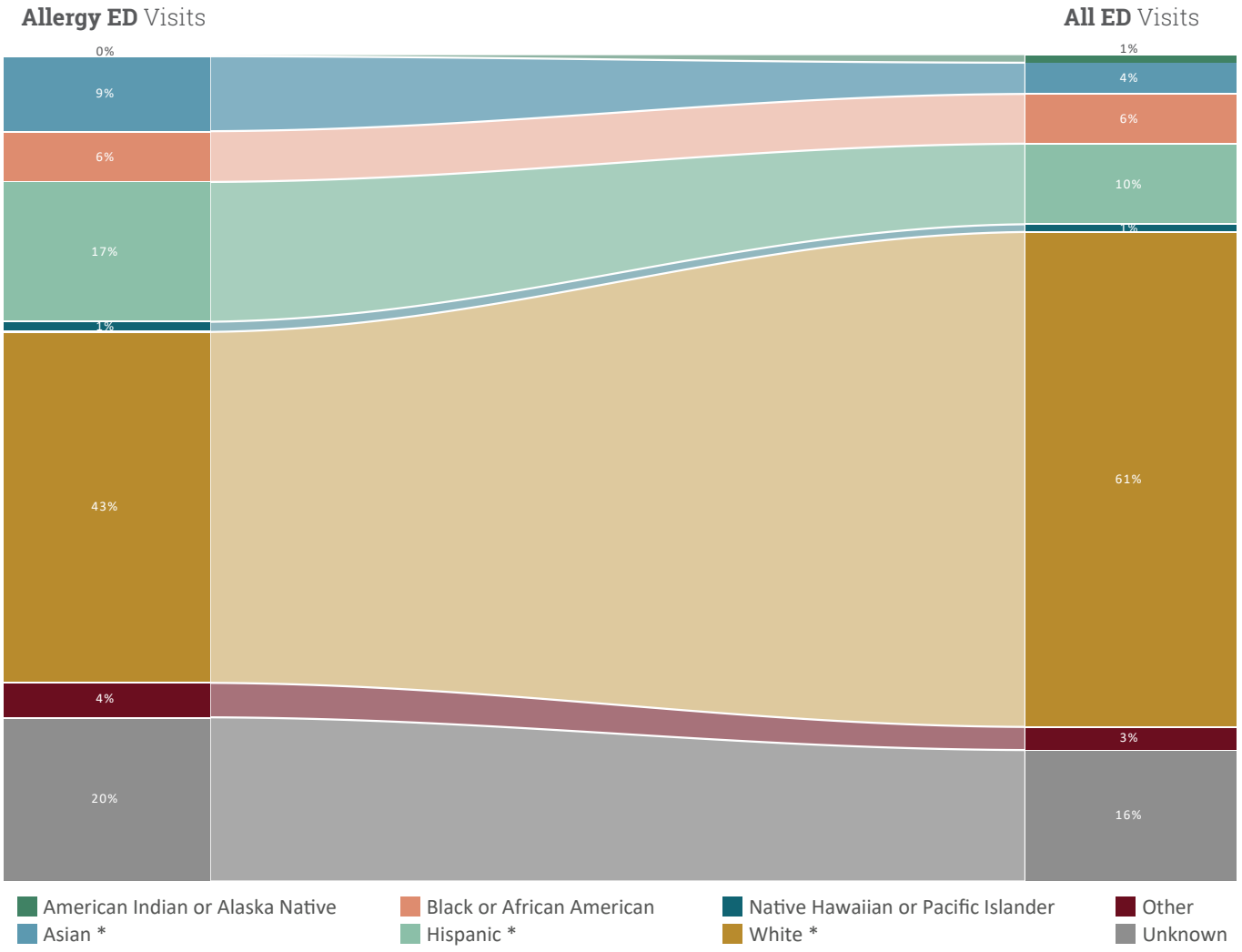


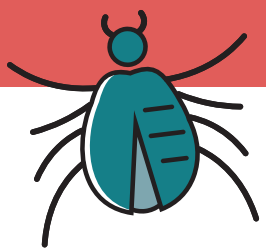
Figure 21. Distribution of pollen allergy-related and all emergency department and urgent care (ED) visits by race/ethnicity, 2016-2022



Data details

This indicator was collected from a statewide data system (ESSENCE)[39] for analyzing visits to emergency departments and urgent care clinics (ED). This indicator documents ED visits for cases with any mention of an allergy as the chief complaint and it excludes allergies due to food, insects, plants, medicines, and other products for the years 2016 through 2022. Complete data became available beginning in 2016, meaning that comparisons to earlier years are not reliable. Records are for visits, not patients, meaning that one person could be counted multiple times if they visited the emergency department more than once for the same complaint or for different complaints. For this reason, we compare sex, age, and race characteristic distributions with all emergency department visits. Rates are also used with all ED visits as a denominator in our risk ratio calculations to account for potential changes in facility reporting over time. The number of urgent care clinics that report visits fluctuates over time. Missing or incomplete records could result in undercounting.

Vector-borne disease



Climate change and health connection

Vector-borne diseases can be transmitted by insects. Mosquitoes and ticks are the main vectors in the tri-county region. Climate change influences the habitat, survival, and seasonality of these insects.

Mosquitoes reproduce more in hotter and humid conditions. Warmer weather expands mosquito habitat and extends their season of activity earlier in the summer and later into the fall.[40] Mosquitoes bite more in warmer temperatures, increasing the risk of vector-borne disease transmission.[41]

The life cycle of the tick is also guided by changes in seasons. Ticks begin looking for a host during the spring and throughout the summer. As spring and winter temperatures increase, ticks begin to look for a host earlier, increasing the length of the Lyme disease season and the number of potential cases.[41]

Unequal impact

Exposure and vulnerability to the risk of insect bites is largely the outcome of social and environmental factors. The conditions that someone lives or works in shape exposure patterns.[42] Groups that are at a higher risk of vector-borne disease include:

- Outdoor workers near habitats supporting insect breeding (e.g., construction, landscape design, landscaping, agriculture).
- People experiencing houselessness with no shelter from insect exposure.
- People living in housing without window or door screens and other sufficient barriers to exclude insects, including renters without tenant protections or whose landlords allow unsafe conditions.
- Youth, older adults, and people with immune conditions are more susceptible to severe illness from vector-borne diseases.
- People without means to purchase personal protective repellants or who lack access to educational resources about insect bite prevention.

Indicator 7
Lyme disease

This indicator measures the number of Lyme disease cases diagnosed in each county, even if the disease was acquired outside the county. Lyme disease is caused by a bacterium called *Borrelia burgdorferi*, most commonly carried by blacklegged ticks. When someone is bitten by an infected tick, disease symptoms may include fever, headache, fatigue, and a bullseye-like rash called an erythema migrans. Severe cases may affect cardiovascular and cognitive function[43].

What is happening in the region?

Regional counts of Lyme disease peaked in 2017 with 34 cases. From 2012 through 2022, the average rate of Lyme disease cases was approximately one person per 100,000 people every year. Lyme disease rates have decreased in Clackamas and Multnomah counties in the most recent 2020-2022 period compared to 2016-2019. Washington County rates have increased by 69% when comparing 2021 and 2022 to 2016-2019.

