WINTER HAZARD BRIEF

24
25

Multnomah County
Health Department

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Acknowledgements

Dedication

Five community members died this past winter due to weather-related causes. We acknowledge this tragic loss of life, and hope the information presented here will support progress towards a safer community for all.

Land

This brief was developed and written on the ancestral lands of the Multnomah, Kathlamet, Clackamas, Chinook, Tualatin Kalapuya, Molalla, and others. We honor the enduring stewardship of these Indigenous peoples and acknowledge that the health of the land and our communities are inseparable.

Support and Review

Multnomah County
Environmental Health Services
Community Epidemiology Services
Office of Sustainability
Emergency Management

Oregon Health Authority
Acute and Communicable Disease

National Weather Service
Portland Weather Forecast Office

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Summary

Winter 2024–25 was mild, with severe storms in February.

The 2024-25 winter season was generally mild and warmer than normal with near average rainfall. There was a cold snap with snow and wind in February. However, this was not as severe as the winter storm in January 2024, the previous winter.

Mild weather likely contributed to decreases in most winter hazard injury outcomes.

The numbers and rates of **emergency department and urgent care (ED/UC) visits for winter hazard outcomes decreased in the 2024-25 winter season compared to the previous winter.** Visits included those for cold-related illness (CRI), carbon monoxide (CO) poisoning, and falls due to ice and snow.

There were five deaths due to hypothermia. This is four fewer deaths than last winter, and two fewer than the average of the past five winters. For the first time in ten years, there were zero deaths related to carbon monoxide poisoning.

The number of non-infectious respiratory illness ED/UC visits increased to a record seasonal high. However, there were no clear ties to a weather event.

People experiencing homelessness continued to face the highest risk of severe cold-related illness.

Despite mild weather, differences in access to resources still drove exposures. **Although people experiencing homelessness represent just 2% of the County's total population, they made up at least 45% (200) of all cold-related illness visits this season.** Continued actions are needed to reduce exposure during periods of heavy rain, severe cold, and when conditions are both cold and wet.

Mild weather likely contributed to decreases in most winter hazard injury outcomes.

There were no long periods of widespread power outages or icy neighborhood conditions, contributing to fewer carbon monoxide poisonings and falls due to ice and snow.

		Counts in Winter 24-25	Compared to last season	Compared to past five season average
Cold-Related Illnesses	**ED/UC Visits**	440	↓ 17% decrease from 527	= 2% decrease from 450
	Hospital Stays	80	↓ 37% decrease from 127	↓ 32% decrease from 118
	Deaths	5	↓ Compared to 9	↓ Compared to 7
Carbon Monoxide Poisonings	**ED/UC Visits**	25	↓ 40% decrease from 42	= Compared to 25
	Deaths	0	↓ Compared to 2	↓ Compared to 2
Falls due to Ice and Snow	**ED Visits**	146	↓ 85% decrease from 982	↓ 63% decrease from 400
	Hospital Stays	<10	↓ ~93% decrease from 134	↓ ~76% decrease from 40
Non-Infectious Respiratory Diseases	**ED/UC Visits**	25,149	↑ 11% increase from 22,587	↑ 19% increase from 20,987

ED/UC Visits = ESSENCE data, ED Visits = Emergency discharge data

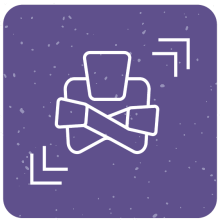
What's In This Brief

Purpose

This brief provides an overview of winter-related illness and injury outcomes to raise awareness of key risks and groups most affected. This information can be used to:

- Help guide preventive action.
- Protect community well-being during the colder months.

It uses data from multiple sources to provide a snapshot of illness and injury that occurred in Multnomah County from October 1, 2024 through April 30, 2025. The four illness and injury outcomes included are:



Cold-Related Illness
ESSENCE, hospital discharge data, vital records

Carbon Monoxide Poisonings
ESSENCE, vital records

Falls Due to Ice and Snow
Emergency discharge data, hospital discharge data

Non-Infectious Respiratory Illness
ESSENCE

Methodology Approach

Below are explanations for choices made and limitations faced in creating this brief. They highlight the limitations of quantitative data and the need for qualitative research on social and environmental factors that drive inequities related to winter hazards. Full methods and data tables are in Appendix A.

Race is included as a demographic subgroup in this brief because it is a social construct that influences outcomes. Racism and colonialism shape lived experiences and environmental exposures (Carroll et al., 2022; Paradies et al., 2015). Reporting outcomes by race can help identify inequities, focus interventions, and monitor progress. However, broad racial categories do not reflect differences that exist within these groups. Race and ethnicity categories in this brief are the same as those used in data sources.

This brief relies on mostly quantitative data, which has limitations. It provides a broad overview, but doesn't capture all personal experiences or contexts that affect outcomes. When available, qualitative information from triage notes is used to describe exposures and contributing factors.

