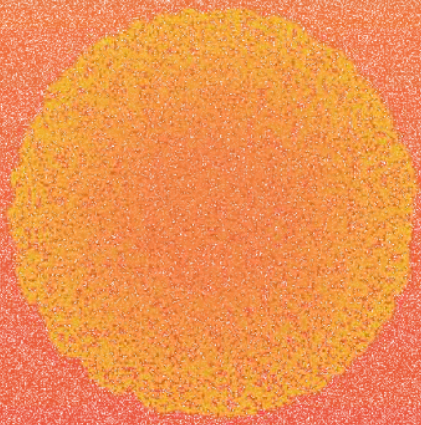
SUMMER 2023

HEALTH IMPACT REPORT
MULTNOMAH COUNTY



Version 1 - July 2024

Multnomah County

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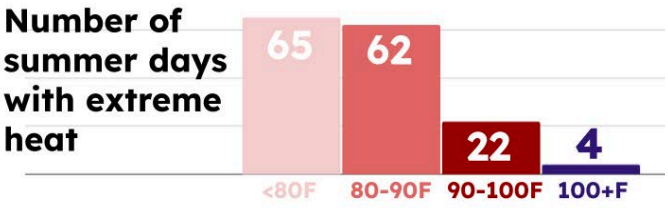
Report At a Glance

This report summarizes health impacts from summer conditions in Multnomah County. Information on illness and premature death come from multiple sources. "Summer" includes the date range of May 1st, 2023 through September 30th, 2023.

Data points:

- Temperature and Heat Risk
- Emergency Room and Urgent Care Visits
- Inpatient Hospital Discharges
- Mortality Trends



2023 was the **second warmest year on record** in Multnomah County, second only to the year of the historic 2021 heat dome.

Summer 2023 by the numbers:

45 days
of moderate heat risk
that affects most people sensitive to heat.

Highest count in the past 8 years.

141 visits
for heat-related illness
in emergency rooms and urgent care centers.

Fewer than during the heat dome, but still elevated compared to the 2018-2022 average.

3 lives lost
due to heat.

The third year in a row there has been fatalities due to heat. The annual average from 2018-2022 was less than 1.

Leading factors in emergency room or urgent care visits for heat-related illness included:

9% **Outdoor recreation.** Strenuous physical activity combined with time outside in the heat.

9% **Occupational exposure.** Commonly outdoor workers or workers inside in hot conditions like kitchens or industrial settings.

8% **Housing instability.** Lack of shelter or a stable place to cool off limits options to recover from long periods of heat exposure.

Executive Summary

The year 2023 was the second warmest year on record in the Portland metro area, behind the year of the historic 2021 heat dome.

There were 141 emergency and urgent care visits for heat-related illness (HRI). This is the third highest visit count since record keeping began in 2016.

- Certain demographic groups visited emergency rooms and urgent care centers for heat-related illness at higher rates than others:
    - American Indian/Alaskan Natives
    - Black and African Americans
- Black, Indigenous, and People of Color over the age of 65 experienced the highest rate of HRI visits among intersecting identities reviewed. They had a HRI visit rate of 58.5 visits per 100,000, which is almost three times the rate of the general population (17.4 per 100,000).

Average daily emergency room and urgent care visits significantly increased on days with a major or extreme heat risk index. On major heat risk days, an average of 5 additional HRI visits occur than on days with moderate heat risk, reflecting a 250% increase.

- While the chance of a HRI visit is significantly higher on days with a major or extreme heat risk index, the bulk (74%) of HRI visits occurred on days with a minor or moderate heat risk.

Leading contributing factors for HRI visits included outdoor recreation (9%), occupational exposure (9%), and housing instability (8%).

- Substance use, including alcohol, was a contributing factor for 4% of HRI visits.

There were 23 heat-related hospitalizations in 2023, which is higher than the 16 in 2022.

- Prior to the 2021 heat dome, which saw 52 heat-related hospitalizations, there were typically less than 10 heat-related hospitalizations each year.

There were three deaths that were caused by or related to heat, which is less than the seven in 2022.

- There were no heat-caused or related deaths from 2018-2020.

Recreational water use increases on warmer days. There were 15 emergency room and urgent care visits for near drowning cases, which is similar to counts in past years.

- Youth and infants were disproportionately represented in near drowning cases. A majority of cases (86%, n=12) were under the age of 18, and 40% (n=6) were under the age of 4. This reflects national trends.

Background

In 2021, a record-breaking heat wave occurred in the Pacific Northwest. The heat dome was unprecedented, classified as a one in a 10,000 year event (McKinnon & Simpson, 2022). In Multnomah County, the heat dome claimed 69 lives and prompted a surge in emergency room visits for heat-related illness (Multnomah County, 2022). Heat domes, and the number of people exposed to them, are projected to increase in the future (Zhang et al, 2023). This raises continued concern for community health amidst a changing climate.

The 2021 heat dome calls attention to the continuing trend that Oregon is experiencing historic summer temperatures. The number of days above 90F has increased significantly over the past decades. In the 1950's, Portland had on average 7.4 days a year when the temperature reached 90F. In the 2010's that average had increased to 17.3 days a year, and between 2021-2022 was 27.

The number of extremely warm nights has also increased. In the 1950's there was on average less than one night when temperatures did not lower to below 65F. By the 2010's overnight lows above 65F had increased to an average of 5 nights a year, and was an average of 17 nights between 2021 and 2022 (Fleishman et al, 2023).

Extreme temperatures can lead to a wide range of preventable types of illness and death. Heat exposure can cause a variety of heat-specific illnesses, like heat cramps, heat exhaustion, or heat stroke. It can also make existing conditions worse, like cardiovascular disease (Liu et al, 2022) and mental health conditions (Thompson et al, 2018).

Extreme temperatures in Oregon are expected to continue to increase in severity and frequency (Fleishman et al, 2023), as well as heat-related health burden, lost labor productivity, and increased health care costs for treatment (Wald, 2019).

Purpose

Evaluation of heat-related health trends is an important strategy to inform climate intervention and adaptation. This should happen for both extreme heat waves and entire warm seasons (Randazza et al, 2023). **This report combines illness and death data from multiple sources to summarize health impacts from warm conditions in Multnomah County. The evaluation period is from May 1st, 2023 through September 30th, 2023.** This analysis also examines disparities between demographics and risk factors for vulnerability.

Extreme Heat and Health Outcomes

Heat-Related Illness. Heat-related illness (HRI) includes a wide range of conditions and symptoms that stem from continuous exposure to warm temperatures. The body's sweat response to maintain a cool body temperature drains water and salt levels. This leads to dehydration, changes in blood pressure, and stress on other organ systems like the heart and brain (Sezekley et al, 2015).

All of the conditions listed on the right are reflected in HRI trends in summer 2023.

Common Heat-Related Illnesses

- ***Heat cramps*** result from strenuous exercise and dehydration, and causes muscle pain or spasms.
- ***Heat syncope*** is dizziness or fainting from heat exposure.
- People experience ***heat exhaustion*** after excessive heat exposure and sweating. Symptoms include nausea, heavy sweating, headache, dizziness and a fast or weak pulse.
- The most severe HRI is ***heat stroke***. This occurs when the body can no longer maintain a healthy temperature. Heat stroke includes heat exhaustion symptoms, plus a body temperature of 103 degrees or warmer, a strong, fast pulse, warm skin, and losing consciousness (CDC, 2017).

Groups that may be more susceptible or exposed to heat and associated health outcomes include:

- Older adults
- Infants and children
- People with medical conditions
- Pregnant people
- Athletes
- People experiencing houselessness or housing instability
- Workers who work outdoors or in settings with limited cooling or exposure to heat
- People without access to adequate air conditioning at home

Near Drowning. As the weather gets warmer, people tend to spend more time around water for recreation. This increases water exposure and risk of drowning. Drowning is the process of not being able to breathe due to water submersion. It is not always fatal. Non-fatal drowning can have a range of mild to severe resulting health outcomes. These include discomfort breathing or swallowing, continued mental distress, long term disability and brain injury. Children ages 1-4 experience the highest drowning rates, most commonly in swimming pools (CDC, 2024).

Data and Outcomes

We define the Summer 2023 season as May 1st, 2023 through September 30th, 2023, when temperatures are usually warmest in the County. These months are also the inverse of the season Multnomah County monitors for cold-related health impacts (October through April). *Complete methods and data limitations can be found in Appendix A.*

Source	Description	Variables
National Weather Service (NWS)	The NWS provides weather and climate information to inform decision-making to protect community well-being.	• Daily maximum temperature • Daily average temperature • Heat risk index
Oregon ESSENCE	The Oregon ESSENCE database tracks visits to all local emergency departments and some urgent care clinics. Records include diagnoses, demographic information, and additional context from triage notes.	• Heat-related illness visits • Near drowning visits • All-cause visits
Inpatient Hospital Discharge Data	This data includes information about residents who received inpatient care at a hospital. This includes why they were admitted and the care they received.	• Heat-related hospitalizations
Vital Records	These records are the most stable source of information about death trends. It includes cause of death and some demographic information. Data are limited to deaths in Multnomah County residents only. *Numbers for 2023 are considered provisional and subject to change.*	• Hyperthermia deaths • All-cause deaths • Heart disease deaths • Cerebrovascular disease deaths • Hypertension and renal disease deaths

Weather Conditions in Summer 2023

Summer Temperature Trends. The year 2023 broke several records for high temperatures. It was the second warmest year on record in the Portland area behind the year of the historic 2021 heat dome.

- The county experienced the warmest May on record with a streak of eight days above 80 degrees starting on May 12th. That period included the warmest Mother's Day on record with a high of 92 degrees.

- June and July were generally warm. July was the fifth warmest July on record.

- August experienced a four day stretch of 100+ degree days, making it the warmest August on record. Multnomah County declared a State of Emergency from August 13th-16th due to the dangerously hot conditions (NWS, 2024).

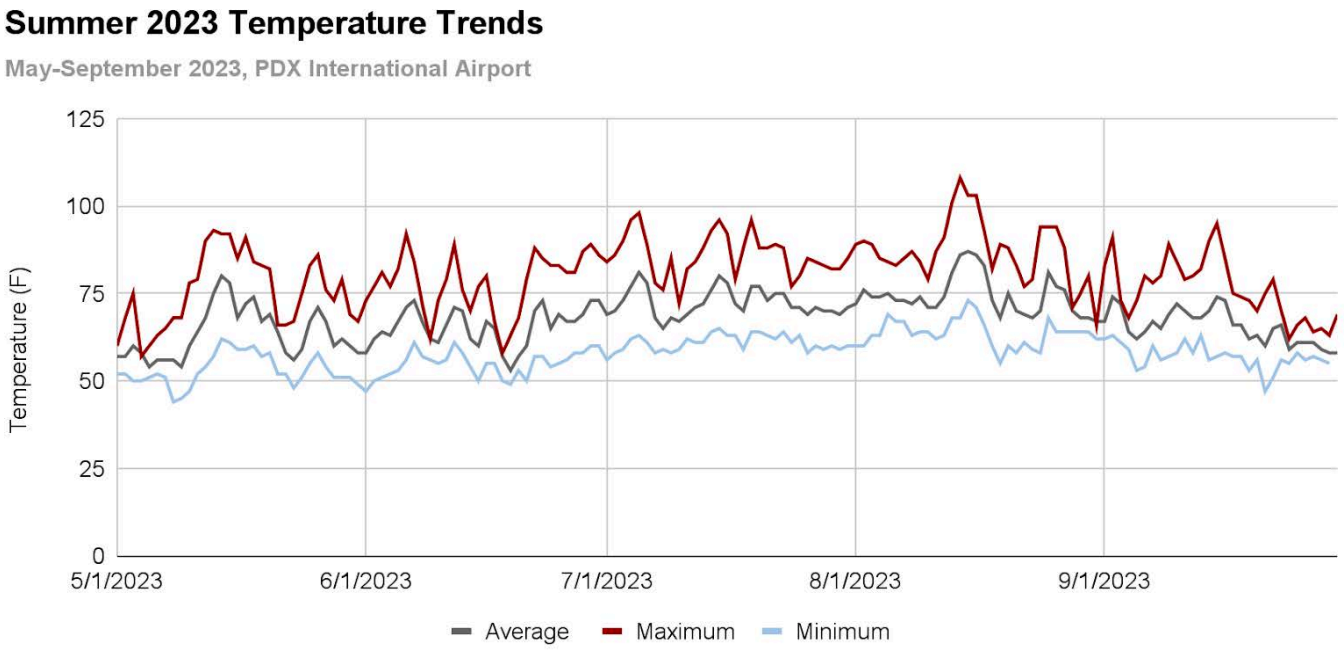
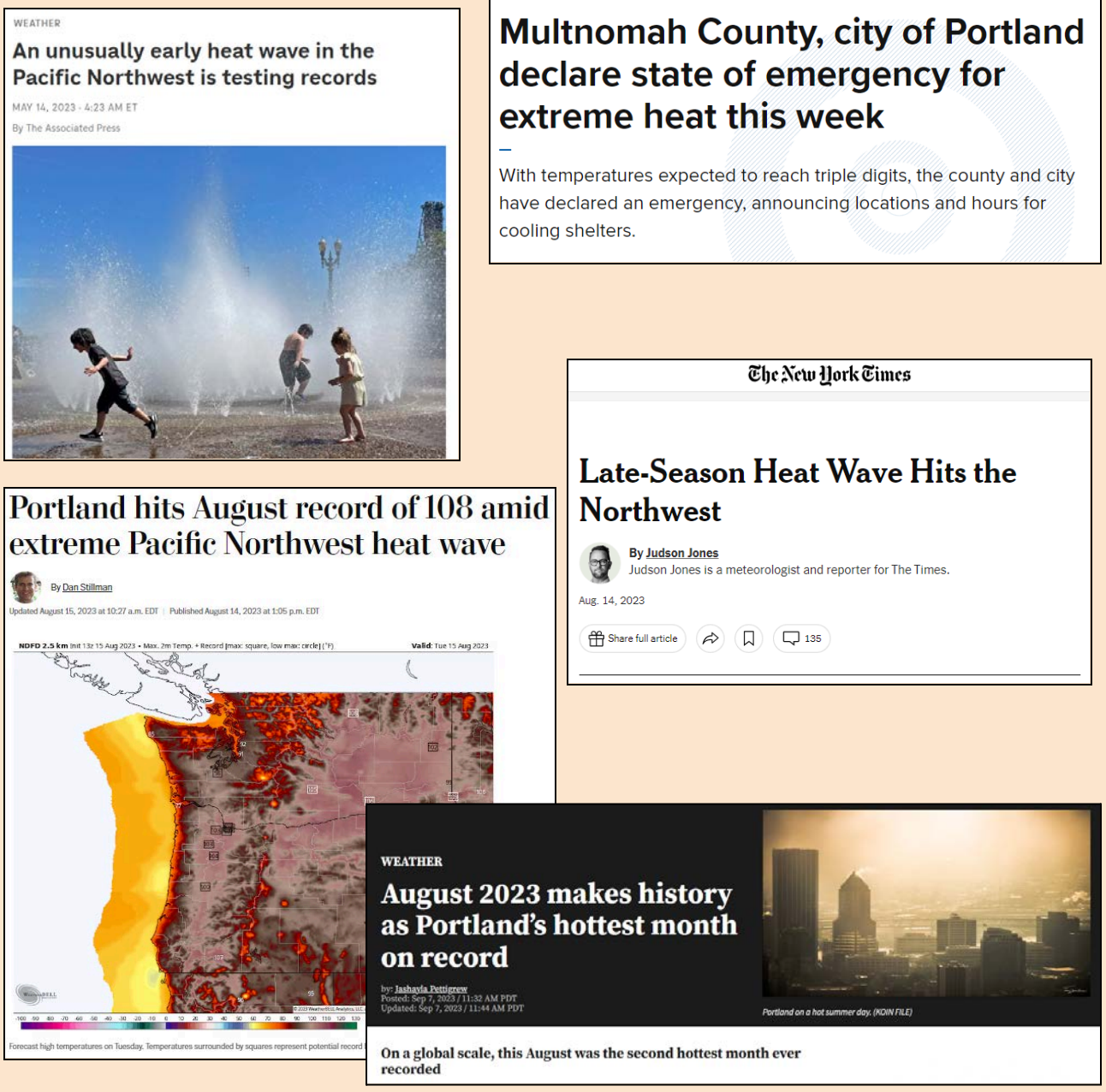


Figure 1. Average, minimum, and maximum temperatures in Multnomah County, Summer 2023.