Figure 22. Lyme disease counts, 2012-2022

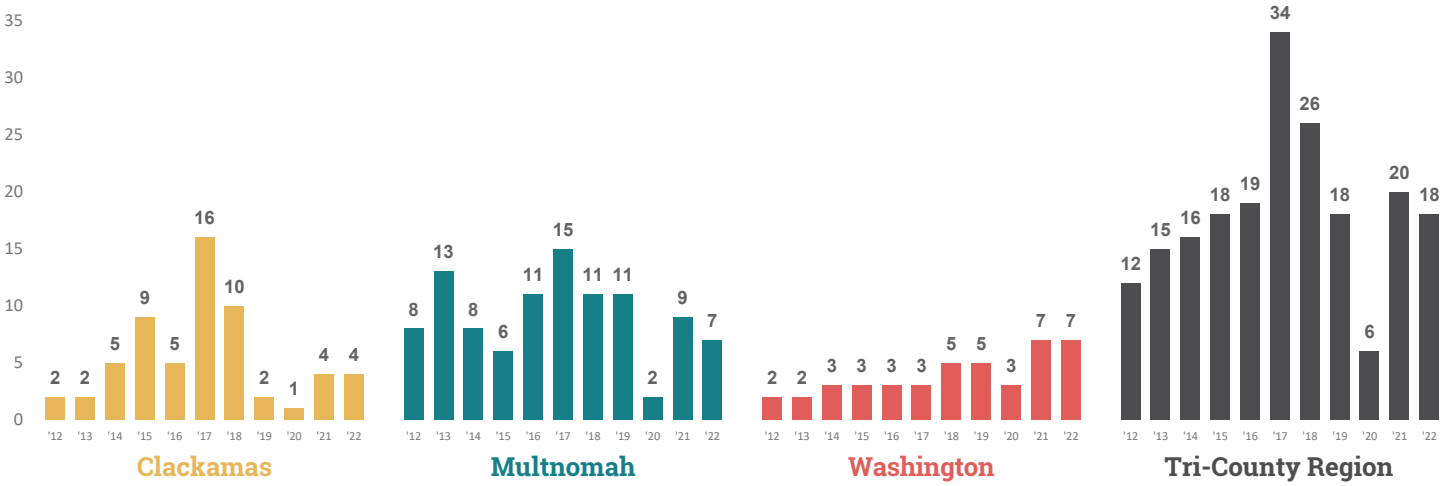
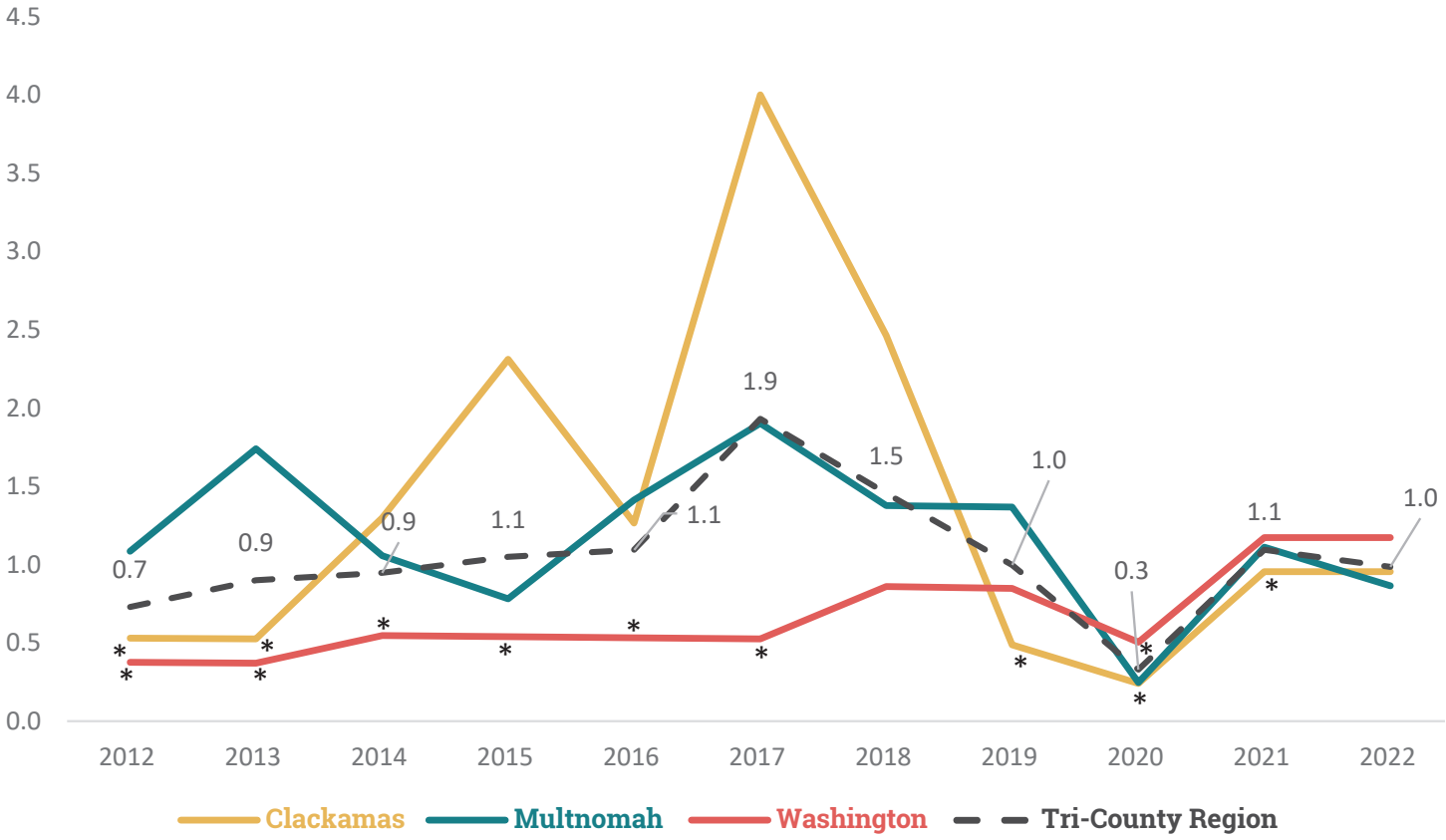


Figure 23. Lyme disease rates per 100,000 persons, 2012-2022



** Indicates an unstable rate estimate because count is less than 5*

Data details

Data are for 2012 through 2020, the most recent year available. The data does not allow us to determine where the disease was contracted. While most cases were contracted outside the region, there are several reasons we include the indicator in this report. Cases of Lyme disease, regardless of where they were contracted, are a burden on local health care systems. Tracking cases is necessary to monitor changes in this burden and including this indicator provides a baseline for future evaluation.