Acronyms used in this brief:

AIAN: American Indian/Alaska Native
BAA: Black/African American
CRI: Cold-Related Illness
CO: Carbon Monoxide
ED/UC: Emergency Department and Urgent Care
ESSENCE: Electronic Surveillance System for the Early Notification of Community-Based Epidemics
H/L: Hispanic/Latine
NIRI: Non-Infectious Respiratory Illness
NHPI: Native Hawaiian/Pacific Islander

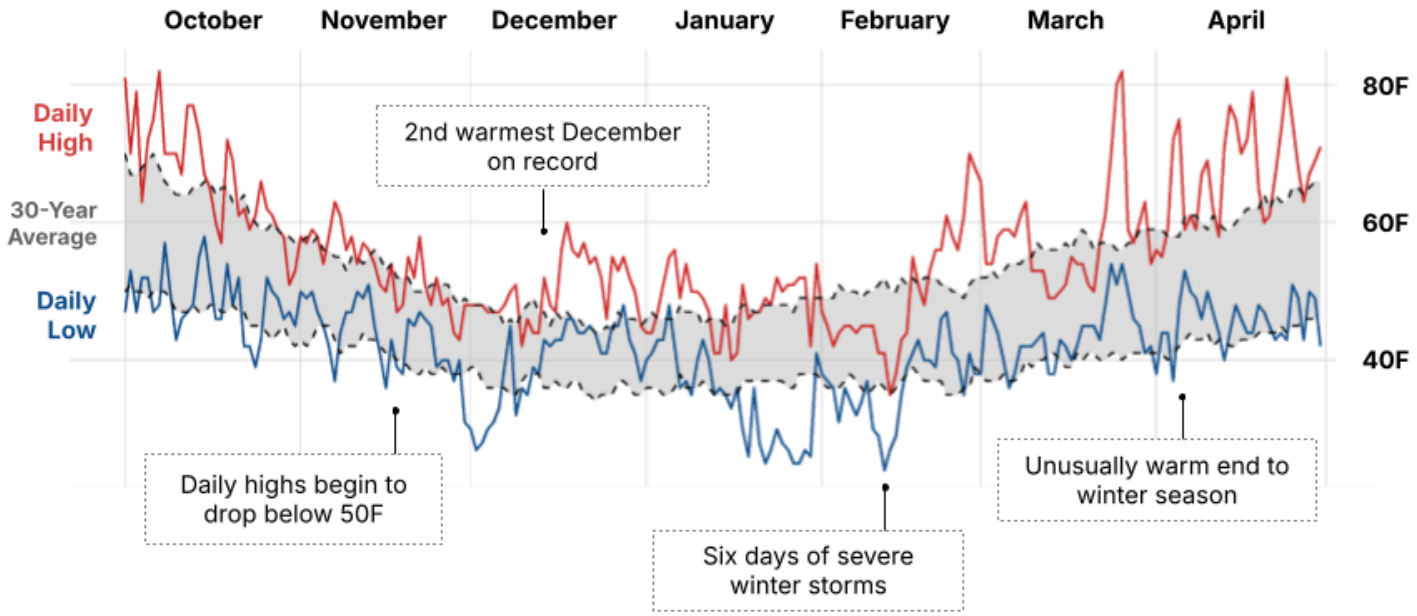
Weather Conditions

Season Overview. The weather during the 2024-25 winter season was a mix of warmer-than-average temperatures, near average rainfall, and a few cold snaps. October began with temperatures much higher than normal. November was mild with frequent rain. December was unusually warm and wet, and was the third warmest December on record.

January started with heavy rains, but set a record of 18 days without rain in the second half of the month. There were strong storms with heavy rain and winds in February. The County opened warming shelters on six days this month (February 4th and 10-14). The storm peaked on February 13th with three inches of snow and a wind chill of 12F. However, the length and intensity of this storm was not as severe as the 12-day storm experienced in January 2024 the previous winter. The winter ended much warmer than normal. Daily highs in the second half of March and April were often far higher than average.

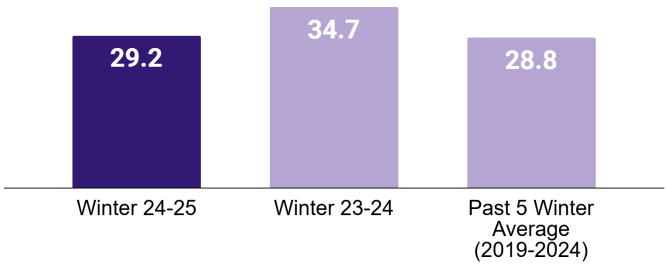
There were 29.2 inches of rainfall throughout winter 2024-25. Almost half (45%) of winter rainfall occurred in November and December. Winter 2024-25 had 5.5 inches less rainfall than the previous winter, but had similar rainfall to the past five winters. Three inches of snow fell in mid-February 2025. This was twice as much snow as the previous winter, but only half as much as the average of the previous five winters.

Daily highs and lows in winter 24-25 tended to exceed averages from the past 30 years.