WEATHER

An unusually early heat wave in the Pacific Northwest is testing records

MAY 14, 2023 · 4:23 AM ET

By The Associated Press

SEVERE WEATHER

Multnomah County, city of Portland declare state of emergency for extreme heat this week

With temperatures expected to reach triple digits, the county and city have declared an emergency, announcing locations and hours for cooling shelters.

The New York Times

Late-Season Heat Wave Hits the Northwest

By Judson Jones

Judson Jones is a meteorologist and reporter for The Times.

Aug. 14, 2023

Share full article

135

Portland hits August record of 108 amid extreme Pacific Northwest heat wave

By Dan Stillman

Updated August 15, 2023 at 10:27 a.m. EDT | Published August 14, 2023 at 1:05 p.m. EDT

Forecast high temperatures on Tuesday. Temperatures surrounded by squares represent potential record

WEATHER

August 2023 makes history as Portland's hottest month on record

by: Jashayla Pettigrew

Posted: Sep 7, 2023 / 11:32 AM PDT

Updated: Sep 7, 2023 / 11:44 AM PDT

Portland on a hot summer day. (KOIN FILE)

On a global scale, this August was the second hottest month ever recorded

Figure 4. Headlines covering extreme summer weather in Multnomah County, summer 2023.[1] [2] [3] [4] [5]

[1] https://www.washingtonpost.com/weather/2023/08/14/pacific-northwest-heatwave-oregon-washington/
[2] https://www.kgw.com/article/weather/severe-weather/multnomah-county-cooling-shelters/283-00c4d324-4f0d-4990-9ef6-083a713309be
[3] https://www.koin.com/weather/august-2023-makes-history-as-portlands-hottest-month-on-record/
[4] https://www.nytimes.com/2023/08/14/us/heat-wave-northwest.html
[5] https://www.npr.org/2023/05/14/1176058301/an-unusually-early-heat-wave-in-the-pacific-northwest-is-testing-records

Days Above 80F. There were 88 days above 80F in summer 2023, one more day than the summer of the 2021 heat dome. In the five years preceding the 2021 heat dome, there were on average 68 days above 80F. The count of days above 80F during the 2023 warm season was 20 days higher than the 2016-2020 average. This is a 29% increase, almost three weeks, of warmer weather.

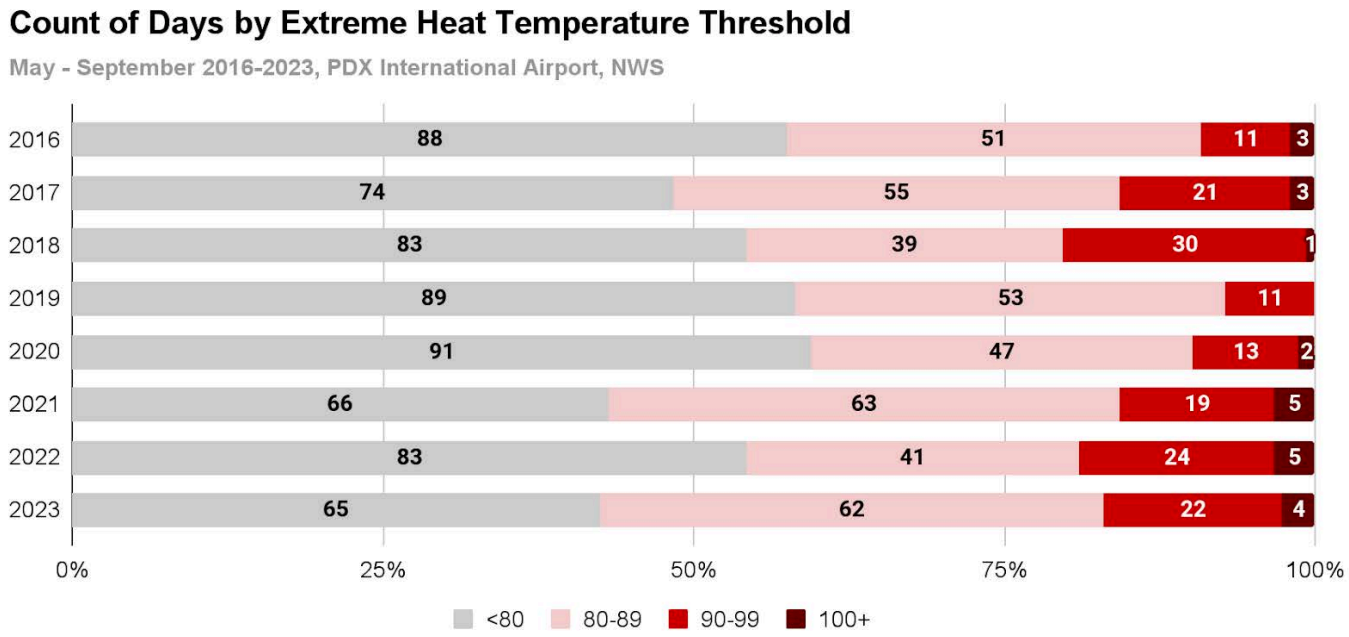


Figure 2. The overall count of days above 80 degrees from May through September increased in 2021 and 2023 compared to the average from 2016 through 2020.

Heat Risk Index. Humidity also plays a role in bodily response to heat and health outcomes. More humid conditions make it more difficult for sweat to evaporate, and the warmer the body feels. The National Weather Service calculates a **Heat Risk Index** value that accounts for both temperature and humidity to generate a score of zero through four that communicates risk. The Heat Risk Index also takes into account:

- Time of year
- Duration of heat across multiple days
- Differences between overnight and daily temperatures.

Learn more about the National Weather Service Heat Risk tool.

Table 1. National Weather Service Heat Risk Index Categories.

0 Green Little/No Risk	1 Yellow Minor Risk	2 Orange Moderate Risk	3 Red Major Risk	4 Purple Extreme Risk
Little to no risk from expected heat.	Affects primarily those extremely sensitive to heat. In particular when they are outdoors without effective cooling and/or adequate hydration.	Affects most who are sensitive to heat. Especially those without effective cooling and/or adequate hydration.	Affects everyone who does not have effective cooling and/or adequate hydration.	This level affects anyone without effective cooling and/or adequate hydration. It is caused by a rare and/or long duration heat with little to no overnight relief.

In summer 2023, there were 45 days with moderate risk, four days with major risk, and one day with extreme risk. This was the highest count of days with a Heat Risk Index value of two or above over the past eight years. This continues a post-heat dome trend of temperatures reaching extreme risk at least once in the summer.

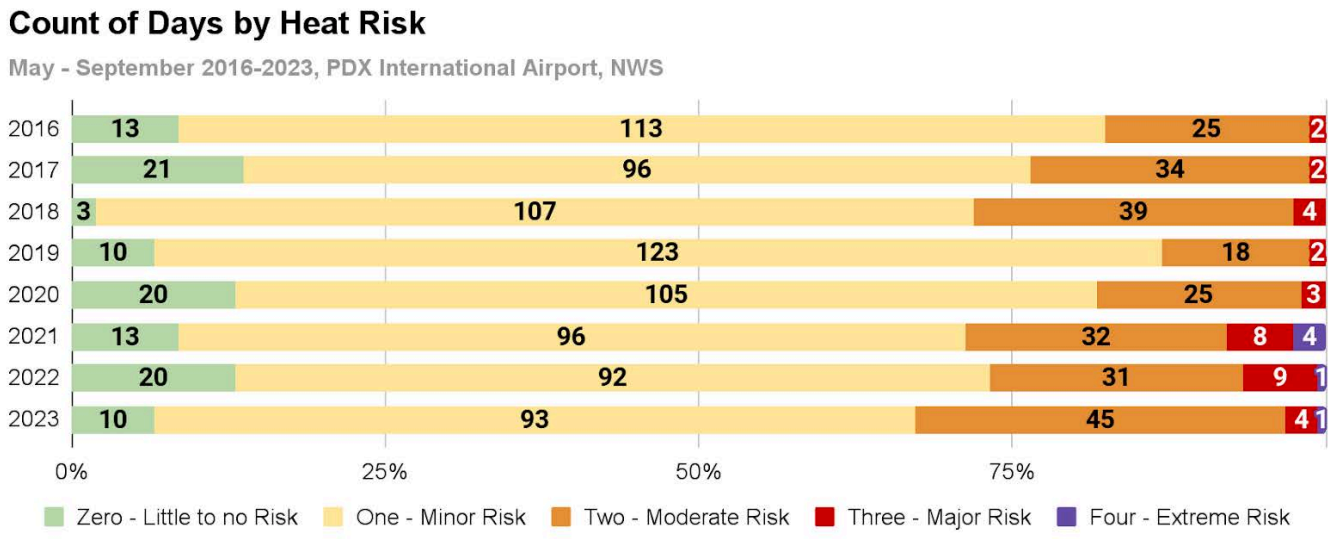


Figure 3. Extreme heat risk continued to appear during the warm season in 2023.

Air Quality Index. Wildfire smoke is becoming an increasingly common warm season concern in Oregon. Wildfire season is typically from late July to early September, but has expanded to mid-July through October (OR DEQ, 2023). Inhalation can lead to a wide range of respiratory and cardiovascular effects. Effects can be as mild as coughing and sneezing, or as severe as impaired lung function, heart attacks, or stroke. A one ugm^3 increase in wildfire specific $PM_{2.5}$ can lead to a .06% increase in cardiovascular hospitalizations, a .25% increase in respiratory hospitalizations, and a .36% increase in respiratory emergency department visits (Gould et al, 2024).

Oregon experienced a mild wildfire season in 2023. Due to increased investments in wildfire response and a more aggressive response strategy, only 16% of the state 10-year acres-burned average was burned (ODF, 2023).

Smoke from wildfires can contribute to increased Air Quality Index (AQI) values. The AQI is a measure of air pollution and related health risk. Scores above 100 (Orange) indicate that pollution levels may affect sensitive groups. There was only one day during the 2023 warm season that reached an AQI value that made conditions unhealthy for sensitive groups. For this reason, this report focuses primarily on conditions related to heat.

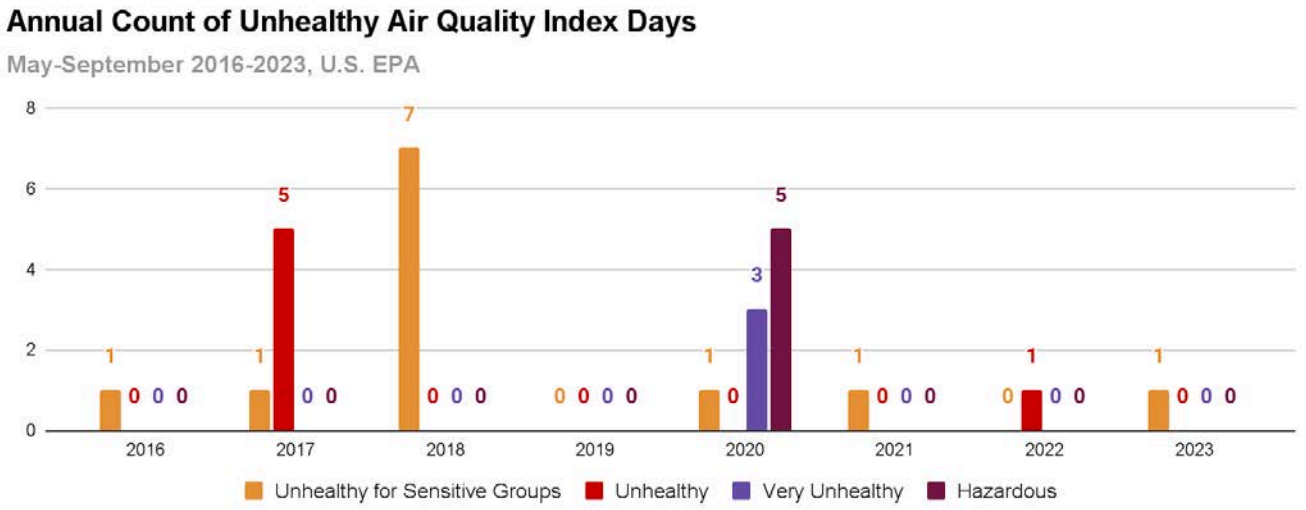


Figure 4. A mild wildfire season contributed to fewer unhealthy air quality days in 2023 compared to past years.