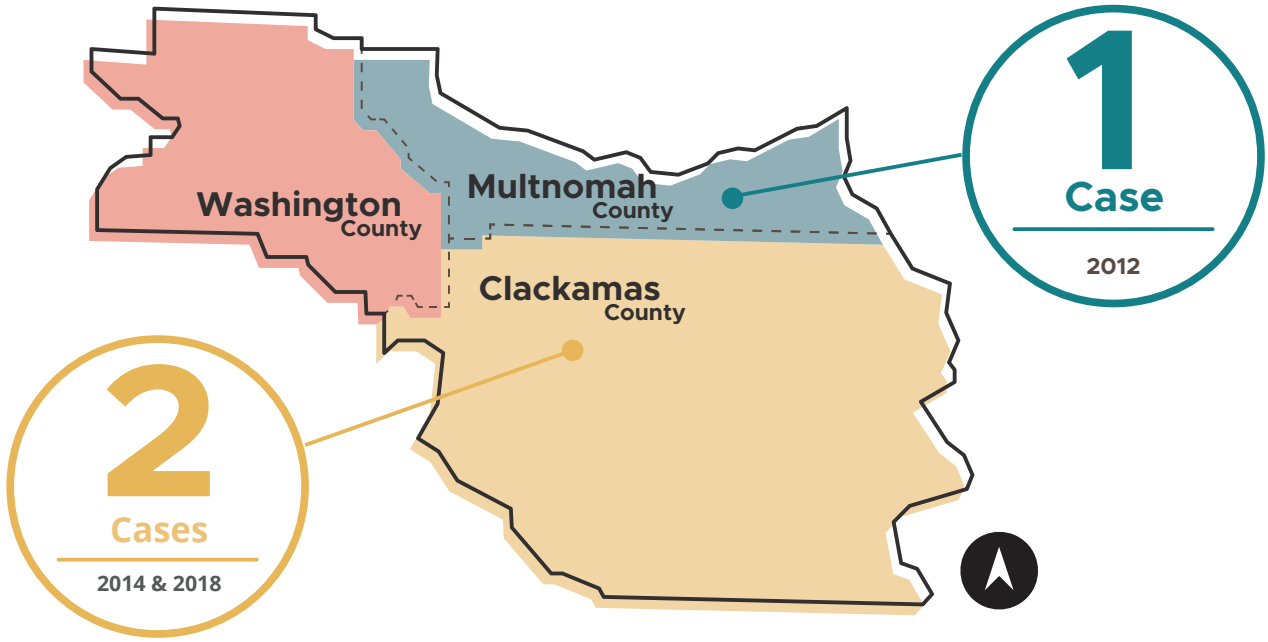
Indicator 8
West Nile virus

This indicator measures the number of cases of West Nile virus diagnosed in each county, even if the disease was acquired outside the county. West Nile virus is a mosquito-transmitted infection. Most people infected with the virus do not show any signs or symptoms; roughly one in five people develops a fever, headache, and body aches. Less than 1% of all West Nile virus cases develop severe symptoms affecting the nervous system through inflammation of the brain, spinal cord, and surrounding tissues.[44, 45]

What is happening in the region?

Three cases of West Nile virus have been documented in the region since 2012, one in Multnomah County and two in Clackamas County. All three cases were acquired outside of the tri-county region, but local transmission is possible.

Figure 24. West Nile virus case count, 2012-2022

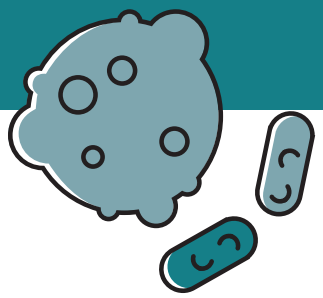


Rates not calculated for this indicator due to sample size

Data details

Cases of West Nile virus, regardless of where they were acquired, are a burden on local health care systems. We include this indicator so we can monitor where cases were acquired and if, over time, West Nile cases start becoming more prevalent closer to our region. Including this indicator provides a baseline for future evaluation. We used data from 2012 through 2022 for this report.

Communicable disease



Climate change and health connection

Climate change influences the survival, reproduction, and adaptation of the microorganisms that carry disease.[46] Some climate events, such as extreme heat or flooding, increase the growth of disease-causing microbe populations, as well as human exposure and the risk of infection through contaminated food, water, and water-based recreational activities. Changes in temperature and rainfall in the Pacific Northwest are projected to create conditions that promote the growth of disease-causing microbes.[47, 48]

- **Salmonellosis:** Increase in temperature is directly associated with increased number of reported salmonellosis cases. Studies have estimated an increase of 1.2% in the relative risk of salmonellosis for every degree increase in weekly temperature.[49] *Salmonella* species multiply faster in warmer temperatures, which leads to an increased risk of food contamination during processing, storage, and production.[50] The number of cases is typically higher during summer months, with an increased risk among children under five years and those over 65 years.
- **Campylobacterosis:** The intestinal bacteria *Campylobacter* shows a seasonal pattern peaking in the summer months. Warmer conditions promote the growth of bacteria in raw sewage, increasing the risk of exposure. Heavy rains and floods can lead to sewage overflow, also increasing the risk of exposure.
- **Tuberculosis:** Climate change can affect the spread of tuberculosis (TB) by displacing people through drought, landscape change, rising sea levels and natural disasters. The spread of TB increases when people are displaced or forced to migrate from regions where TB is common and relocate to places with low rates of the disease. Famine and changes in environmental conditions can also spread TB by lowering a person's immunity and increasing their susceptibility to infections.

Unequal impact

Low income and rural areas are impacted more by communicable diseases resulting from climate change and environmental factors. People with low incomes have fewer resources and live in areas less equipped to mitigate the fallout from extreme heat, floods from precipitation, and other extreme weather conditions.[51] Groups that are at higher risk of communicable diseases include:

- Older adults, children, pregnant people and those with compromised immune systems.
- Communities of color that have experienced historic redlining, structural exclusion, or who have lived in areas that have not been prioritized for public works enhancements.
- People who spend time in water bodies for recreation or occupation.
- People living in communities with aging water and sewage infrastructure that may be more prone to flooding and water contamination.
- Communities that are geographically isolated or do not have backup systems for essential services like water when those systems are damaged by extreme weather.

Indicator 9
Salmonellosis

This indicator measures the number of cases of salmonellosis diagnosed in each county. Salmonellosis is primarily a foodborne illness caused by *Salmonella* bacteria, causing gastrointestinal symptoms that include diarrhea, cramps, nausea, and vomiting.

What is happening in the region?

Regional counts were lowest in 2020 with 140 cases, and highest in 2018 with 271 cases. From 2012 to 2019 the average rate of salmonellosis cases for the region was 12 new cases per 100,000 people, whereas during the early part of the Covid-19 pandemic the rate averaged nine new cases per 100,000 people. There were 77 more cases in 2022 than in 2021. Multnomah and Clackamas counties had sharp increases from 2021 to 2022 as compared to Washington County. These rates reflect levels typically seen pre-pandemic and coincide with restaurants reopening. When we compared recent rates of salmonellosis with pre-pandemic years (2016-2019) we found no statistically significant difference for 2021. In 2022 there was a substantially higher (33%) rate of salmonellosis.