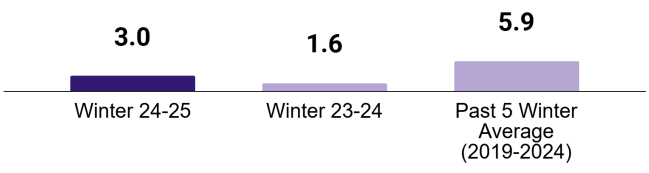
Winter Rainfall

NWS, Multnomah County, Oct-Apr



Winter Snowfall

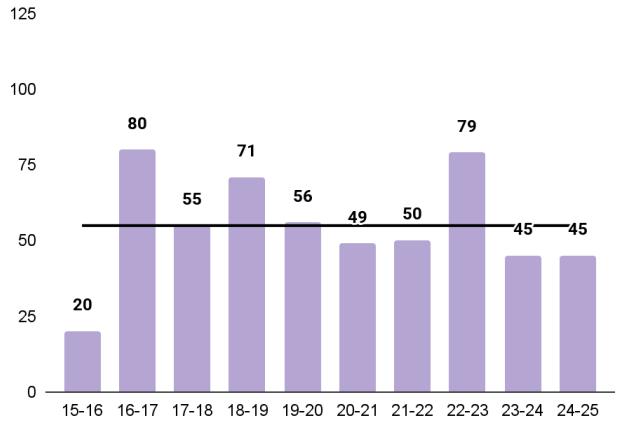
NWS, Multnomah County, Oct-Apr



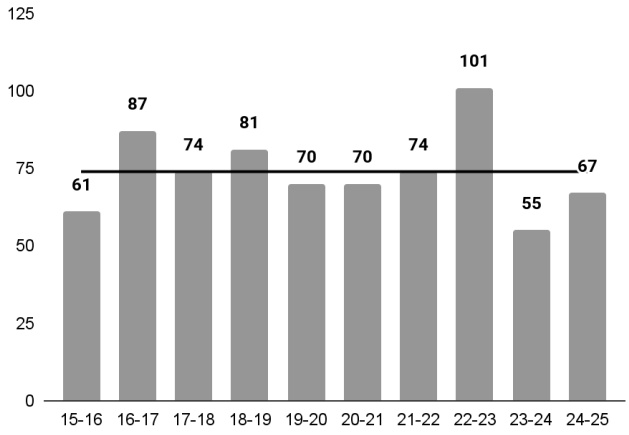
Across several measures of cold and wet conditions, winter 24-25 counts were near or less than average.

*NWS, PDX International Airport, *winter 15-16 wind chill data only represents 2016.* ***Black line*** *on all charts marks the average of all seasons shown.*

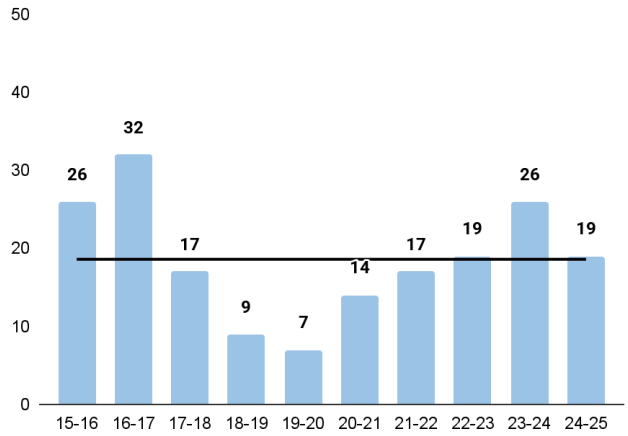
Days At or Below 32F Minimum Wind Chill



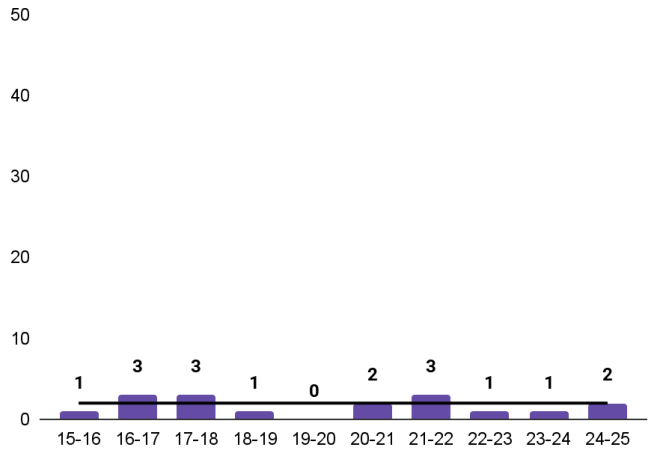
Days At or Below 50F Maximum



Days At or Above 1/2" of Rain Fall

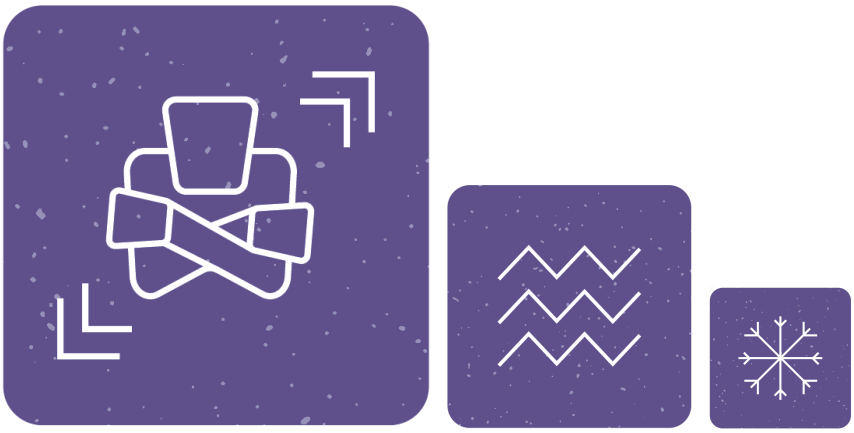


Days At or Above 1" of Snow Fall



Compared to Past Seasons. Different measures help understand cold weather not just by how cold it is, but also by how uncomfortable or dangerous the conditions are for people, particularly those with limited shelter.

- **Days at or below a 32F wind chill:** This counts days when the wind makes the air feel freezing or colder. These conditions cause discomfort or danger for anyone outside.
- **Days at or below a 50F maximum:** This counts days when the temperature never gets warmer than 50F. This means there's no break from the cold, even during the warmest part of the day, making it harder for people to warm up when outside.
- **Days at or above ½" of rain:** This counts days with heavy or continuous rain fall. Wearing wet clothing increases the risk of cold-related illness because wet clothes lose heat faster.
- **Days at or above 1" of snow:** This counts days with heavy snow fall. Not only does this mean intense cold, but also hazardous travel conditions, which can make it hard to reach shelter or services.