Emergency Department and Urgent Care Visits

Heat-Related Illness

Visits. There were 141 emergency and urgent care visits for Heat-related illness (HRI) during the 2023 summer. These visits made up .001% of all visits during that period (n=185,648). This was the third highest visit count for HRI since record keeping began in 2016. The count is lower than the past two years, but still elevated compared to the 2018-2022 5 year average (128 visits).

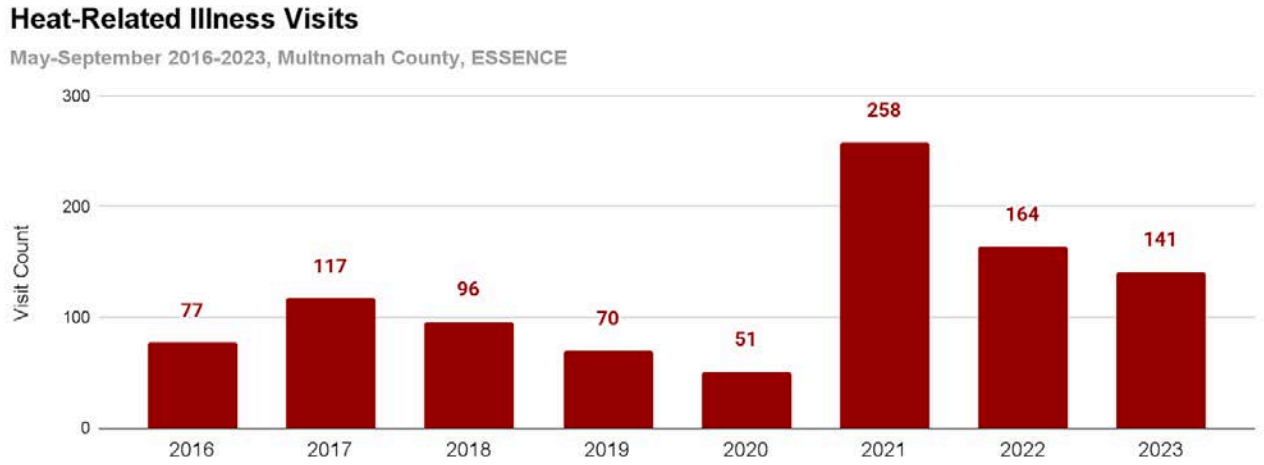


Figure 5. Annual counts of heat-related illness visits continue to remain elevated after summer 2021.

The overall crude rate of HRI visits per 100,000 population was 17.4. This is a 44% decrease in comparison to the year of the heat dome in 2021. However, the 2023 rate was still a 67% increase compared to the five-year average HRI visit rate between 2016 and 2020 of 10.4 before the heat dome, and a 10% increase from the most recent five-year average rate between 2018 and 2022 of 15.8.

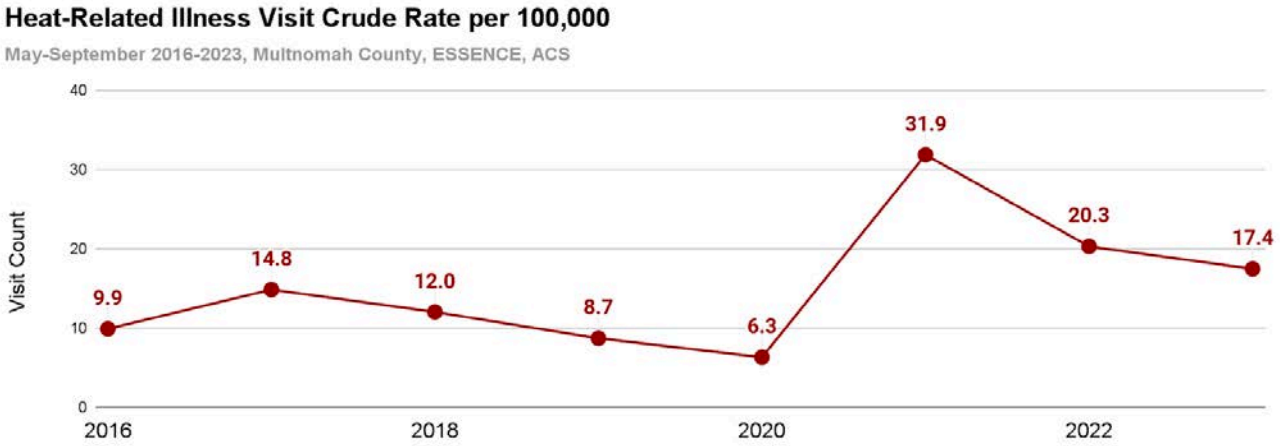


Figure 6. Annual rates of heat-related illness visits, summers 2016-2023.

Weekly Visit Trends. The first cluster of HRI visits (about 16% of visits, n= 22) occurred during the record high temperatures for May from the 13th through the 20th. A second spike in visits (5%) occurred shortly after July 15th when temperatures reached 96F. Roughly one third of HRI visits (30%, n=43) occurred during the week of August 14th, when temperatures exceeded 100 degrees for several days. This was the only period during the summer when the heat risk index reached 3 and 4, indicating major and extreme heat risk.

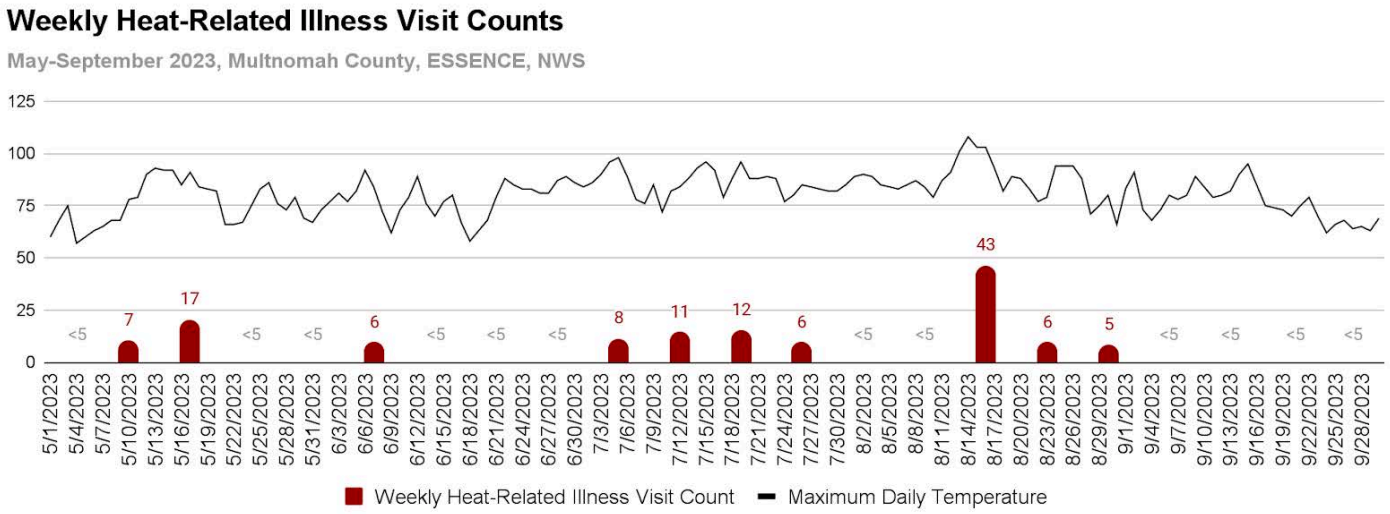


Figure 7. Weekly heat-related illness counts against daily maximum temperatures and heat risk index

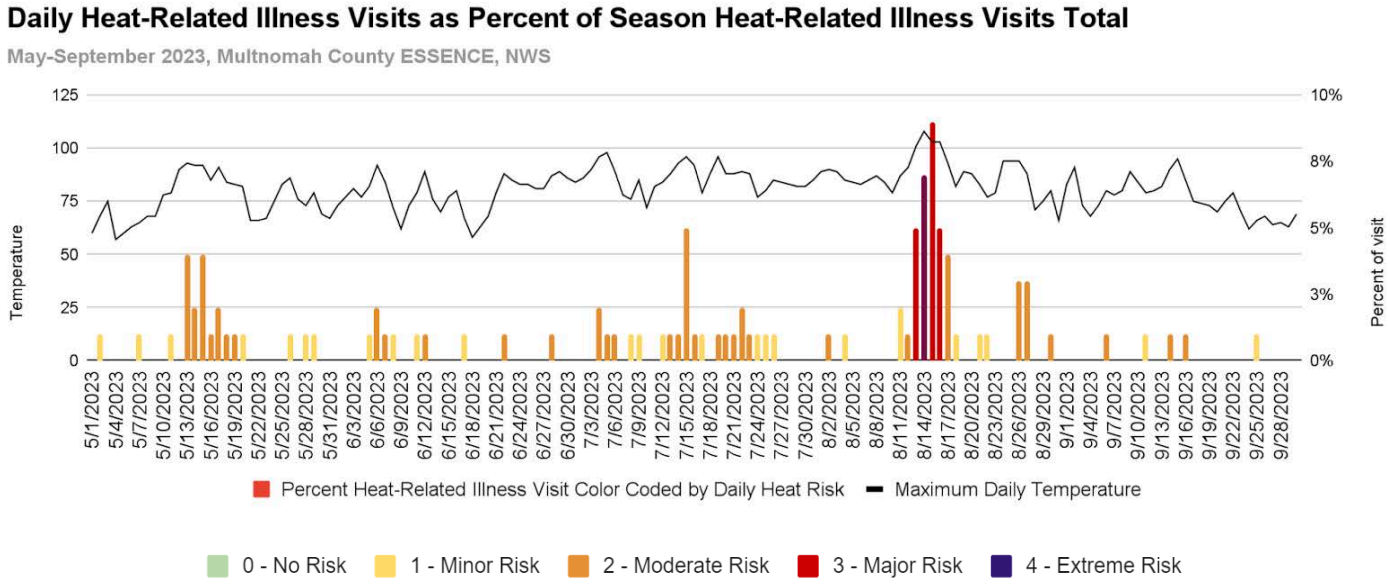


Figure 8. Some of the largest percentages of daily visits occurred when there was major or extreme heat risk. No visits occurred when there was no heat risk.

Facility Type. A majority of HRI visits occurred at emergency rooms (83%, n=117). This was higher than the percentage of emergency room visits for all-causes (66%) during the study period. This indicates that HRI treatment could necessitate a higher level of care and require a greater degree of health care resources. There was no clear trend in types of chief complaints and admittance to either an emergency room or urgent care visit. Triage note review revealed that ambulances transported 33% of HRI visits (n=47).

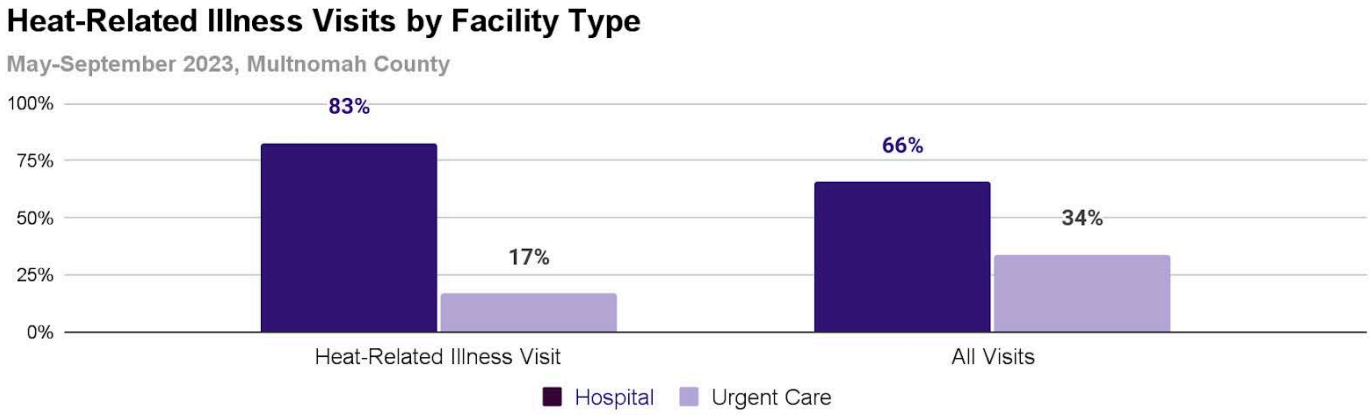


Figure 9. Percent of heat-related illness and all-cause visits at hospital emergency rooms vs. urgent care centers.

Time of Visit. Forty-five percent of HRI visits (n=64) occurred between 12p and 6pm, and over 80% of visits occurred between 12p and 12a (n=116). This aligns with the warmest part of the day in Multnomah County, between 2p and 8p. HRI visits were more skewed toward the afternoon in comparison to all-cause visits, which were more evenly distributed throughout the 12a-12p time frame.