Figure 25. Salmonellosis counts, 2012-2022

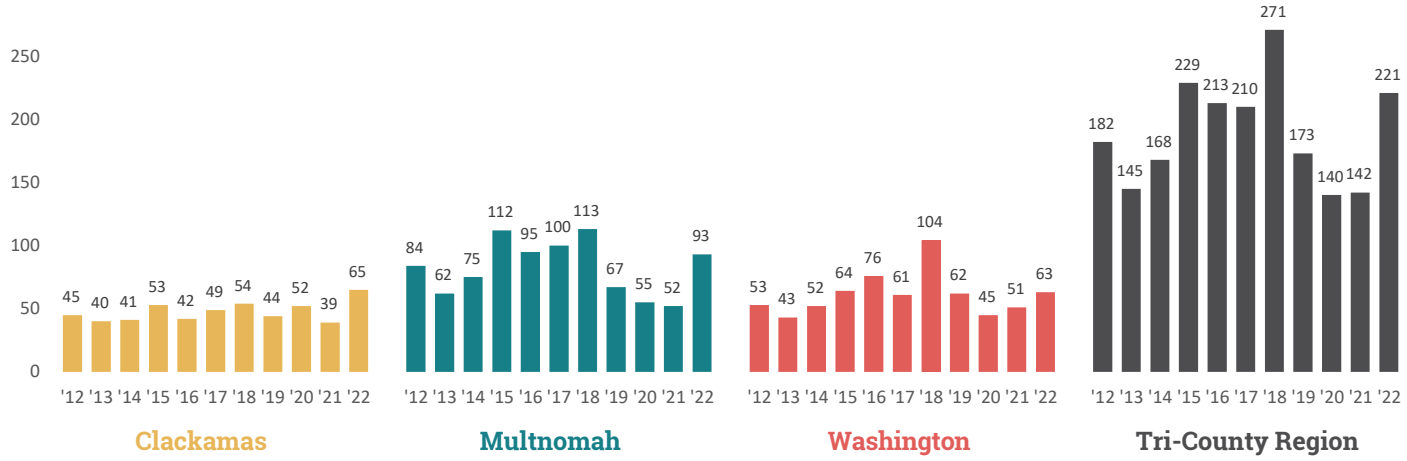
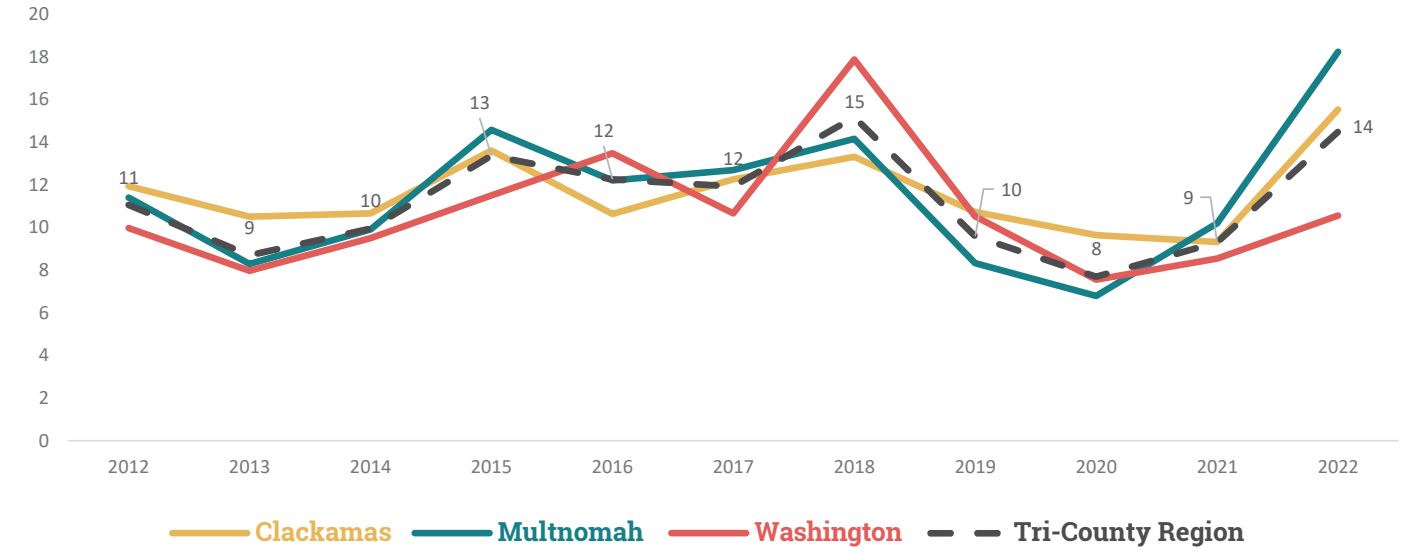


Figure 26. Salmonellosis rates per 100,000 persons, 2012-2022



Indicator 10
Campylobacteriosis

This indicator measures the number of campylobacteriosis cases diagnosed in each county. *Campylobacter* infection, one of the most common foodborne illnesses in the United States, occurs primarily through consumption of raw or uncooked poultry, or through contaminated water. Symptoms include diarrhea, abdominal pain, vomiting and headache.[52]

What is happening in the region?

Except for lower rates during the pandemic, the number of annual campylobacter cases has remained fairly consistent over the past decade. Cases were significantly lower in 2020 compared to 2016-2019, but this phenomenon is likely due to less contact with the healthcare system during the COVID-19 pandemic.

Multnomah County did see a sharp increase in rates in 2022, though this rate was still lower than in previous years. Clackamas and Washington counties saw a moderate increase in 2021, but these recent rates returned to levels similar to those seen before the pandemic by the end of the recent time period.

Figure 27. Campylobacter counts, 2012-2022

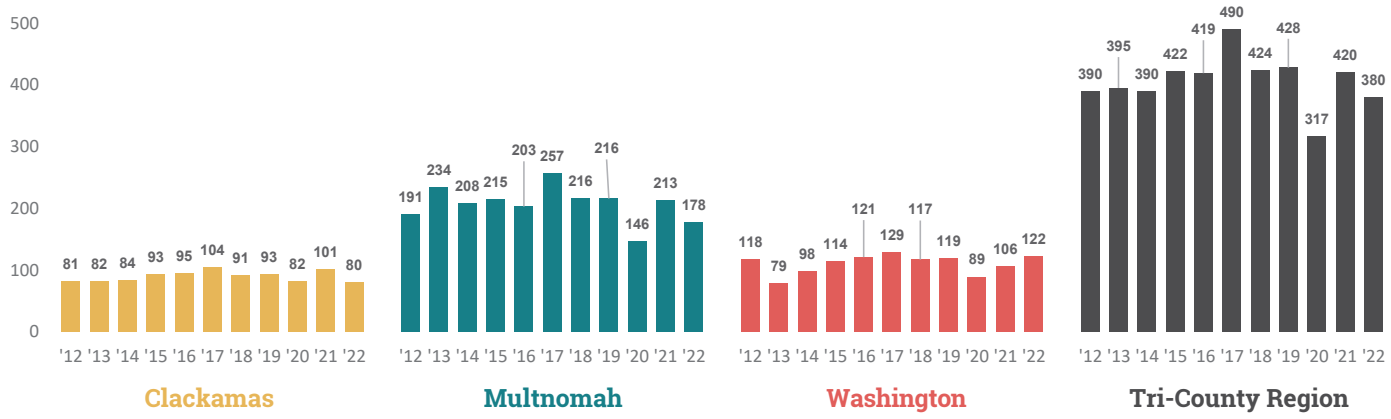
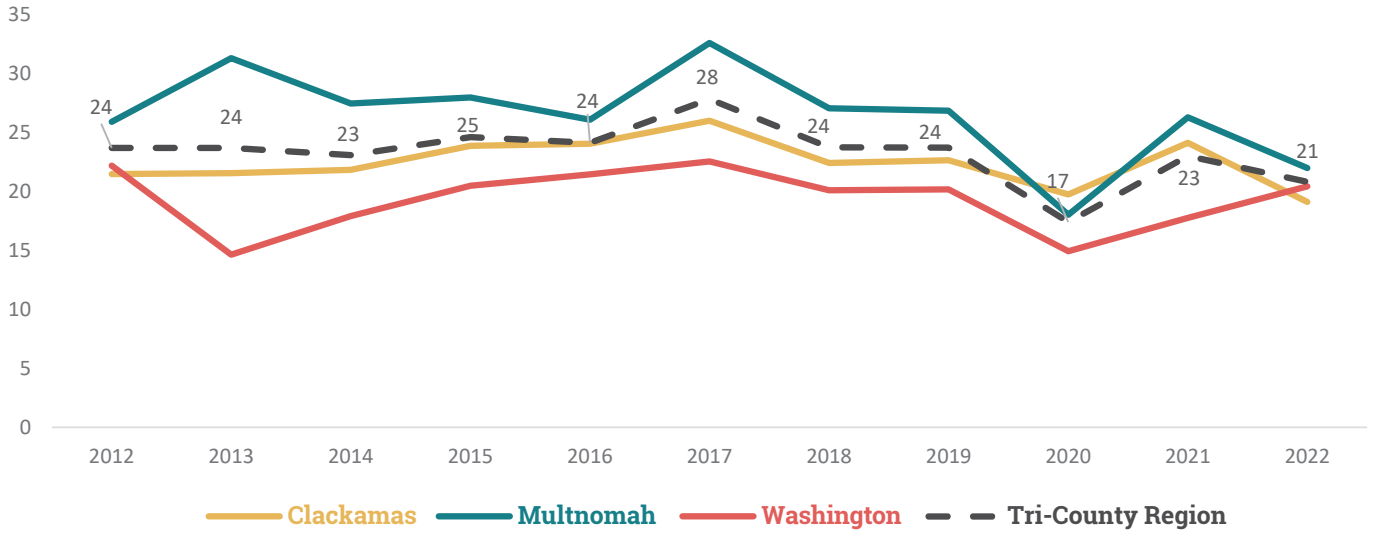


Figure 28. Campylobacter rates per 100,000 persons, 2012-2022



Indicator 11
Tuberculosis

This indicator measures the number of active cases of tuberculosis in each county. Tuberculosis (TB) is caused by *Mycobacterium tuberculosis*, which most frequently attacks the respiratory system but can infect other body systems as well. An infected person does not always develop clinically visible signs of the infection. While infection may remain dormant for a long period of time (i.e., latent TB), only a person with active TB can spread the infection to others.