Cold-Related Illnesses and Injuries

Cold-related illnesses and injuries include:

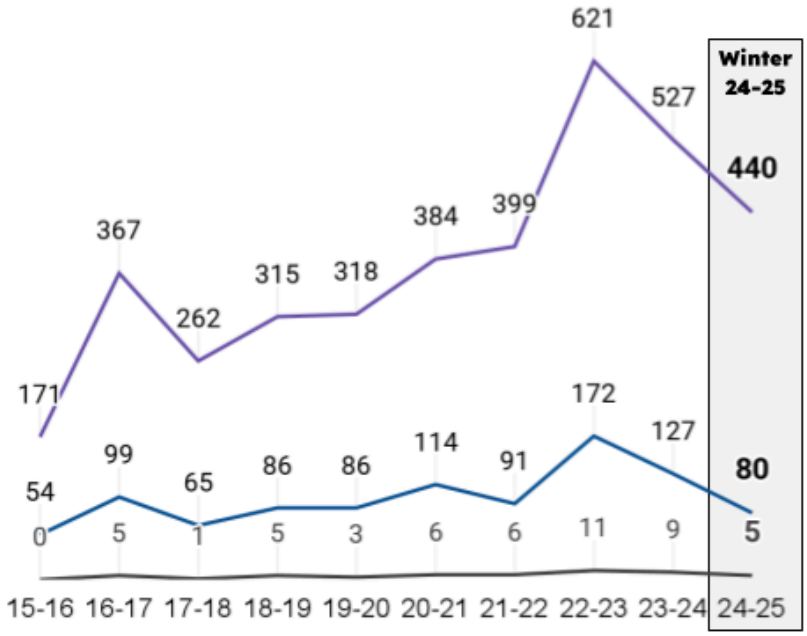
- **Hypothermia** happens when a person's body temperature falls below 95F. This can cause symptoms like shivering and confusion, and can quickly lead to organ damage or death (Paal et al., 2022).
- **Frostbite** is when skin and tissue actually freeze, which can cause permanent damage in affected areas.
- **Immersion syndrome** (also known as trench foot) happens when a foot is wet and cold for a long period of time. It involves numbness and swelling of the foot, and can lead to serious infections (Heil et al., 2016).

Cold-related illness and injuries can occur at relatively warm temperatures (up to 50F), especially for people living outdoors (Paal et al., 2022).

*For resources for care and prevention of cold-related illness and injuries, visit the County **Care for When it's Cold** webpage.*

Cold-related illness ED/UC visits, hospital stays, and deaths decreased in winter 24-25.

Multnomah County, ESSENCE, Hospital Discharge Data, Vital Records



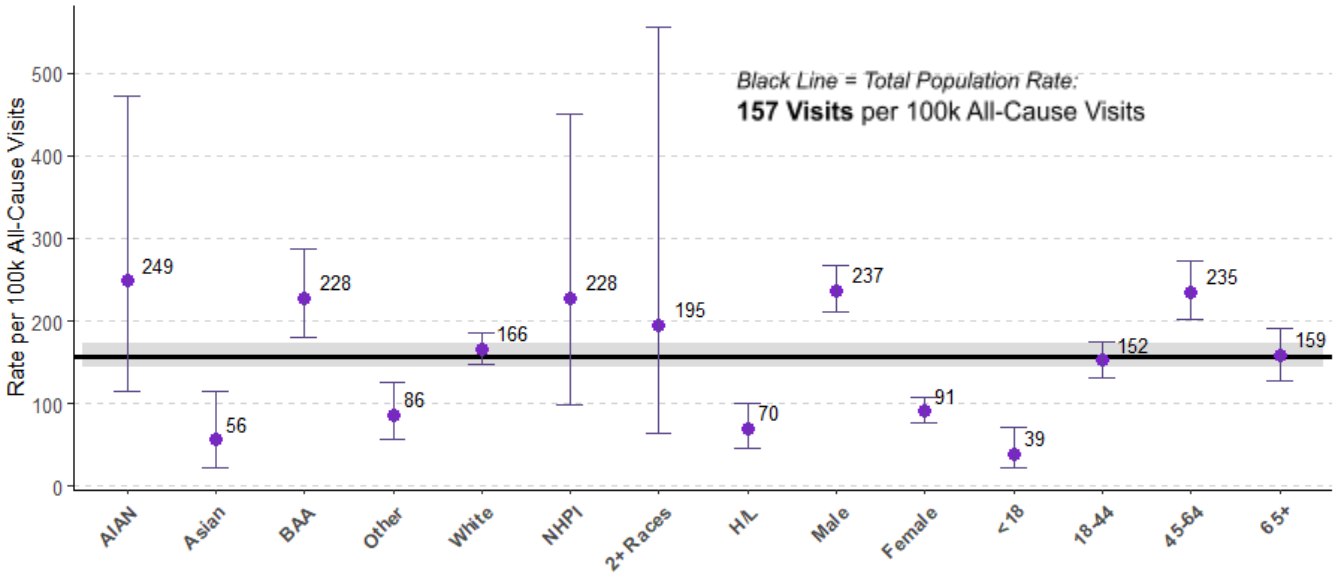
Emergency Department Visit Counts decreased compared to last winter, and were similar to the average of the past five winters.

Hospital Stay Counts decreased compared to last winter, and were below the average of the past five winters.

Death Counts decreased, and were below the average of the past five winters.

Cold-related illness ED/UC visit rates for Black/African Americans, men, and people ages 45-64 were significantly higher than the total population cold-related illness visit rate.

Multnomah County, ESSENCE, Winter 24-25, purple lines and grey shading show 95% confidence interval



A confidence interval is a range of values that help us understand how likely the rate is true. A wider range means we are less certain of the rate. This can be due to a small sample size or high variation.