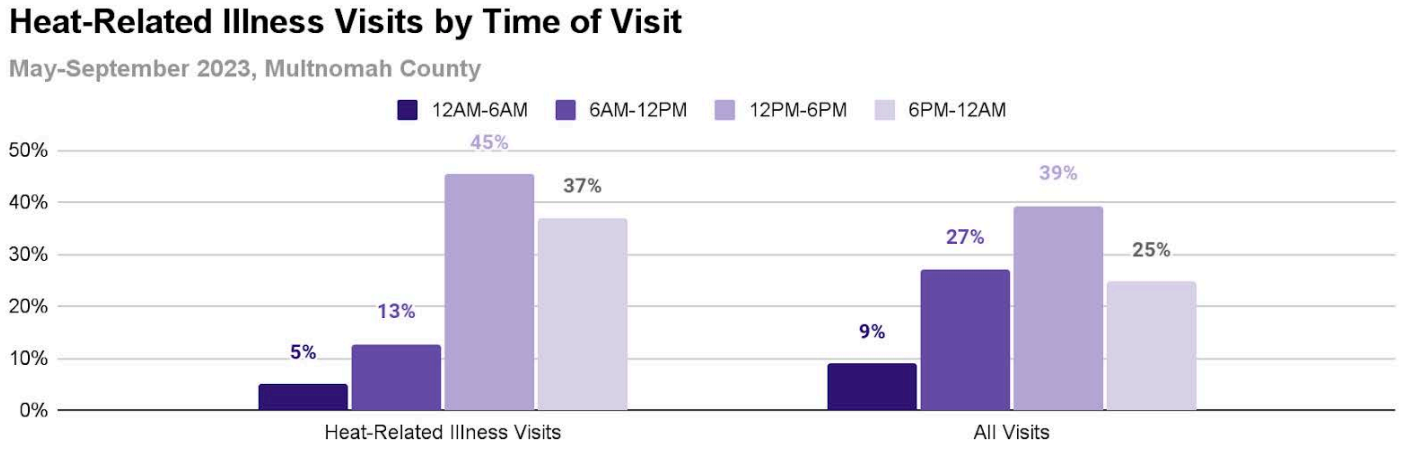


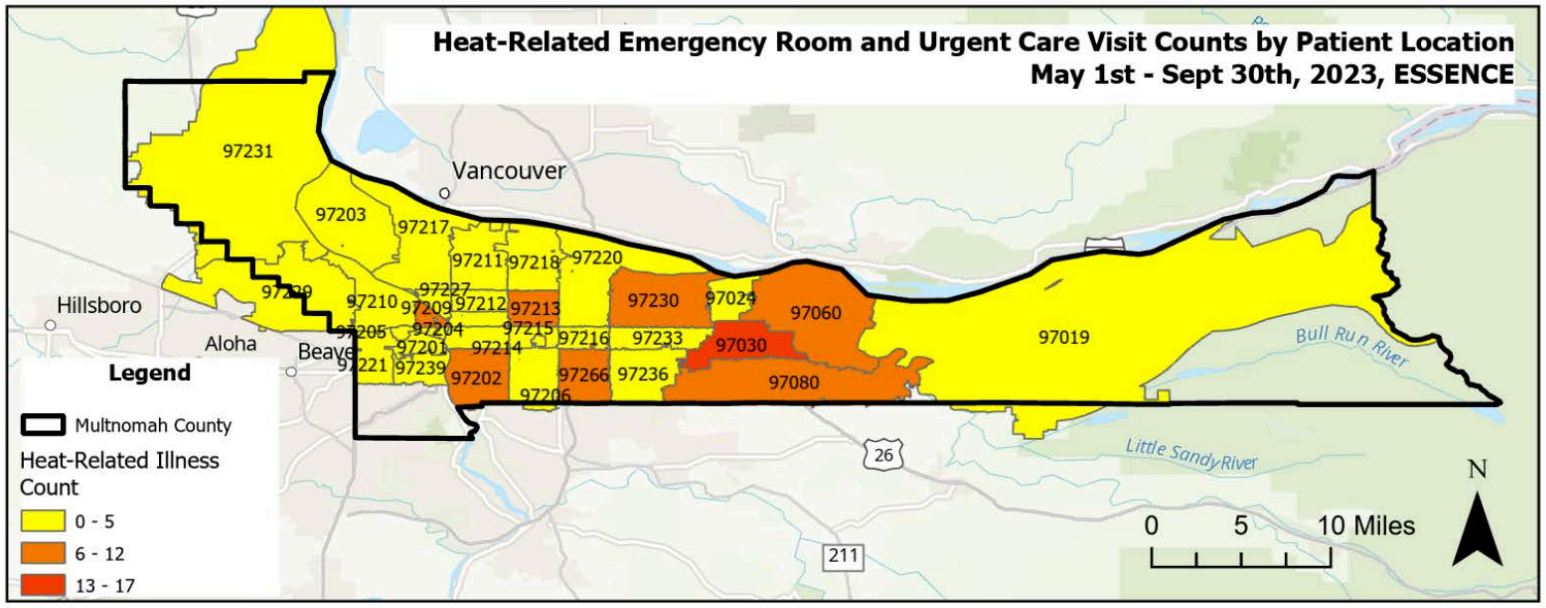
Figure 10. Percent of heat-related illness and all-cause visits across 6-hour time windows.

Heat-Related Illness Location by Zip Code. Increased urban development and activity can generate, store, and re-release heat in ways that amplify neighborhood temperatures. Less green space and tree canopy reduces cooling effects, further amplifying temperature. These higher temperature areas are known as urban heat islands (UHI). UHIs are not evenly distributed throughout cities. Different development patterns, uses, and design features influence how heat acts. These factors affect how heat is reflected, absorbed, and released in any given area of a city (Kim & Brown, 2021). Adaptive capacity, like income and housing availability, influence where in a city someone lives. Additionally, legacies of racial discrimination and residential segregation influence where cooling features like parks and denser tree canopy are located (Wilson, 2020). These in turn affect what degree of urban heat someone may be exposed to. Together these two factors influence the geography and spatial distribution of heat-related illness and create heat-related health inequities.

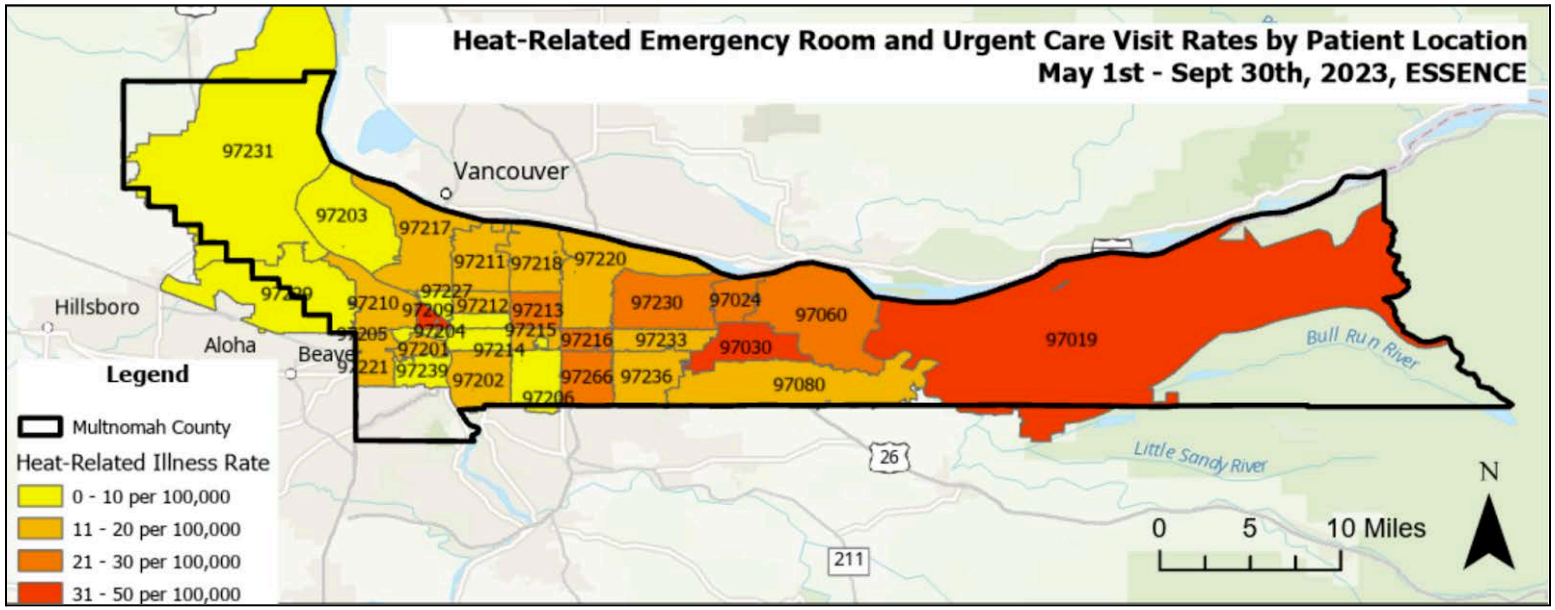
The highest counts of heat-related illness visits were from patients who reside in zip codes 97030, 97209, and 97266. The zip codes with the highest crude rates per 100,000 were 97209, 97030, and 97109. Visits from 97209 (downtown Portland) and 97030 (Gresham) occurred at over twice the rate of the county overall.

Table 2. Counts and Crude Rate per 100,000 of Heat-Related Illness by Zip Code

Rank	HRI Count	HRI Crude Rate per 100,000
1	97030 (n=17)	97209 (48.9)
2	97209 (n=10)	97030 (43.6)
3	97266 (n=9)	97019 (34.9)
4	97230 (n=9)	97216 (28.6)
5	97206 (n=9)	97060 (27.1)



Map 1. Counts of heat-related illness visits by zip code.



Map 2. Crude rates per 100,000 of heat-related illness visits.

Heat-Related Illness and Heat Risk. Almost three-fourths of HRI visits (74%, n=104) occurred on a day with a Heat Risk Index value of 2 or less. Half of HRI visits (51%, n=73) occurred on a day with a Heat Risk Index value of 2 (moderate risk). There were four days with a Heat Risk Index value of 3, and one with a value of 4. These five days accounted for 26% (n=37) of HRI visits.

A majority of days during the study period had Heat Risk Index values of 1 or 2. This helps explain why a majority of visits occurred when risk was less extreme. Daily average HRI visits increased as Heat Risk Index values increased. Daily average HRI visits increased by five visits (250% increase) from a Heat Risk Index increase from two to three, and another three visits (43% increase) from a Heat Risk Index increase from three to four.

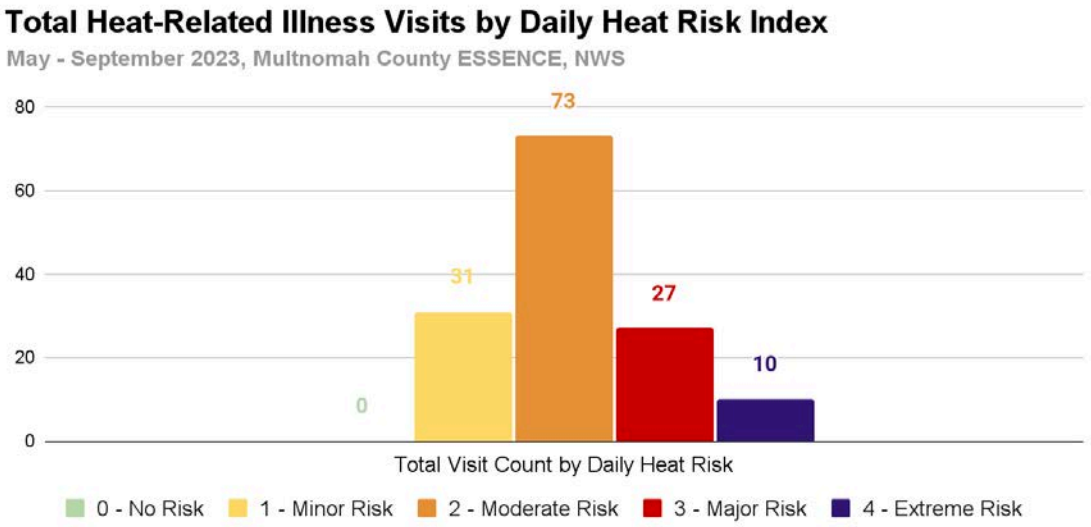


Figure 11. A majority of HRI visits occurred on moderate heat risk days, largely because these are the most common risk level experiences throughout the warm season.

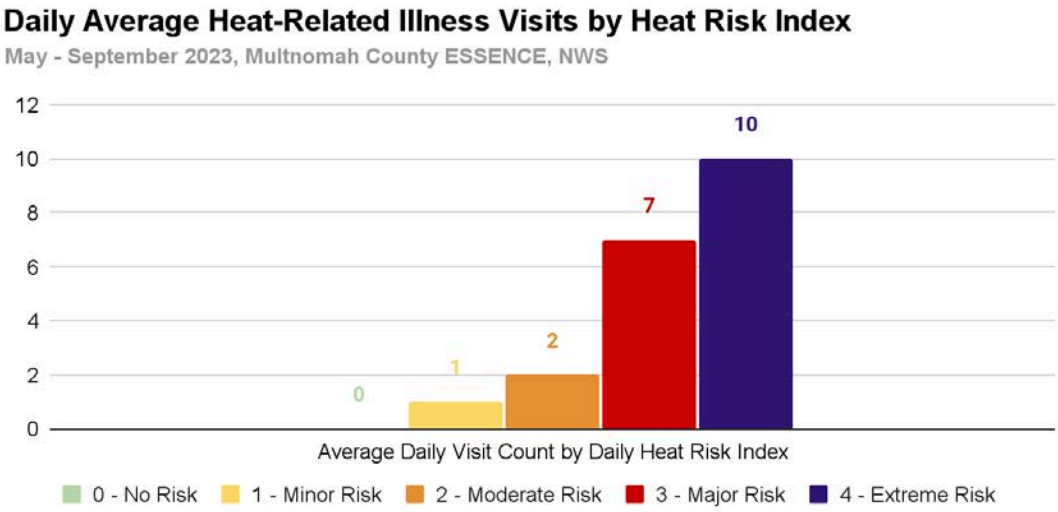


Figure 12. Days with extreme heat risk experienced the highest daily average HRI visits.

Risk Factors

Review of visit triage notes revealed the following themes in risk factors and heat exposures:

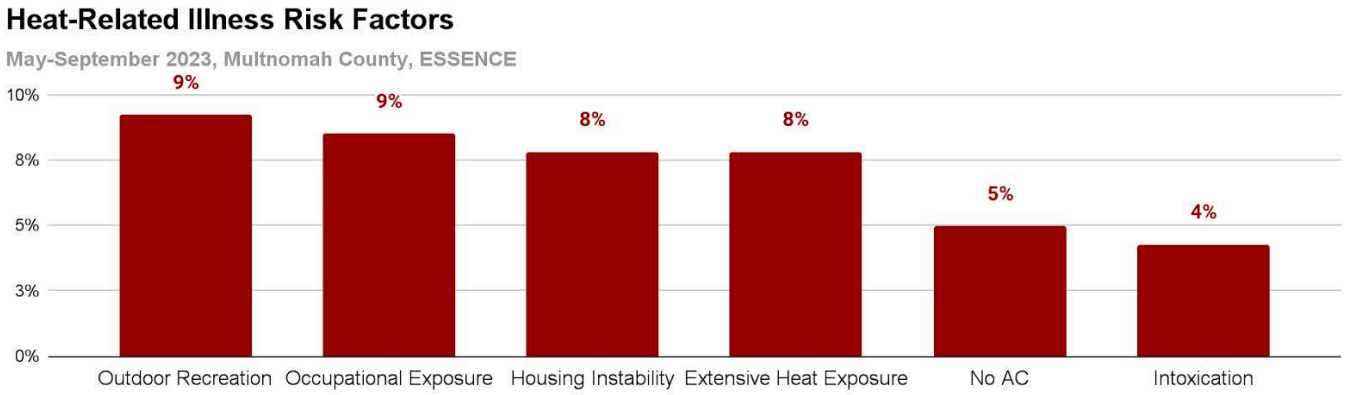


Figure 13. Frequency of risk factors and contributing causes for heat-related illness.