What is happening in the region?

With the exception of a dip in cases during the pandemic, the number of TB cases in the tri-county region has remained fairly steady. The rate of TB in Clackamas County has consistently been lowest among the three counties in the region. In 2020, counts were lower than in previous years but have now returned to levels seen pre-pandemic. TB rates in 2022 are not significantly higher than recent years (2016-2019) but the apparent increase for Multnomah County is being closely monitored due to concerns of undiagnosed TB from people not seeking care during the pandemic.

Figure 29. Tuberculosis counts, 2012-2022

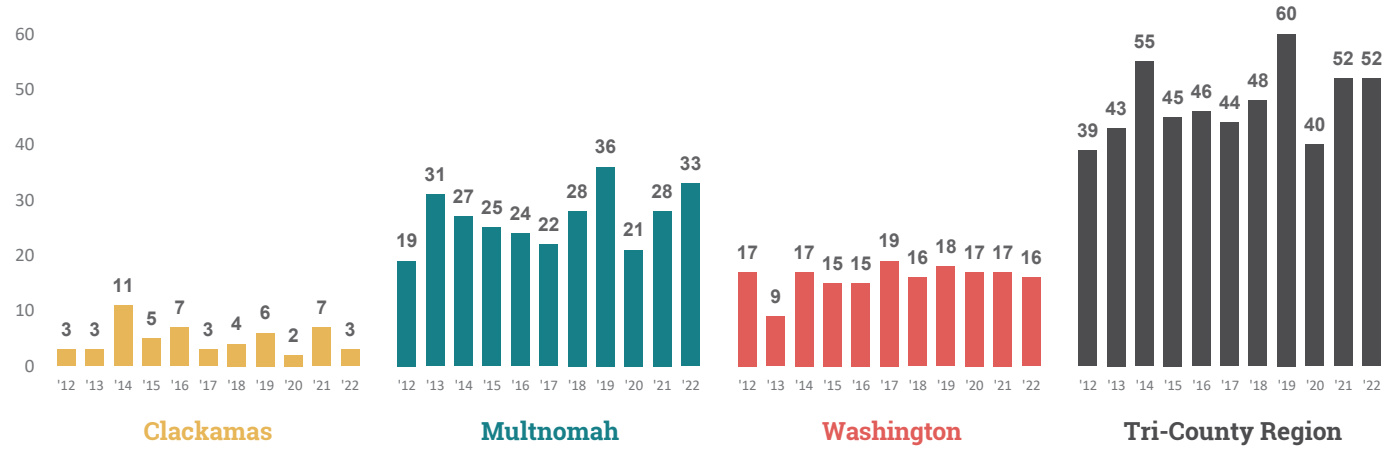
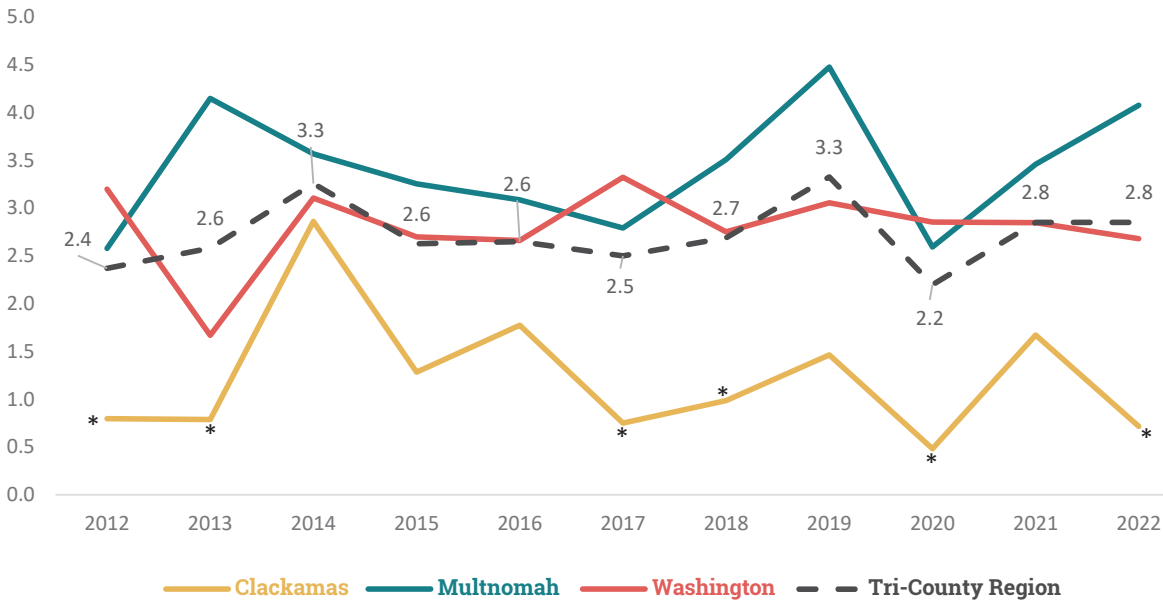


Figure 30. Tuberculosis rates per 100,000 persons, 2012-2022

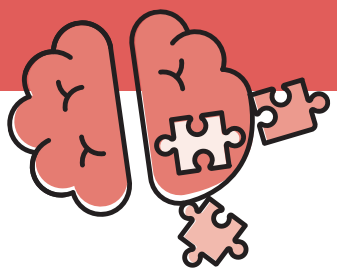


** Indicates an unstable rate estimate because count is less than 5*

Data details

Data (pg. 33-35) is based on hospital visit records from ORPHEUS. Misclassification errors such as underreporting may affect rates.

Mental health



Climate change and health connection

The impact of climate change-related events on mental health was an emerging area of research just a few years ago, but now there are multiple studies and reports establishing the importance of mental health in the context of climate change.[53] In general, mental health refers to our emotional, psychological, and social well-being that influences how we feel, relate to stress, and make daily choices. Mental health outcomes in response to climate change are affected by how individuals relate to and experience climate change events.[54] Different types and lengths of climate change events can create a wide variety of mental health impacts, including:

- **Short and acute events that last a few hours to a few weeks like heatwaves, extreme storms, or wildfires.** These events can lead to anxiety, depression, post-traumatic stress disorder (PTSD), sleep deprivation, trauma, shock, and thoughts of suicide. If an event creates property damage, causes displacement, or affects economic livelihood of a group it can lead to a sense of loss of place, loss of control, and loss of personal or occupational identity.[55] Heat events specifically can lead to increases of aggression and worsening of existing mental health conditions, as well as creating negative side effects for some psychiatric conditions. [56]
- **Long periods of extended climate change events, like drought, or recovery periods from acute events.** In addition to the mental health impacts of short events, extended events or recovery periods place ongoing and compounding stress on mental and emotional well-being. It can create disruption in access to physical and mental health care services, school, and social networks, all of which are protective factors for good mental health.[57]
- **Ongoing direct or indirect exposure to the hazards of climate change, like rising temperatures, rising sea levels, and other global and regional threats.** Whether someone has direct experience with a climate change-related event or not, the continued exposure to media coverage and threat of climate disasters can affect mental health. A broad range of terms have evolved to describe these impacts, including eco-anxiety (severe worry and frustration about risks from environmental impacts to future generations and the planet)[58, 59, 60] and climate grief (sadness, loss, and hopelessness about future generations and the planet).[61]

Unequal impact

Mental health outcomes related to climate change are affected by a wide range of social, cultural, environmental, and economic factors. Groups at higher risk for negative mental health outcomes related to climate change are:

- Youth who will face greater exposure to severe climate change impacts and have limited control over actions to mitigate them today.
- People who have been personally impacted by a climate disaster or who reside in an area at risk of a climate disaster.
- Native Americans and indigenous tribes who have lost or are at risk of losing traditional ways of life and self-determination due to climate change and other social factors.
- People with pre-existing mental health conditions, like anxiety or depression.
- People with limited social connections and access to resources.
- People who have limited means to recover from a climate disaster, or whose livelihood would be significantly affected by a climate disaster, such as the agricultural industry.
- Communities of color who carry past and current traumas of interpersonal and structural racism.
- Health care professionals providing care and treatment to people affected by climate change events.