Key Takeaways on Cold-Related Illnesses

Emergency Room and Urgent Care Visits

Counts. There were **440 CRI visits** in winter 2024-25. This is:

- 87 fewer visits than the previous season (a 17% decrease).
- Similar to the average of the past five seasons (450 visits, a 2% decrease).
- Still elevated compared to pre-pandemic levels (range 171-367).
- 2.5x the heat-related illness visit count experienced earlier in the summer (Multnomah County, 2025).

Rates. The CRI visit rate was **157 visits per 100k all-cause visits** in winter 2024-25. This is:

- A 20% reduction compared to the visit rate last season (203 visits per 100K all-cause visits).
- A 14% reduction compared to the average visit rate over the past five winters (184 visits per 100k all-cause visits).

Season Trends. On average there were two CRI visits per day throughout the season. The highest daily visit count was nine CRI visits, which occurred in mid-November. On this day, daily temperature maximums dropped below 50F for the first time in the season and coincided with heavy rain.

Environmental Factors. Rain and daily high temperatures were significantly associated with CRI visits. While both low temperatures and rain led to more visits, rain had a more powerful effect.

- For every quarter inch of rain that fell, the number of visits increased by about 25%.
- Roughly one in ten visit records (55 visits, 13%) indicated the patient was wearing wet clothing.
- Half of CRI visits occurred when daily minimums were 39F or warmer.

Subgroup Trends. CRI visit rates for Black/African Americans, men, and people ages 45-64 were significantly higher than the total population CRI visit rate. CRI visit rates were significantly lower for Asians, Hispanic/Latines, women, and people under the age of 18.

Homelessness. People experiencing houselessness (PEH) make up 2% of the total County population (HSD, PSU Population Research Center). Yet almost half of all triage notes for CRI visits indicate the patient was experiencing houselessness (200 visits, 45%).

- While the number of visits decreased, the proportion of patients who were homeless increased compared to last winter (213 visits, 40% of CRI visits).
- This is 15x the heat-related illness visit count of people experiencing homelessness in the previous summer (n=13) (Multnomah County, 2025).

Location. Two zip codes stand out for their elevated CRI visits.

- Zip code 97209 (downtown Portland) had 62 CRI visits. This was twice as many as any other zip code.
- Zip code 97208 is a small area within zip code 97209 that contains a former USPS site. This zip code had the highest rate per 100k all-cause visits of 4220. This is 27x the overall CRI visit rate.
- These zip codes also have the highest counts of visits with records that indicate homelessness (n=42, 18, respectively).

Multiple visits. At least 28 people made multiple visits to the ER/UC for CRI, for a minimum total of 73 visits, or at least 17% of the season's total visits. One individual was seen at least eight times for CRI, and seven of those visits happened within a two week span.

Hospital Stays

Counts. There were **80 CRI hospitalizations** in winter 2024-25, this is:

- 47 fewer hospitalizations than the previous year.
- 38 fewer than the average count over the past five years of 118 hospitalizations per winter.

Emergency Room Services. A majority (n=75, 94%) of hospitalization patients received emergency room services before admission.

Insurer. Medicare was the insurance payer for almost half of all CRI hospitalizations in winter 2024-25 (n=38, 48%). Medicaid followed (n=32, 40%).

Subgroup Trends. The largest proportion of patient subgroups hospitalized for CRI were men (n=51, 63%), White (n=55, 69%), non-Hispanic/Latine (n=71, 89%), and over the age of 65 (n=33, 41%).

Deaths

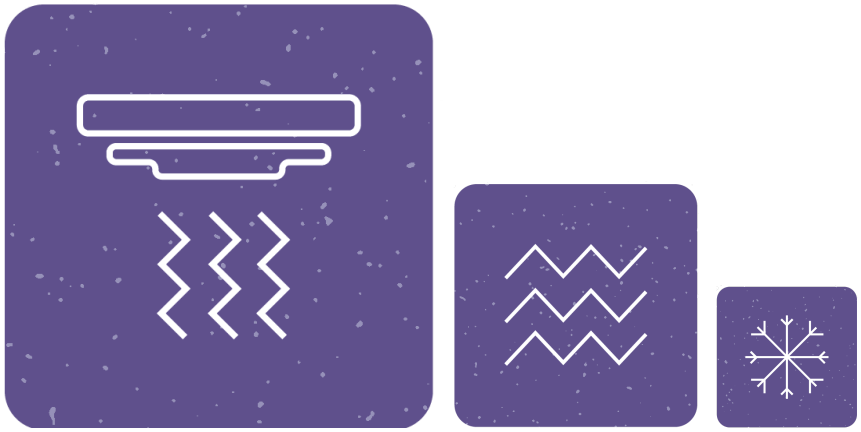
Subgroups are calculated for visits that have occurred over the past 10 years because of the small sample size in winter 2024-25.

Counts. There were **5 hypothermia deaths** in winter 2024-25. This is:

- 4 fewer deaths than the previous year.
- 2 fewer than the average count over the past five years of 7 deaths per winter.

Season Trends. Deaths occurred throughout the season. A majority (n=4) occurred when wind chill caused "feels like" temperatures to drop to 32F or below. It did not rain or snow on any of the days a hypothermia death occurred.

Subgroup Trends. Over the past ten winter seasons there have been 51 hypothermia deaths. The subgroups with the largest proportions among hypothermia deaths over the past ten seasons are people who are men (n=34, 66%), White (n=38, 75%) and between the ages of 45 and 64 (n=23, 45%).