Table 3. Descriptions of risk factors and possible contributing causes of heat-related illness. Categories are not mutually exclusive.

Risk Factor	Description
Outdoor Recreation (9% of visits, n=13)	The patient was engaging in some form of outdoor physical activity. Examples include participating in a sporting event, spending time at a river or pool, or gardening.
Occupational Exposure (9% of visits, n=12)	The patient was exposed to heat while at work. These occurred in both outdoor professions, like construction or delivery, as well as indoor professions, like food preparation or manufacturing.
Housing Instability (8% of visits, n=11)	The patient was experiencing some form of housing instability, either living on the streets, in a vehicle, or in between stable housing situations. This instability led to increased exposure to heat.
Extensive Sun Exposure (8% of visits, n=11)	The patient indicated that they had spent an extended period of time (several hours or more) outdoors in the sun.
No A/C (5% of visits, n=8)	The patient did not have A/C in their home.
Intoxication (4% of visits, n=7)	The patient consumed some form of intoxicant, either alcohol or another substance.

Demographics[6]

HRI patients tended to be white (72%, n =101), male (57%, n=80), non-Hispanic (91%, n=129), and between the ages of 18 and 44 (42%, n=59). The general population in Multnomah County visited the emergency room or urgent care center for HRI at a rate of 17.1 people per 100,000 during the 2023 warm season. Three demographic groups visited emergency rooms and urgent care centers at higher rates than the general population:

- People over the age of 65 years (30.7)
- American Indian/Alaskan Natives (23.9)
- Blacks and African Americans (22.8)

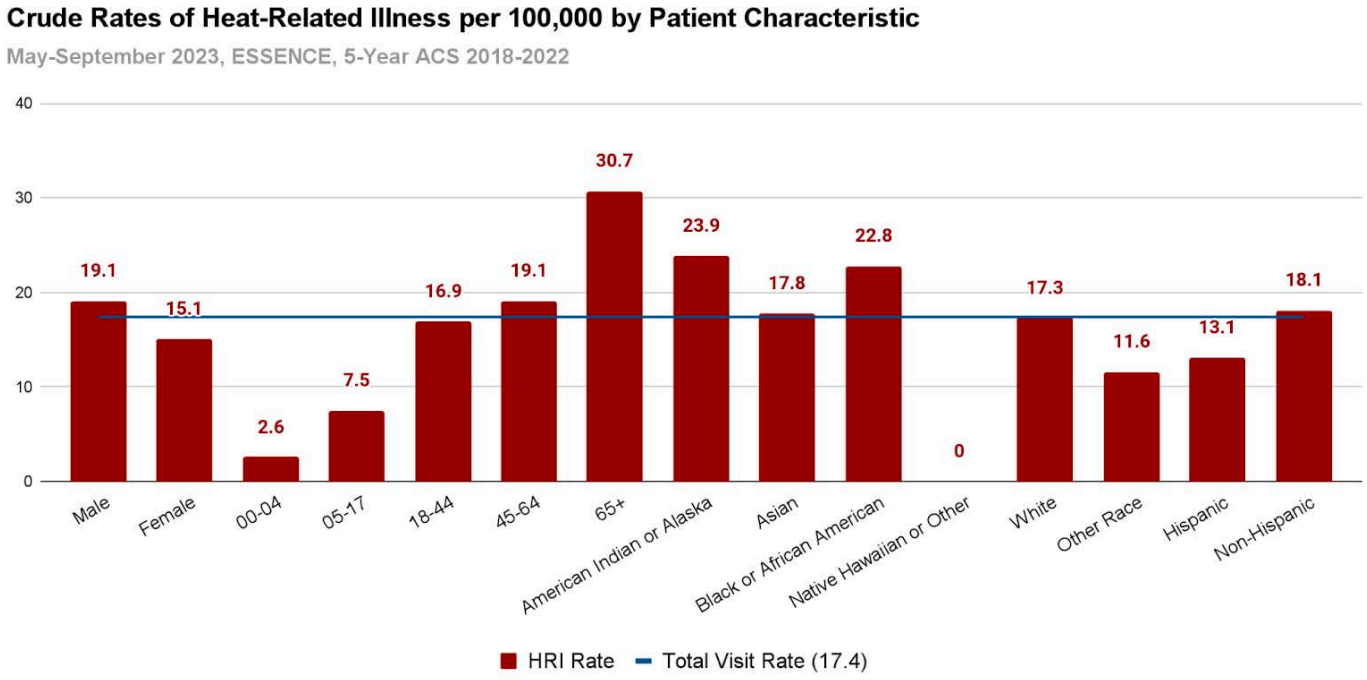


Figure 14. Rates of heat-related illness for each demographic group compared to the overall county rate.

[6] Demographic information is reported by health care providers and some visit records did not have race recorded (17/141 records [13%]). An expanded demographic analysis is available in Appendix B.

Intersectionality in Heat-Related Illness. People can have multiple identities defined by their age, gender, race, and more. Intersectionality refers to how social identities overlap and interact with various systems of oppression to affect health outcomes. Groups that experience multiple forms of racism, sexism, or classism may not only face multiple challenges accessing resources, but new ones formed by the combinations of barriers they face. Climate change is another complex system that adds another layer of threat and barrier that can compound existing inequities (Versey, 2021).

We examined how race intersected with age and sex in HRI visits. Black, Indigenous, People of Color (BIPOC) over the age of 65 experienced the highest rate of HRI visits at 58.5 visits per 100,000 (n=12). This is nearly twice the rate of all individuals over the age of 65 (30.7 per 100,000, n=35), and almost three times the rate of the entire study sample (17.4 per 100,000, n= 141). White women experienced twice the rate of HRI visits as Black, Indigenous, women of Color. There were no significant differences between race for men.

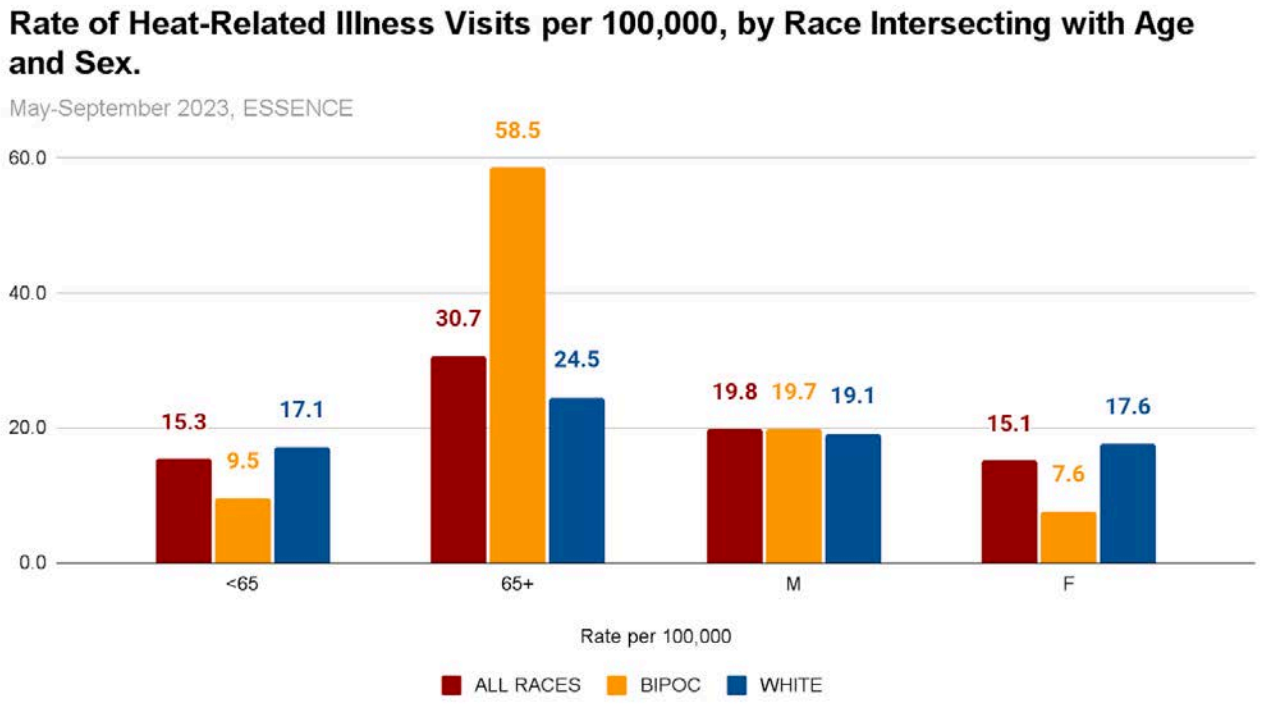


Figure 15. Heat-related illness rates per 100,000 by intersectional identities. Racial identities are aggregated due to small numbers. Further analysis of intersectional identities is limited by small sample size.

An expanded demographic analysis is available in Appendix B.

Near Drowning

Visits. There were 15 emergency room and urgent care visits for near drowning cases in summer 2023. This was roughly one visit less than the 2018-2022 five year average of 16.5 visits. Seventy-one percent of all near drowning visits in 2023 occurred from May through September. Near drowning cases that occurred during the 2023 summer months represented 71% of total visits that occurred during the complete calendar year.

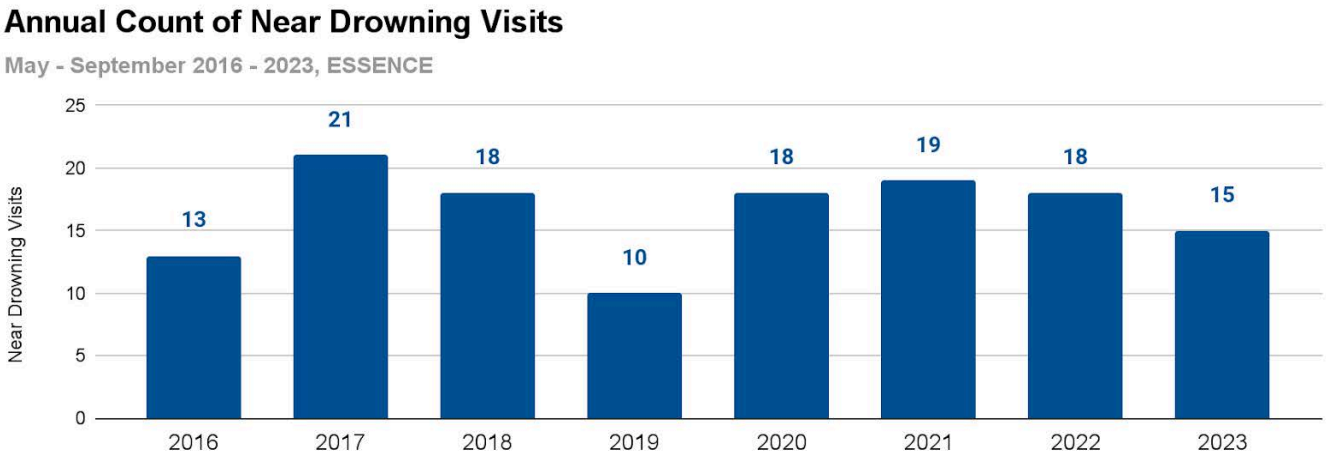


Figure 16. Annual count for near drowning emergency room and urgent care visits for Multnomah County residents.

Risk Factors and Demographics

Small numbers limit detailed analysis of ESSENCE data on near drownings. A majority of cases in summer 2023 were related to recreational activities. They were evenly distributed between general recreation at a pool, general recreation at a source of open water like the ocean or a lake, or a sport-specific recreational activity involving water.

Youth and infants were overrepresented in near drowning cases. A majority of cases (86%, n=12) were under the age of 18, and 40% were under the age of 4. Roughly half of cases were male (53%, n=8). A majority of cases were white non-hispanic.

These trends are similar to those across the nation. Children ages 1-4 have the highest drowning rate, and they tend to occur in swimming pools. Contributing factors are weak swimming ability and lack of close supervision or fences that block pool access. Of children aged 5-14, 40% of drowning occur in sources of open water like oceans or lakes, and 30% occur in swimming pools (CDC, 2024)

Heat-Related Hospitalizations

Hospitalizations for HRI remained elevated in Multnomah County following the post-heat dome period. There were 23 hospitalizations for heat-related illness in 2023, which is higher than the 16 in 2022. Prior to the 2021 heat dome, which saw 52 heat-related hospitalizations, there were typically less than 10 heat-related hospitalizations each year.

Roughly 3 people per 100,000 were hospitalized for HRI in Multnomah County in 2023. This was double the rate for Oregon overall (1.5 per 100,000)[7] and three times the average rate for the tri-county region during 2016-2019.[8]

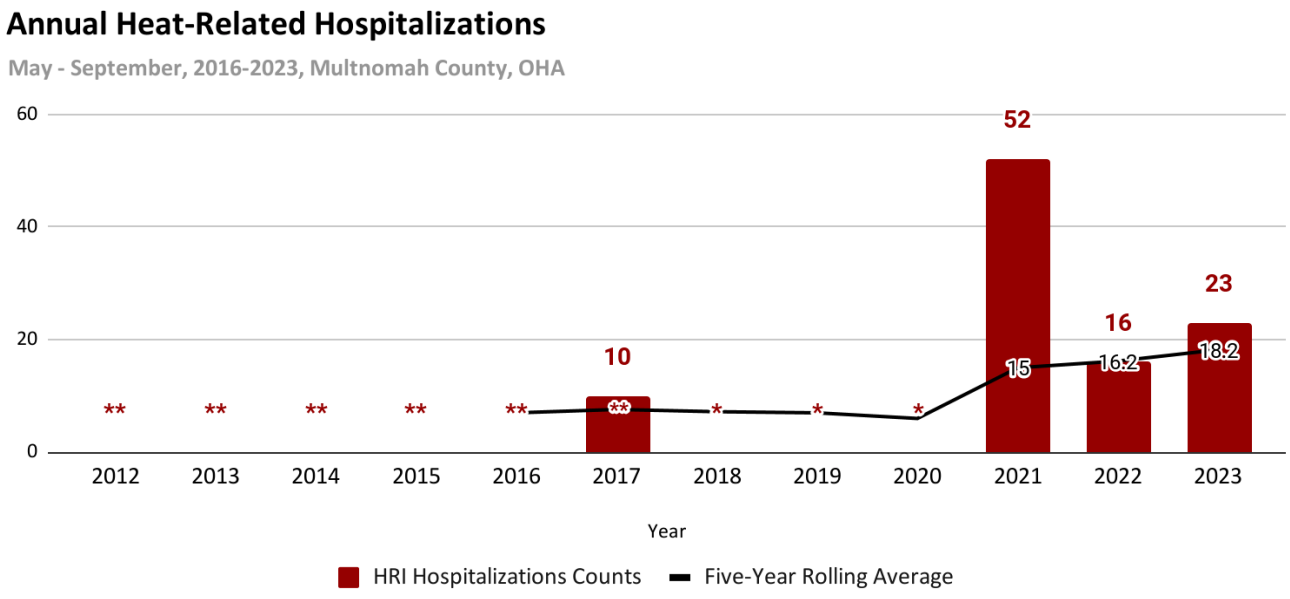


Figure D1. Annual count for hospitalizations related to heat illness for Multnomah County residents. Data for summer 2023 was not available at the time of this report's development. Small numbers are suppressed to meet new OHA guidelines. *Count is between 1-4. **Count is between 5-9.