Strong social supports and environments that foster collective action toward addressing climate change can tip the scales and leverage the positive potential of anxiety-like symptoms.[62]

What is happening in the region?

At the local level there are limited indicators of mental health and those that do exist are impacted by underreporting. We reviewed data sources for the tri-county area and did not identify a reliable indicator explicitly tied to climate change that allowed for comparison over time. We continue to look for a suitable measurement for the mental health effects of climate change, so we can include this as a formal indicator in future reports.

The 2021 report included a snapshot of tri-county region mental health based on a survey on mental health-related perceptions about climate change and a survey about Oregon teen mental health. For this report, we are taking a different approach. First, we examined Google data from 2018 to 2022 to examine search patterns immediately following extreme heat events. We looked for how often people searched for terms related to mental health services, anxiety, and PTSD.

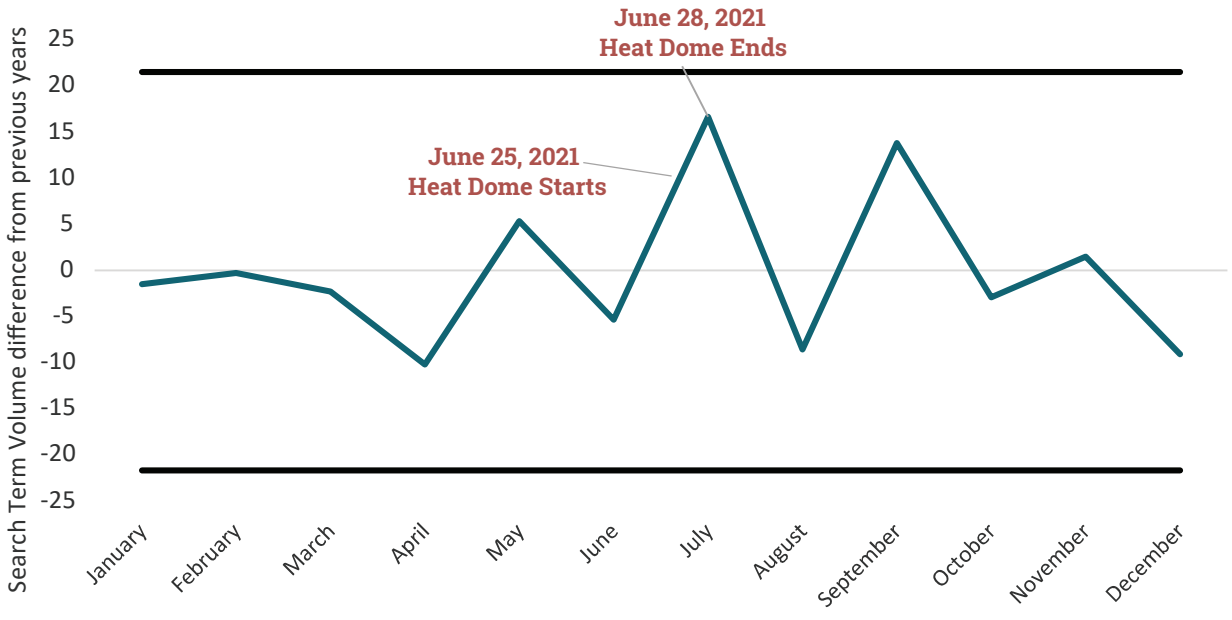
Second, we conducted informational interviews with emergency and community responders to get their impressions of how the extreme heat and wildfires affected community mental health.

During these interviews, lack of access to mental health resources and trauma were the most prominent themes identified.

Google trends summary

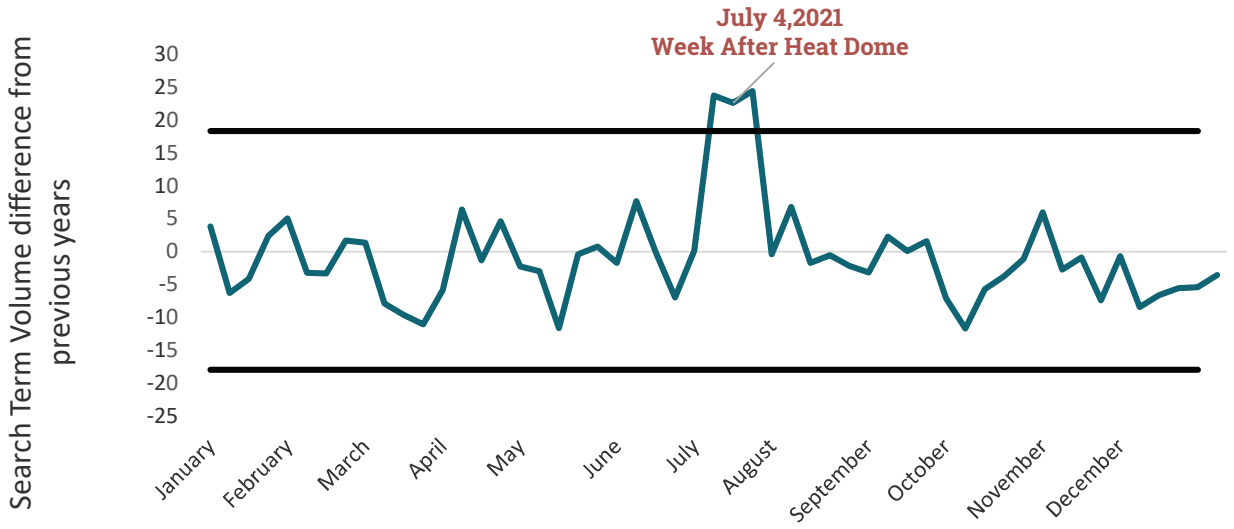
We collected data from the results of Google Trends queries of various terms related to mental health. We looked at how often during a week or a month people searched for specific terms. The time series chart shows the number of search terms occurring beyond what we expect based on average seasonal changes and general trends over the years. Within a week after the heat dome event in 2021, there was an increased search volume for trauma-related terms. As similar events continue to occur it is important to understand how mental health is affected and how we can better respond to mental health in the context of climate change.