Carbon Monoxide Poisoning

Carbon monoxide (CO) is a colorless, odorless gas that can cause illness or death when inhaled. Symptoms of CO poisoning include dizziness, headache, confusion, fatigue, chest pain, and vomiting. CO inhalation can cause permanent damage to the heart and brain (ATSDR, 2012).

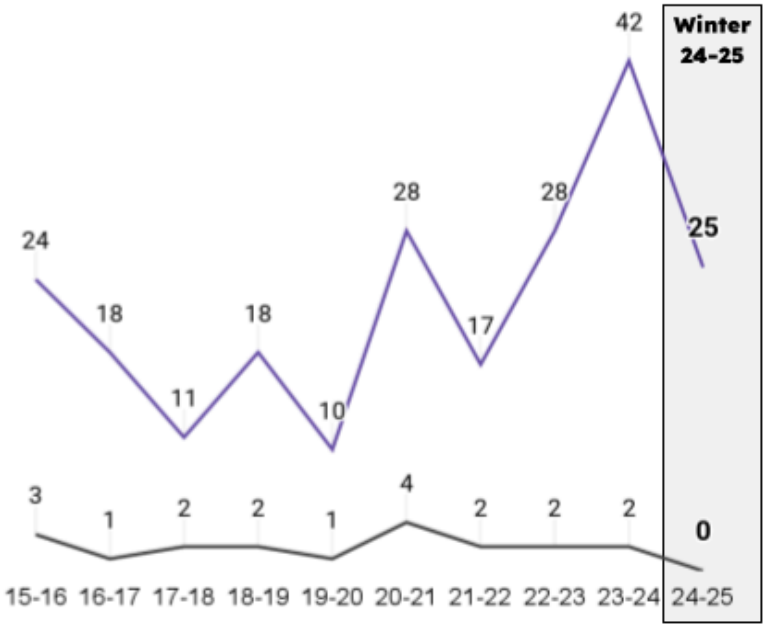
Common sources of exposure include vehicle exhaust, generators, and heating and cooking equipment like gas or wood stoves. CO poisoning is more common in the winter months when people need heat and they tend to keep windows closed (Moberg et al., 2023). It is also more common during and after winter storms. This is when power outages occur and households look to alternative sources of power (Stevens & Ashley, 2022).

Rising energy costs can force households to choose between paying for heating and paying for other needs like food, housing, or health care (McTague & Trujillo-Baute, 2025). The “heat or eat” tradeoff can lead to the use of alternative heating sources that increase CO poisoning risk.

*For resources for care and prevention of carbon monoxide poisoning, visit the County **Care for When it‘s Cold** webpage.*

Carbon monoxide poisoning ED/UC visits decreased in winter 24-25, and there were no deaths for the first time in 10 years.

Multnomah County, ESSENCE, Vital Records

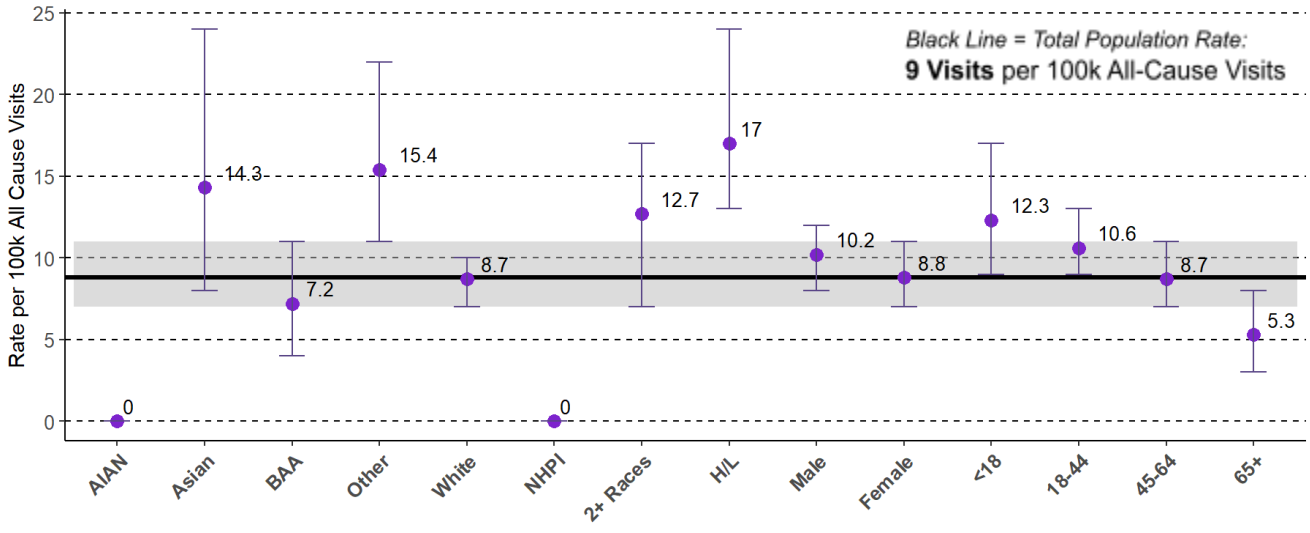


Emergency Department and Urgent Care Visit Counts decreased compared to last winter, and were similar to the average of the past five winters.

Death Counts dropped to zero for the first time over the past ten years.

Over the past 10 years, the carbon monoxide poisoning ED/UC visit rate for the Hispanic/Latine population was 1.8 times higher than the total population rate.

Multnomah County, ESSENCE, winters 15-16 through 24-25, purple lines and grey shading show 95% confidence interval



A confidence interval is a range of values that help us understand how likely the rate is true. A wider range means we are less certain of the rate. This can be due to a small sample size or high variation.