[7] Centers for Disease Control and Prevention. Environmental Public Health Tracking Network. State Hospital Inpatient Discharge data. (2022). Accessed at: https://ephtracking.cdc.gov/

[8] Tri-counties, Clackamas County, Multnomah County, Washington County. (2023). Regional Climate and Health Monitoring Report, 2012-2022.

Heat-Related Deaths

Deaths due to heat (heat-associated deaths) can be put into two groups:

- Heat caused (environmental heat was directly involved in the sequence of events leading to death)
- Heat related (environmental heat was not directly involved in the sequence of events, but it contributed to the death).

This section will focus on deaths in 2021, 2022, and 2023. For demographics, the three years will be combined due to a small number of observations in 2023. There were no heat-associated deaths in 2018, 2019, or 2020.

The heat dome of 2021, described previously in this report, accounts for the vast number of heat-associated deaths in the 3-year period, with 75 of 85 total deaths (88%).

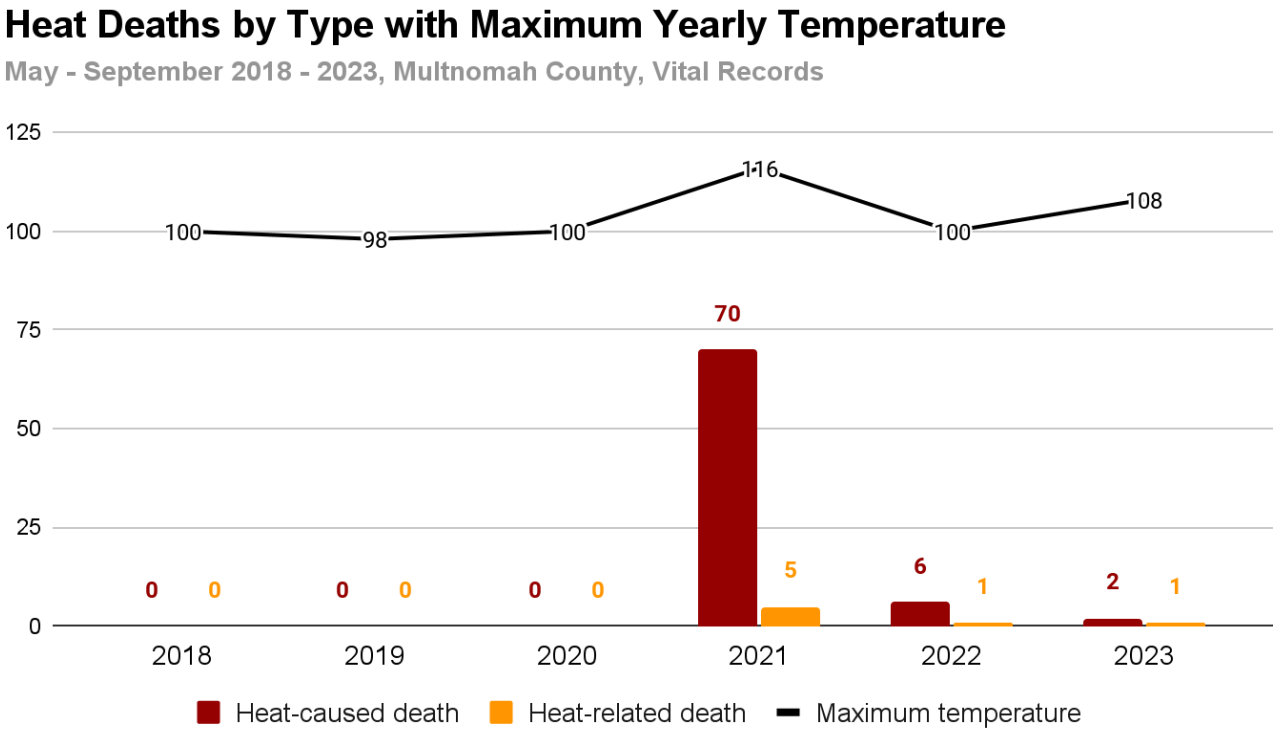


Figure 17. Deaths related to heat for Multnomah County residents. Data for summer 2023 is provisional and subject to change.

Demographics

Nearly 7 in 10 deaths (69%) occurred in males, while 90% of deaths occurred in persons 50 years of age or older. Most decedents were not Hispanic or Latino, and most were white race. Note: in this chart, the race categories are not mutually exclusive, so the percentages will sum to more than 100% (see methods section for more details).

Male heat deaths were more likely to occur outside; only 1 of 25 (4%) heat deaths among females occurred outside, while for males the proportion was 8/59 or 14%.

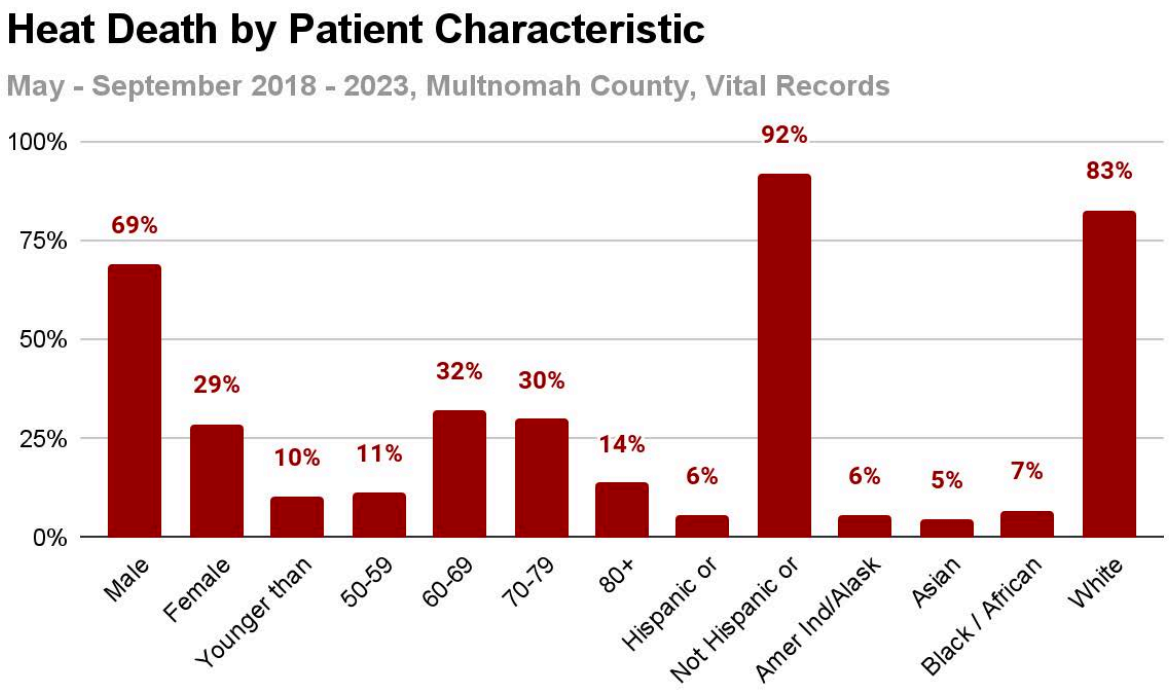


Figure 18. Demographics of people who died from heat-associated deaths, Multnomah County residents

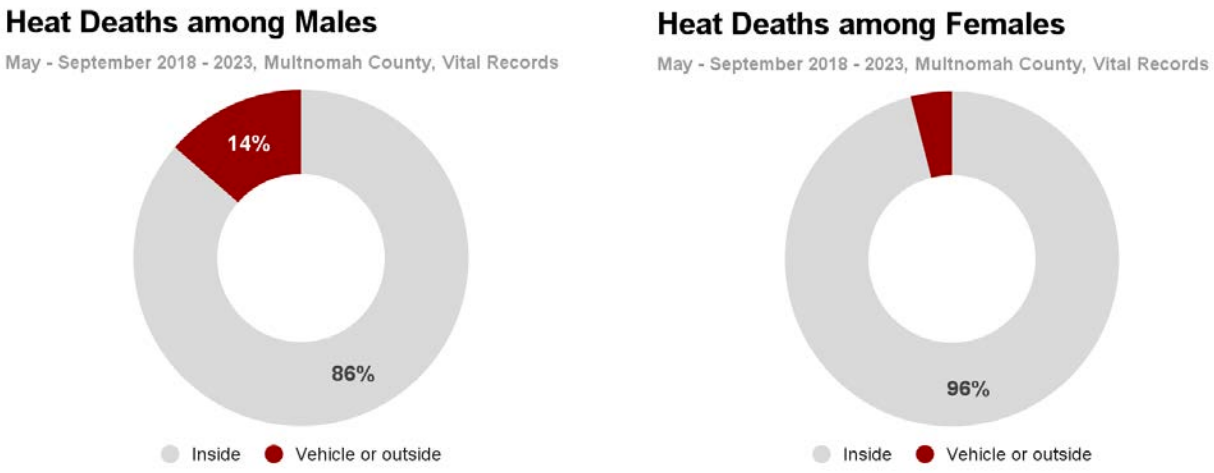


Figure 19. Proportion of heat deaths by location and sex, Multnomah County residents.

Conclusion

Extreme heat continues to lead to illness, injury, and death in Multnomah County. While the HRI visit rate for summer 2023 (17.4 per 100,000) was less than the County experienced during the summer 2021 with heat dome conditions (31.9 per 100,000), it still slightly exceeded the five-year average rate from 2018-2022 (15.8 per 100,000). Additionally, groups experiencing marginalization and groups that are more sensitive to heat continue to experience disproportionate impacts. This includes American Indian/Alaskan Natives, Black/African Americans, and people over the age of 65. HRI visits tended to originate from either downtown Portland or Gresham. The most common exposure pathways were from:

- Physical activity in warm conditions in some form of outdoor recreation
- Outdoor and indoor work conditions that caused heat stress or made it worse
- Prolonged heat exposure caused by housing instability.

This report did not focus on heat-related interventions. However, Multnomah County Public Health continued to support work to reduce exposure and increase community adaptive capacity, including:

- Provision of emergency room and urgent care data during extreme heat events to inform County situational awareness and operations
- Opening and operating cooling centers throughout the County
- Collection, analysis, and distribution of heat data from urban heat islands and affordable housing in the Tri-County area
- Planning efforts on climate hazards, including extreme heat

Findings from this report can be used to continue to inform operations, including:

- Providing guidance on people, places, and times that experience the greatest risk during heat waves
- Demonstrating the usefulness of health surveillance tools when weather conditions do not meet emergency operation activation thresholds
- Informing prevention strategies to reduce risk of HRI. This could look like communication campaigns and programmatic intervention during outdoor recreation activities
- Elevating exposure pathways that need additional policy attention, like working conditions or the continued need to address housing instability

Acknowledgements

National Weather Service

Oregon Health Authority

Multnomah County Public Health

Multnomah County Communications Office

Media Inquiries

PressOffice@multco.us

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Appendix A. Expanded Methods

National Weather Service Data

Daily minimum, maximum, and average temperature data were gathered from the National Weather Service. Heat risk data was calculated by the National Weather Service. Readings were collected from the PDX International Airport Monitor. We define the Summer 2023 season as May 1st, 2023 through September 30th, 2023, when temperatures are usually warmest in the County. These months are also the inverse of the season Multnomah County monitors for cold-related health impacts (October through April).

Limitations to this data set: Weather factors may vary at different locations and elevations in the County. Urban design influences hyperlocal temperatures, creating additional variability across the county.

Oregon ESSENCE (Electronic Surveillance System for the Early Notification of Community-based Epidemics)

The Oregon ESSENCE database tracks visits to all local emergency departments and some urgent care clinics. The data captures demographic information and information related to the visit like patient primary complaint, triage notes, and discharge diagnosis. Observed daily numbers and percentages of heat-related visits were identified using the Oregon Health Authority heat-related query “Heat Related Illness V2” applied to CC and DD category for Multnomah County residents using ER data by patient location datasource. To identify risk factors for admittance, two reviewers independently read through the triage notes in patient records coding for indication of houselessness, intoxication, occupational, recreational, and in-vehicle exposures. Differences in results were resolved collectively in a second round or review. One duplicate entry was removed from the sample.

Limitations to this data set: Counts may include the same person visiting the emergency department on separate occasions. Some visit records are incomplete and did not have triage notes to code (30/141 records [21%]). Triage notes do not provide a comprehensive picture of the patient context of conditions. Counts of less than 5 are suppressed or aggregated for demographic information to protect confidentiality, unless presented as a percentage. Demographic information is reported by health care providers and some visit records did not have race recorded (17/141 records [13%]).

Oregon Hospital Discharge Data

Hospital discharge data comes from the Oregon Health Authority Hospital Reporting program. Cases were collected from May 1st through Sept 30th. Heat-related hospitalizations are classified with one of the following diagnoses codes:

- T6701XA - Heatstroke and sunstroke
- T6702XA - Exertional heatstroke
- T6709XA - Other heatstroke and sunstroke
- T671XXA - Heat syncope

Counts are based on patient residence. They do not include transfers between hospitals or admissions to federal or out of state hospitals.