Figure 31. Google search anomalies for "mental health services" in 2021



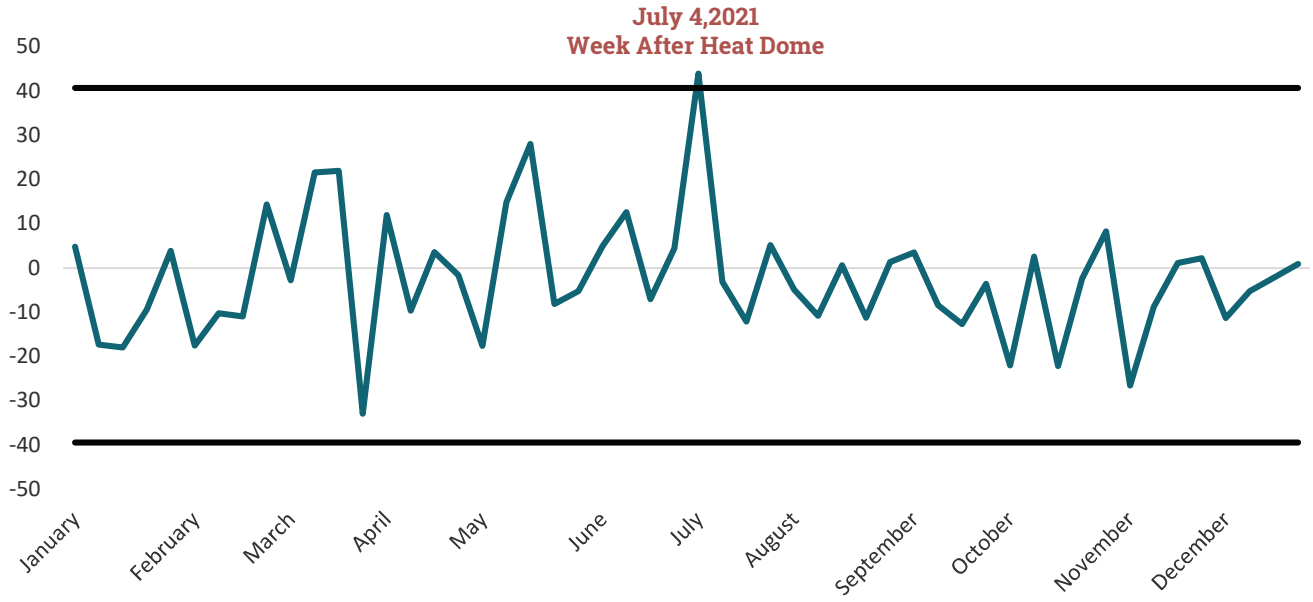
Dark black lines indicate daily search volumes with statistically significant differences from previous years

Figure 32. Google anomalies for "anxiety + anxious + panic + fear" in 2021



Dark black lines indicate daily search volumes with statistically significant differences from previous years

Figure 33. Google search anomalies for "stress + PTSD + reaction to acute stress + reaction to severe stress" in 2021



Dark black lines indicate daily search volumes with statistically significant differences from previous years

Data details

Search volumes on Google have been associated with mental health conditions such as anxiety in populations including self-reported unmet mental health needs and ED visits.[63,64] Search frequency was obtained from the Google Trends page for people with an IP address in the Portland area. Google search anomalies are counts that subtract average searches during the annual season and counts attributed to gradual increases or decreases over the entire period. Mental health services frequency includes the search term "mental health services." Anxiety search frequency includes search terms for "anxiety," "anxious," "panic," and "fear." Trauma and stress related frequency include search terms for "stress," "PTSD," "reaction to acute stress," and "reaction to severe trauma."

Community responder interviews summary

We conducted a qualitative analysis using semi-structured informational interviews with emergency first responders, mental health and disability service providers, and representatives from community-based organizations (CBOs) to better understand the mental health effects of climate change during the 2020 wildfires and 2021 heat dome event. We chose responders with lived experience and who worked with community members during these events.

We interviewed eight people for 45 minutes each. A team of four analysts conducted thematic analyses to determine which themes were mentioned most often during the interviews. The results below are categorized into the themes that were mentioned most often.

Overall theme frequency for key informant interviews

Access to mental health services

The most common theme identified in the interviews was lack of access to mental health services and lack of mental health providers. Interviews with emergency and mental health representatives emphasized the systemic issue of an overwhelming demand, with too little supply.

Emergency responder

I still think accessing mental health is probably our biggest issue. Either people don't know how, or they call 911. And when we respond as a fire agency, our knowledge of mental health providers isn't there... and then you add in a heat event or a cold event, or something like that, I think that the system on a whole just gets overwhelmed and makes it that much harder to access.

Mental health representative

People are having a very hard time finding therapists, finding prescribers, finding case managers to find the help that they need. The system, I think, is very fragile right now, because of the pandemic, and we've lost a lot of providers.

Systemic trauma

Trauma was the second most often mentioned theme during our interviews. Representatives from CBOs and disability services discussed the ongoing barriers as a result of systemic racism and traumas that can inhibit BIPOC communities from accessing mental health services. One CBO representative explained that communities who have had negative experiences with the criminal justice system, child welfare system, immigration, and other government agencies, are less likely to risk coming under the radar to seek services.

Disability services provider

BIPOC communities are also going to be ones that have the least amount of access to obtain mental health, or even health care due to, you know, it could be legal status, or maybe there's distrust in the system. But I've noticed, especially with like Latino communities, mental health just isn't something that is generally talked about.

CBO representative

Events that you're talking about created a deep sense of fear and kind of an ongoing trauma, or like piled on top of other ongoing traumas. We call it the multiple and overlapping traumas and oppressions is what we frequently refer to it as. There is a great sense of just not being able to feel safe or be grounded.

Compounding factors

The 2020 and 2021 climate events did not happen in a vacuum; compounding factors refer to the snowball effect of experiencing one traumatic event after another. During the timeframe discussed in the interviews, the tri-county region was living through the COVID pandemic, wildfires with heavy smoke, a heat dome, and racial tensions. The mental health effects of these compounding factors were widespread, but interviewees took notice of the exceeding impacts on BIPOC communities.

Special populations and vulnerabilities

We asked the responders if they perceived any special populations facing greater threats to their mental health and how those groups were impacted during the climate events in 2020 and 2021. The responders identified the unhoused/unsheltered, elderly, and Black, Indigenous, Latine/x, and People of Color (BIPOC) communities as being more vulnerable to experiencing mental health effects. One person pointed out that different types of climate events, like an ice storm or extreme heat, expose different types of vulnerabilities among communities or groups. One of the mental health representatives explained how the unhoused population had difficulties finding shelter from the heat and smoke, and many mental health facilities had to close, leaving them without access to essential mental health services.

Mental health representative

These are also folks, due [to] their symptoms, [which make it] more stressful to be around large groups of people or to be in congregate settings, and then, of course, we say, 'Well, you can go to a cooling shelter, or you can go here or there.' But sometimes that just adds another challenge for them because then they're around a lot of stimulation and a lot of people, and sometimes they don't feel safe. And of course, we have people with sometimes very deep trauma...I think it's just hard to find a safe place when it feels like the climate is conspiring against you.

A disability services representative spoke about the elderly population, many who live in social isolation and experience depression and stress related to lack of mobility, chronic health conditions, and disconnection from the community. This social isolation is exacerbated by heat and smoke events.

Government mistrust

Responders representing CBOs, emergency agencies and mental health providers frequently mentioned community mistrust of the government. Community-based organizations and mental health representatives brought up the trauma of poor experiences with government entities in the past that immensely impacts the stress level of communities when there is a need to interact with government entities during disasters.

CBO representative

That's one thing that came up during the wildfires. People thought if they stay, they would get in trouble and their kids could get taken away. But if they left, they'd be homeless and then their kids would be taken away... and the other thing is that also receiving services would draw attention to a family member in a family of mixed status...and so the fear for going anywhere as a family together and requesting services made them feel very vulnerable because they didn't know if everybody would be eligible to receive services, or if that would draw attention to, or they'd have to show proof.

CBO representative

During the heat wave...It's awesome that they have [cooling shelters], but many people don't feel comfortable going to places like that, and a lot of it could be even just triggering thinking that you have to. Like maybe you've had experiences in your life of the child welfare system, or things like that. And then you're taking your kids to a shelter.