Key Takeaways on Carbon Monoxide Poisoning

Emergency Room and Urgent Care Visits

Counts. There were **25 CO poisoning visits** in winter 2024-25. This is:

- 17 fewer visits than the previous season (a 40% decrease).
- Equal to the average of the past five seasons.
- Unlike the previous winter 2023-24, there was no multi-day storm event that caused prolonged power outages. This likely contributes to the large decline in visit counts.

Rates. The CO poisoning visit rate was **9 visits per 100k all-cause visits** in winter 2024-25. This is:

- A 43% reduction compared to the visit rate last season (16 visits per 100K all-cause visits).
- Similar to the average visit rate over the past five winters (10 visits per 100k all-cause visits).

Subgroups are calculated for visits that have occurred over the past 10 years because of the small sample size in winter 2024-25.

Season Trends. The highest weekly count of CO poisoning visits was six visits. This occurred the week of 1/19 when daily temperature minimums dropped below 30F for the first time in the season.

Differences in Subgroups. The CO poisoning visit rate per 100k all-cause visits was significantly higher for Hispanic/Latines than the population overall. It was 1.8 times higher than the total population visit rate.

Shared Exposures. Over the past 10 years, records indicate that at least 21 CO exposures led to multiple people within a household seeking care. The range of household size was 2-8. A majority of those exposures (n=14, 66%) included people under the age of 18.

Location. Zip code 97233 spans the Mill Park, Rockwood, and part of the Hazelwood neighborhoods in East Portland and Gresham. It has the highest cumulative CO poisoning visit count over the past 10 years (n=32).

Deaths

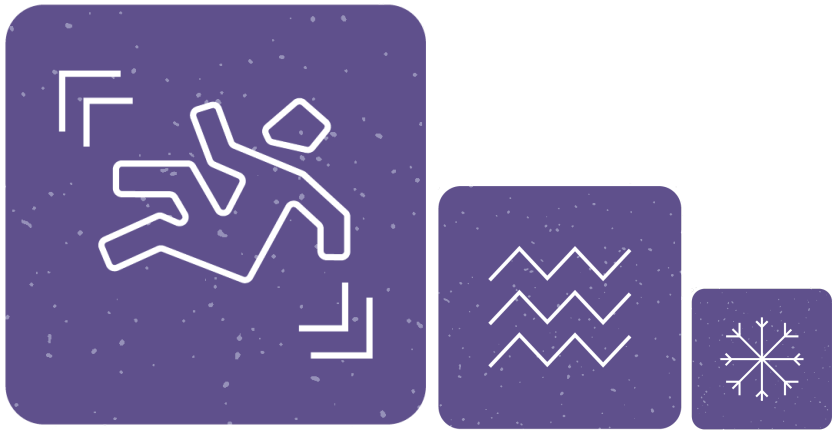
Subgroups are calculated for visits that have occurred over the past 10 years because of the small sample size in winter 2024-25.

Counts. There were **zero deaths related to CO poisoning** in winter 2024-25. This is the first time over the past 10 winter seasons this has occurred.

Subgroup Trends. Over the past ten winter seasons there have been 25 deaths due to CO poisoning. The largest subgroup proportions were men (n=14, 56%), White (n=18, 72%), non-Hispanic/Latine (n=23, 88%) and between the ages of 45 and 64 (n=11, 44%).

Sources of Exposure. There are two leading causes of CO poisoning deaths over the past ten winters:

1. Exposure to CO released by a house fire (n=16, 65%).
2. Exposure to CO released through combustion for heat (ie gas stove, propane heater) or power (ie generator) (n=7, 28%).



Falls due to Ice and Snow

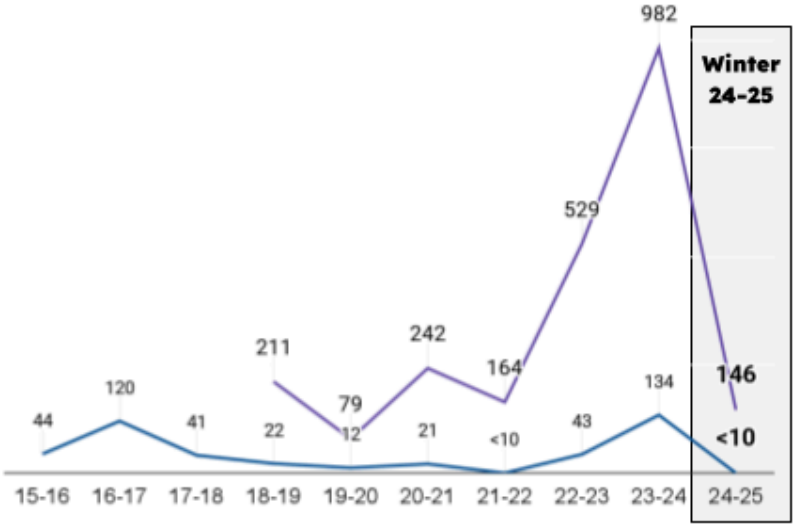
Winter weather increases the risk of injury from slips and falls in two ways. Recreational activities like skiing, hiking, or ice skating create more opportunities for falls. Ice and snow in neighborhoods and job sites contribute to increases in falls while at work and doing everyday activities. (Kakara et al., 2021).

A common reaction to a fall from ice and snow is to reach a hand out. As a result, these types of falls can result in more wrist and forearm fractures (Hajat, 2017).

For resources for care and prevention
of falls due to ice and snow,
visit the County ***Care for When it's Cold*** *webpage.*

Emergency department visits and hospital stays for falls due to ice and snow decreased in winter 24-25.