*Limitations to this data set: Small numbers are suppressed when the count is between 1-9. Suppressed fields are displayed as * for counts between 1 and 4, and ** for counts between 5 and 9.*

Multnomah County Vital records

Data were obtained electronically from Multnomah County's database of vital records. The Oregon Health Authority updated the data weekly. Dates of death were limited to January 1, 2018 to December 31, 2023. Data were limited to deaths occurring in Multnomah County residents. 2023 data are considered provisional and partial and are subject to change. Summer deaths were flagged as occurring in any year when the death was in May, June, July, August, or September. Heat associated deaths were classified in two ways:

- Heat caused. Environmental heat was directly involved in the sequence of events leading to death (underlying cause of death)
- Heat-related. Environmental heat contributed to the death, but was not in the sequence of events leading to death (contributing cause of death)

International Classification of Disease, 10th revision (ICD-10) codes used to indicate environmental heat were based on the CSTE/EPHT case definition (EPA, 2017):

- Heat-caused: X30
- Heat-related: T67.0-T67.9

In addition, deaths classified as heat associated must be certified by a medical examiner. Prior analysis of death records shows a handful of deaths that are classified as heat related but jurisdiction by a medical examiner was declined. This means that they likely were not true heat related deaths. For heat associated deaths occurring in hospitals, we used the injury location variable to assess if the original incident occurred in Multnomah County and excluded any deaths that did not meet this criteria. We used an "any mention" approach for categorizing race. In this classification, any person can be in multiple groups, because they are listed under every racial or ethnic group they have indicated. For this scheme, the total will add up to more than 100%. This type of disaggregation is important for proper resource allocation and delivery of culturally specific interventions (RWJF, 2020).

Appendix B. Additional Heat-Related Illness Demographic Information

Sex. HRI visits were disproportionately men (57%, n=80) in comparison to both all-cause visits during that period (46%) and Multnomah County overall (50%). Men were admitted for HRI at a crude rate of 19.8 per 100,000, whereas women were admitted at a crude rate of 15.1 per 100,000. *Note: No visits were coded outside of the binary male/female categories for HRI.*

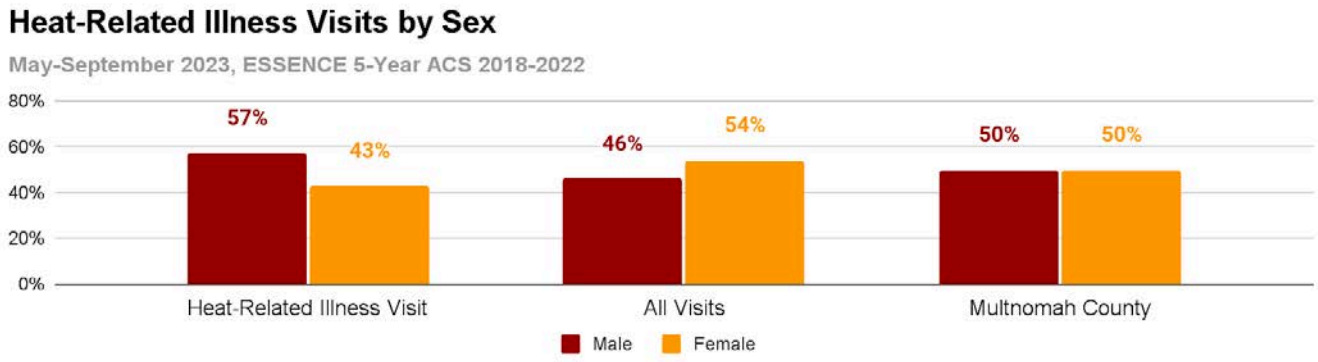

Figure B1. Percent male or female of heat-related visits, all visits, and in the Multnomah County population.

Age Group. The most common age category admitted for HRI was ages 18-44 (42%, n=59). People ages 65 and older were overrepresented within HRI visits (25%, n=35) in comparison to both all-cause visits (20%) and the Multnomah County population (14%). Patients ages 0-4 were underrepresented in HRI visits (1%) in comparison to both all-cause visits (5%) and Multnomah County overall (5%). Crude rates per 100,000 increase by age category, ranging from 2.6 per 100,000 for ages 0-4 to 30.7 per 100,000 for ages 65 and older.

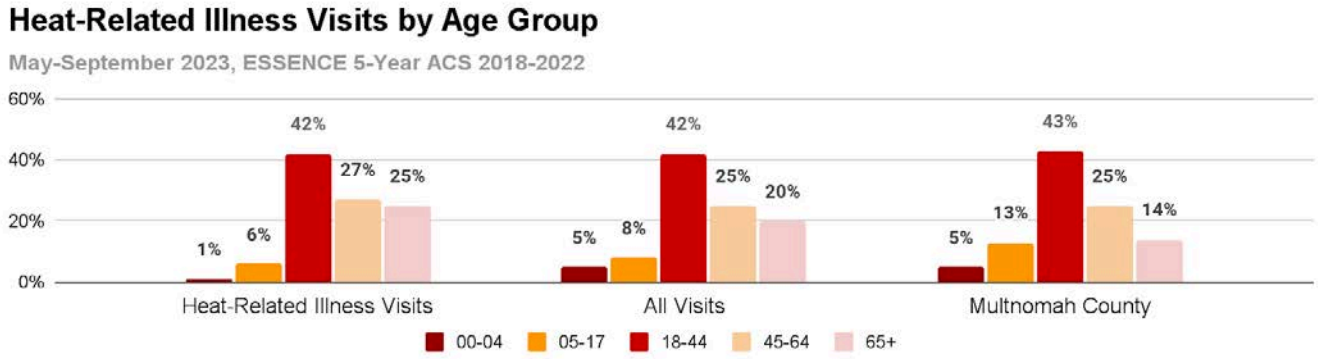

Figure B2. Age group percentages of heat-related visits, all visits, and in the Multnomah County population.

Race. A majority of HRI visits were among white people (72%, n =101), and HRI distribution across racial groups was similar to the Multnomah County population. When compared to all-cause visits, HRI patients were disproportionately Asian and white.

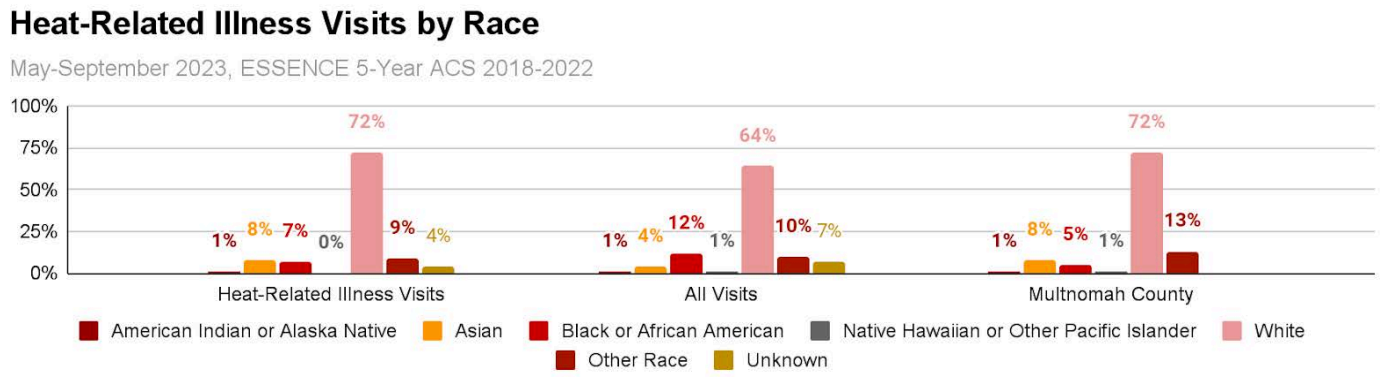

Figure B3. Racial group percentages of heat-related visits, all visits, and Multnomah County.

Ethnicity. A majority of HRI visits were non-hispanic (91%, n=129). Hispanic patients were slightly underrepresented in HRI visits (9%, n = 9) when compared to all-cause visits (12%) and Multnomah County overall (12%).

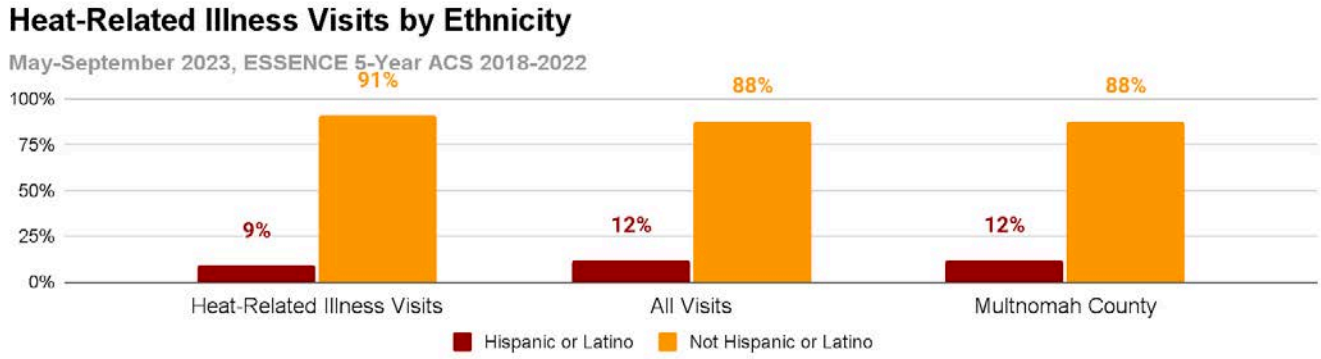

Figure B4. Hispanic and non Hispanic percentages of heat-related visits, all visits, and Multnomah County.

Table B1. Counts of Heat-Related Illness and All-Cause Visits by Patient Characteristic

Counts suppressed when under 5	Heat-Related Illness Visit	All Visits	Multnomah County
Total	141	185,648	808,098
Sex			
Male	80	85,498	403,380
Female	61	99,902	404,718
Other	<5	248	n/a
Age Group			
00-04	9	8588	39,020
05-17		15597	106,526
18-44	59	77504	348,939
45-64	38	46145	199,426
65+	35	37532	114,187
Race			
American Indian or Alaska Native	<5	2388	8,385
Asian	11	8259	61,740
Black or African American	10	21471	43,931
Native Hawaiian or Other Pacific Islander	<5	2290	5,197
White	101	118697	585,219
Other Race	12	18925	103,626
Unknown	5	13618	n/a
Ethnicity			
Hispanic or Latino	13	22499	22499
Not Hispanic or Latino	128	163149	163149
Intersecting Identities			
BIPOC & <65	24	n/a	242794
BIPOC & 65+	12	n/a	20496
BIPOC & Female	10	n/a	131559
BIPOC & Male	26	n/a	131731
White & <65	77	n/a	451117
White & 65+	23	n/a	93691
White & Female	52	n/a	273159
White & Male	48	n/a	271649

Appendix C. Heat-Related Illness and Temperature Across the Calendar Year

Between January 2016 and December 2023 there were 1,040 heat-related illness emergency department and urgent care visits in Multnomah County. 90% of visits occurred on days that were 78F or warmer, and roughly half (48%, n=500) of visits occurred at 94F or warmer.

When we examine the average number of HRI visits on days at a given temperature, a trend emerges in which the likelihood of a HRI visit increases as the temperature increases. Table 4 outlines this relationship.

Table C1. Temperature thresholds and average daily heat-related visits.

Temperature Range	Average Daily Heat-Related Illness Visits
80-85F	<1
85-89F	1
90-94F	2
95-99F	5
100-104F	8
105-110F	11
110F+	54 *(includes heat dome)*

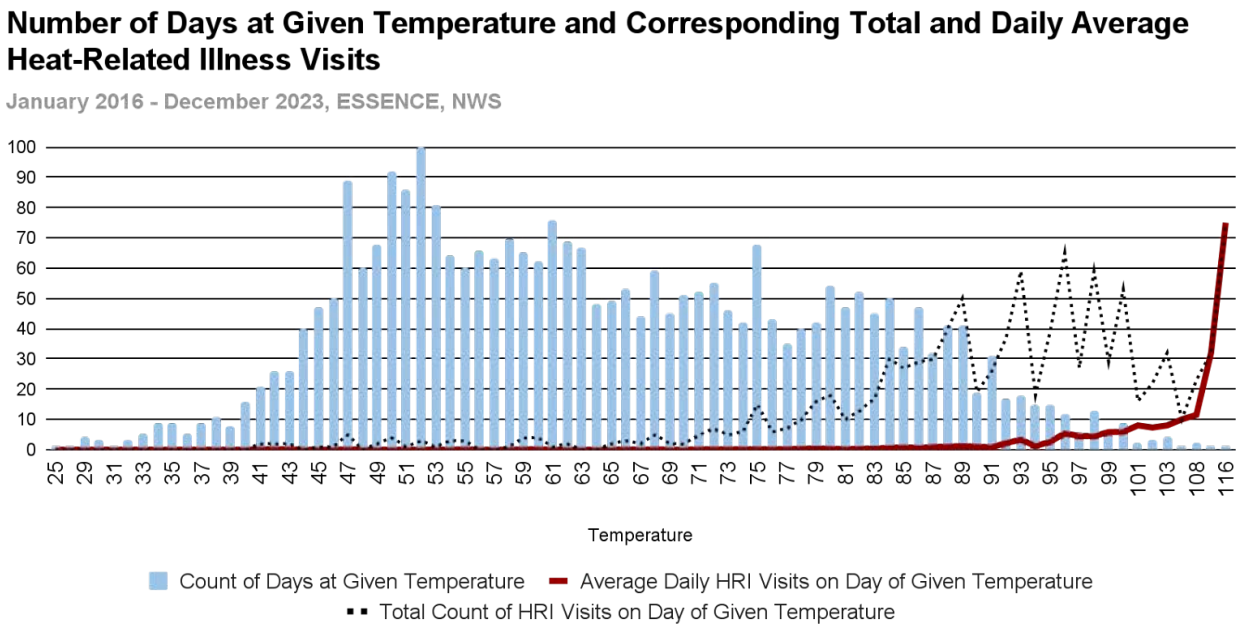

Figure C1. Comparison between counts of heat-related visits on days at a given temperature. Also, adjusted visits based on how many days between 2016 and 2023 have been a given temperature.