On the other hand, emergency responders reflected on a preexisting trust that had been built with communities prior to the climate events, making it easier for government entities to enter communities to provide essential services and wraparound support.

Emergency responder

I wear a uniform and a badge, so there's instant fear when I walk out there. But because they see me out there all the time, and because I'm offering support services, and I'm with people that have built those relationships, and I'm giving water and Naloxone kits and information, I'm helping them learn about addiction and mental health and stuff, I think that trust spreads outward from each other versus coming from me... We put a positive spin and a trusting relationship on people in uniform.

Systemic trauma

Representatives from CBOs and disability services discussed the ongoing barriers as a result of systemic racism and traumas that can inhibit BIPOC communities from accessing mental health services. One CBO representative explained that communities who have had negative experiences with the criminal justice system, child welfare system, immigration, and other government agencies, are less likely to risk coming under the radar to seek services.

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BIPOC communities are also going to be ones that have the least amount of access to obtain mental health, or even health care due to, you know, it could be legal status, or maybe there's distrust in the system. But I've noticed, especially with like Latino communities, mental health just isn't something that is generally talked about.

Outreach and language services

A CBO representative working with Latinx communities discussed the need for more timely and robust language interpretation prior to and during climate events. They shared that the strong reliance on CBO's community health workers to disperse information in various mediums and languages "added strain on staff during already stressful times," mentioning that effective interpreting and translation requires an investment of time and energy that often takes them away from other important work with the community.

CBO representative

The vast majority of information comes out in English first and then it comes out in Spanish next and then it rarely even comes out in other indigenous languages... it creates fear and distrust in communities because they have to wait several days for information, and they know something important came out, but they don't know what it is.

A representative for Native American communities discussed the lack of outreach during the climate events.

CBO representative

It was actually hurtful. And the native community was left out. There was targeted outreach to many underserved communities who needed these resources. And then they just forgot. They forgot that there was also an urban native community.

Well-being of providers and responders

We asked community responders if providers and responders had the necessary resources to meet community needs and the challenges they faced.

Emergency responders shared that they are trained for these kinds of emergencies and that there is a protocol even when resources are short. One mentioned that this is the profession they chose and love, but that responders' family members' well-being is an important consideration during these events.

Sense of duty

During the climate events, interviewees explained how providers and responders went above and beyond their call of duty, many working overtime or showing up despite challenges in their home life.

Mental health representative

I had people who had to evacuate their homes and then were still not taking time off. They still were trying to help others, which is incredible.

Burnout

We heard from responders that although staff were dedicated to helping their community, the snowball effect of many crises and the sense of responsibility led to a huge mental toll and burnout.

Disability services provider

When we are hearing crisis after crisis after crisis all day it becomes very draining emotionally...We have our ebbs and flows, but there are some weeks where you just get hit with one thing after another. When we add that next layer on top of all of these crises with the heat and then the wildfires, it just burns you out more quickly.

CBO representative

I do want to say that people that work directly with communities that they identify with or are part of, it's extremely taxing, and there's like a sense of obligation and commitment. Sometimes our staff feels like they can't let things go – that they just have to keep going and keep going.

Resilience and community connection

We asked responders if they perceived any characteristics that support resilience in specific communities or among individuals. Across the interviews, community connection was identified as the most important influence on resilience against mental health impacts from climate events. Many interviewees brought up the significant interest, especially among older adults and cultural groups, for more ways to connect. This included going beyond the service of interpretation and creating spaces welcoming to all people and cultures.

CBO representative

Maybe having the shelter be welcoming and accessible. Maybe that would include having specific activities while people are there that help people reconnect to their cultural and identity specific things... there has to be more forethought in the shelters and a service point where somebody meets the agency to receive the service. You have to include more than just an interpreter.

Mental health representative

One of the things that we are trying to be better at is trauma-informed care... it's recognizing that almost every individual that you encounter has some event in their life or multiple events that were traumatizing in some way... And we're trying to focus on that, because resiliency after a crisis is only as good as the resiliency before the crisis happens.

CBO representative

Having connection to other people is really meaningful, knowing that you have support. If something does happen that there's people that you can reach out to that are reaching out to you that are checking on you. Especially for our elders.

Unhoused and unsheltered

There was strong reference to the unhoused and unsheltered community as being particularly resilient, despite their vulnerable circumstances.

Emergency responder

They trust one another a lot more than they trust anything that looks like authority or county or government... I think that a houseless person with almost nothing is usually the first person to help another houseless person with almost nothing versus, you know, the rich guy on the hill that has everything. And so, I think that really helps that group be resilient and be strong.

Mental health representative

This again applies to a lot of our unsheltered folks, who are very resourceful. And I think it was folks who could navigate resources that ended up having some of the better outcomes. Being able to know where they could go, what was available, that kind of information.

Recommendations

Community responders were asked if they had recommendations for improving community mental health support during climate events. They recommended the following:

1. Do not wait for people to come to you

An emerging theme called on agencies and community members to create lists of numbers to call and check in on those who are vulnerable – homebound people, those that are socially isolated, people with disabilities, the elderly, those with small children – neighbors, friends, family.

> **Emergency responder**
>
> *We need to go to people that don't have the ability to reach out and ask for help... because they don't know how to ask for help, or that there is help to ask for.*

> **Disability services provider**
>
> *There are not systems in place. That makes it difficult to serve people... And so I feel like it's just been like a react, learn. I just I didn't feel prepared.*

2. Proactive instead of reactive: A systems and structure approach

Having systems in place prior to climate events was a recommendation from nearly all interviewees. Some people recommended having an emergency operating center during climate events, systematically deploying peer support and mental health specialists, cross-training staff to know how to respond when there is need for mental health services, and to build better working relationships with community-based organizations.

3. Learn from past climate events

Along with the need to be proactive, some interviewees called for broken systems to work better during these kinds of emergent situations. One mental health representative brought up the difficulties that some individuals experienced trying to get emergency refills on psychiatric medications after having to flee their homes. Another example from mental health and CBO representatives was the need to hire and retain staff, especially bilingual staff, to meet community needs during future climate events.

> **Mental health representative**
>
> *We needed to have been doing this all along the last three years, and that would have had a different trajectory for our workforce crisis.*

Looking forward

Health outcomes of climate change are one of the primary ways communities feel the impacts of an increasingly warming planet. Emergency department visits from the September 2020 wildfires and fatalities from the June 2021 heat dome foreshadow what the region will experience during future climate events and provide stark contrast to trends documented in this report over the past five to ten years.

The time for action is now. Collective and coordinated strategies to create policies, systems, and conditions that reduce inequities and bolster resiliency across sectors will help reduce climate change-related health impacts. The tri-county health departments are accelerating adaptation efforts to meet the need created by complex and increasingly severe environmental threats. Ongoing collaboration with departments at the state level, as well as community groups and organizations at the local level, is critical in building informed and effective interventions. The 2021 public health modernization investment supports local and regional efforts in building environmental resilience and reducing health inequities.

This report provides a template for regional coordination and data assessment to understand the health impacts of climate change. It indicates the need for sustained resources in addressing air quality, wildfire, and extreme heat and cold impacts, as well as routine mental health monitoring and support systems to meet the need of increasing climate anxiety, trauma, and stress. Strategies to address climate change and its potential health impacts include:

- Developing actionable and timely climate change adaptation and mitigation plans with community and partners at the local level.
- Continuing to monitor health outcomes and strengthen data collection and analysis to understand the distribution of impacts across populations and geographies.
- Co-creating messages with community and culturally specific organizations to increase knowledge of climate change and capacity to mitigate its health impacts at the community level.
- Educating the public and policymakers on the health benefits of climate change mitigation strategies.
- Building cross-sector partnerships and interventions to address factors and practices that cause or exacerbate climate change.
- Securing funding to support climate and health adaptation efforts.

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