The number of visits that occur across the entire calendar year is an important metric to track as winters become warmer and summer-like conditions occur earlier and last longer in the year. A total 159 HRI visits occurred in 2023. The crude HRI rate for the full calendar year was 19.7 per 100,000, slightly higher than the summer crude HRI rate of 17.4. The five-year average rate from 2019 through 2023 was 18.0 per 100,000. Both of these rates are lower than recent national estimates for heat-related emergency room visits of 32.3 per 100,000 from 2008-2020 (Dring et al, 2022).

HRI visits that occurred in January through April and October through December made up 11% (n=17) of HRI visits in 2023. A cluster of HRI visits occurred in the last week of April. There is no clear trend in HRI visits that happen outside of the warm season, but this is the largest number of HRI visits outside of the summer season on record. On average, about 6% of HRI visits occurred outside of the warm season from 2016 through 2022.

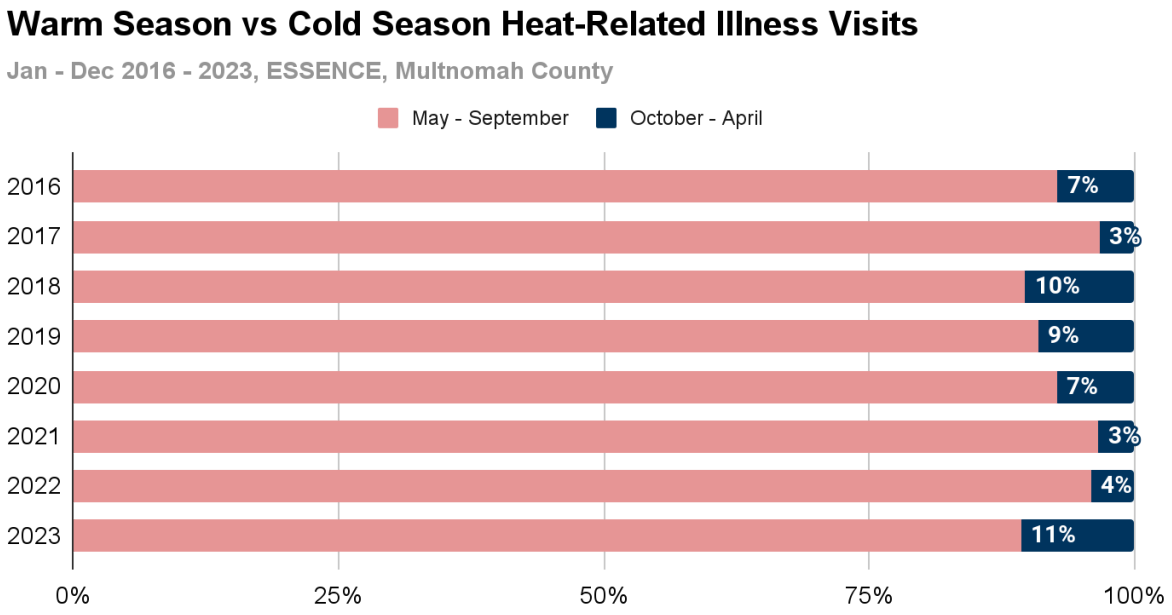

Figure C2. The largest percentage of annual HRI visits outside of the typical May - September monitoring periods occurred in 2023.

HRI visits and Heat Risk Index patterns in 2023 mirrored distributions prior to the 2021 heat dome. A majority of visits tended to occur on days with a Heat Risk Index of 1 or 2, rather than days with a Heat Risk Index value of 3 or 4 like in 2022 and 2021. This reflects that HRI can occur on days with lower heat risk for a wide range of reasons. These include prolonged exposure, greater sensitivity, or lag effects from previous days. Despite this similarity, counts remained elevated across Heat Risk Index categories 1 through 4 in 2023 compared to 2016-2020 averages.

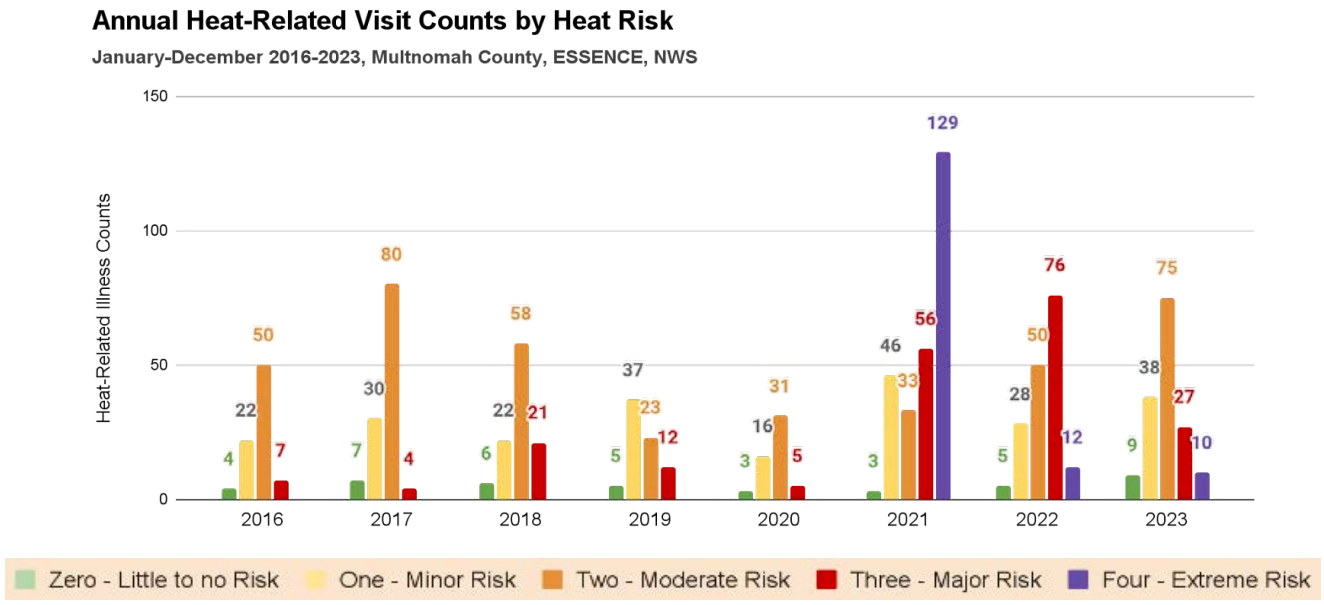

Figure C3. HRI visit counts by daily heat risk from 2016 through 2023.

HRI likelihood increases on days with higher risk. Including the full calendar year, there are less than one heat-related illness visits on average on a day with a heat risk index score of 0 or 1. On days with a score of 2, moderate risk, there are on average two visits. Average visits triple when the heat risk index increases from moderate risk to major risk. When the heat index increases from 3 to 4, extreme risk, average daily heat-related illness visits increase by almost 5 times.

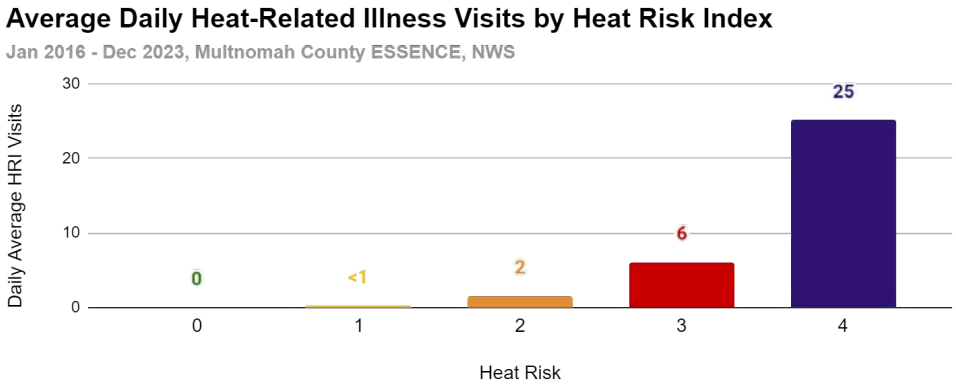

Figure C4. Daily average HRI county by heat risk index.

Appendix D. General Mortality Trends

The chart below shows the number of all-cause deaths in Multnomah County by year, broken out by warm month season (May-September). The summer season of 2021 stands out with 3,592 total deaths, compared to an average of 2,871 for the warm months during 2018-2020. As previously mentioned, we know the heat dome increased deaths during the summer of 2021.

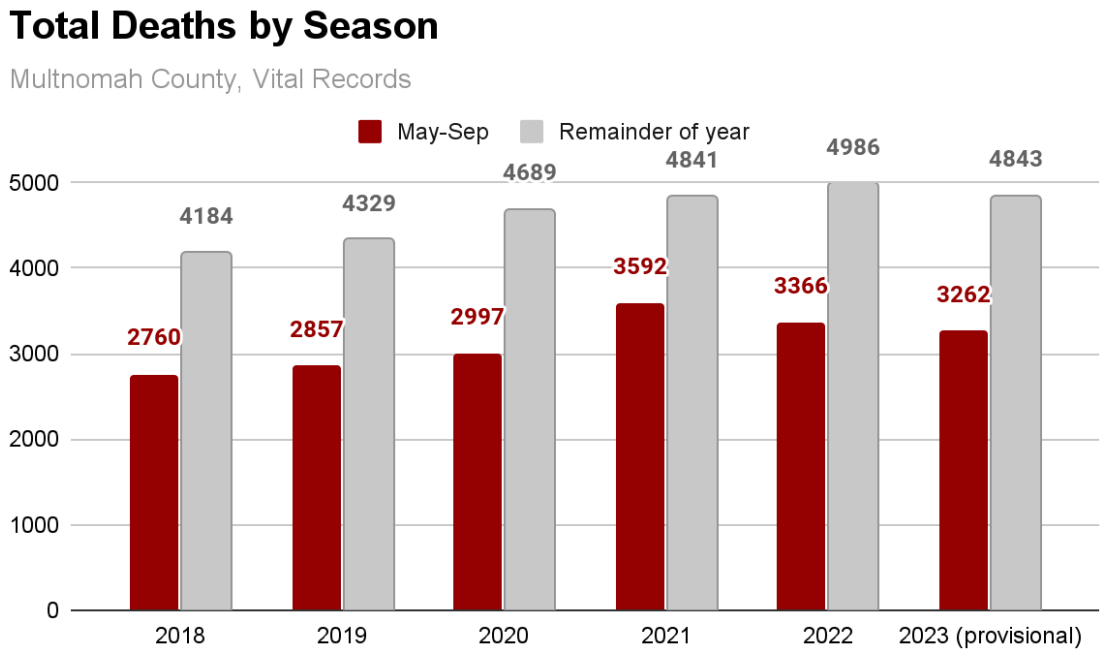

Figure 23. Total all-cause deaths among Multnomah County residents by year and May through September. 2023 is provisional and subject to change.

The chart below examines these deaths in greater detail. It shows the proportion of the summer deaths by specific causes that are associated with heat. Once again, 2021 stands out with a higher proportion of unintentional injuries compared to the 2018-2020 period, which averaged 7.7%. This is not surprising, because this category captures the larger number of heat deaths from the 2021 heat dome. There was a slight decline in 2022, and a rise in 2023. This is likely due to an increase in drug overdose deaths. However, the provisional nature of the data limits further speculation about other causes.

For example, there were 116 fentanyl overdose deaths in Multnomah County residents from May-September in 2022. The provisional number for 2023 is 203, or nearly double. [9] The trends in the other causes of death were fairly unremarkable, although future research may include an excess mortality analysis that is outside the scope of this report.

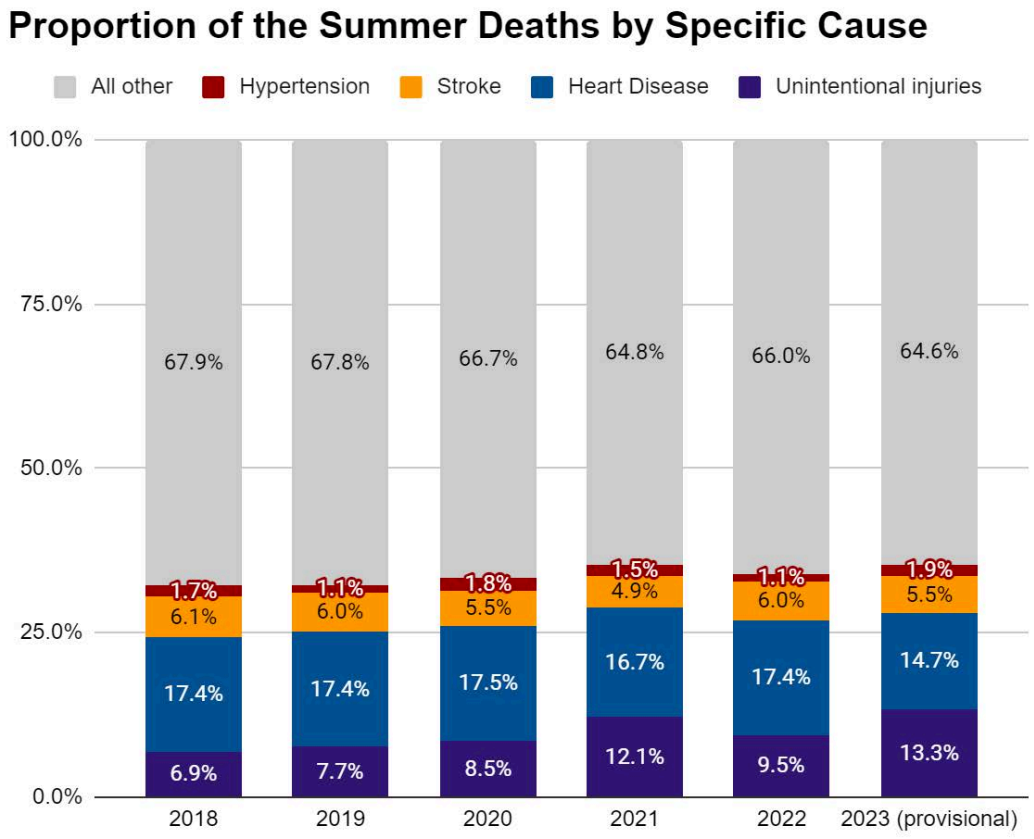

Figure 24. Proportion of total deaths occurring in summer months (May-Sep) among Multnomah County residents by specific cause of death groups. 2023 is provisional and subject to change.

[9] Source: CDC WONDER. https://wonder.cdc.gov/controller/saved/D176/D383F454