Multnomah County, emergency discharge data, hospitalization discharge data

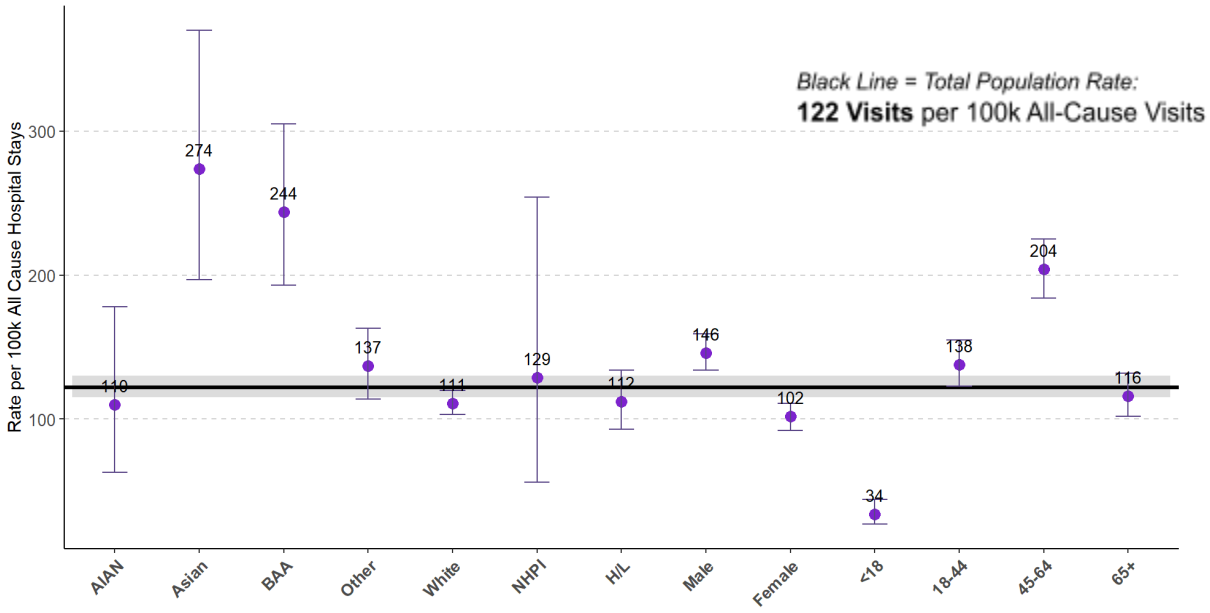


Emergency Department Visit Counts decreased compared to last winter and the average of the past five winters.

Hospital Stay Counts decreased compared to last winter, and were below the average of the past five winters.

Over the past two winters, the rate for visits for falls due to ice or snow per 100k all-cause visits were higher for Asians, Black/African Americans, men, and people ages 45-64

Multnomah County, emergency discharge data, winters 2023-24 through 2024-25 purple lines and grey shading show 95% confidence interval



A confidence interval is a range of values that help us understand how likely the rate is true. A wider range means we are less certain of the rate. This can be due to a small sample size or high variation.

Key Takeaways on Falls due to Ice and Snow

Emergency Room Visits

These figures use emergency room discharge data.

Subgroups are calculated for visits that have occurred over the past 2 years because of the small sample size in winter 2024-25.

Counts. There were **146 visits related to falls due to ice or snow** in winter 2024-25. This is:

- 836 fewer visits than the previous season (an 86% decrease).
- 253 fewer visits than the average of the past five seasons (399 visits).
- Unlike the previous winter 2023-24, there was no multi-day ice event that affected neighborhoods across the County in winter 2024-25. This likely contributes to the large decline in visit counts.

Rates. The visit rate for falls due to ice and snow was **19 visits per 100k all-cause visits** in winter 2024-25. This is:

- An 84% reduction compared to the visit rate last season (120 visits per 100K all-cause visits).

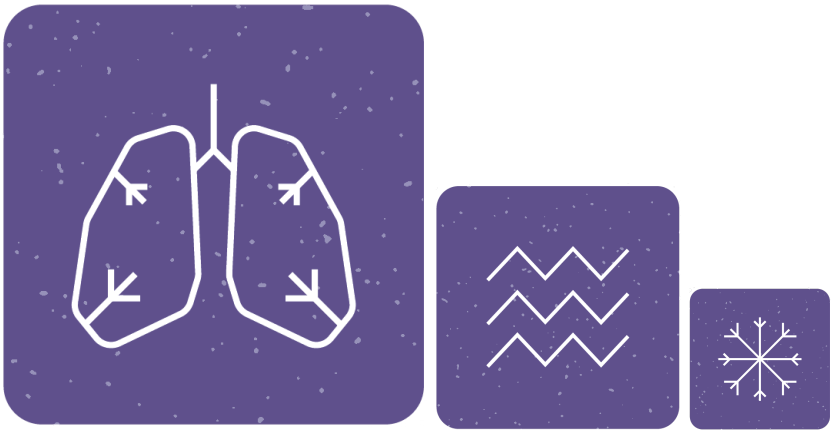
Differences in Subgroups. Over the past two winters, the overall rate for visits for falls due to ice or snow per 100k all-cause visits were significantly higher for Asians, Black/African Americans, men, and people ages 45-64 than for the total population fall visit rate. Fall visit rates were significantly lower for people under the age of 18.

Hospital Stays

Counts. There were **fewer than ten hospital stays from falls due to ice and snow** in winter 2024-25. This is:

- At least a 124 count decrease compared to the previous year.
- At least 34 fewer than the average count over the past five years of 44 hospitalizations per winter.

Emergency Room Services. All patients received emergency room services before admission.



Non-Infectious Respiratory Illnesses

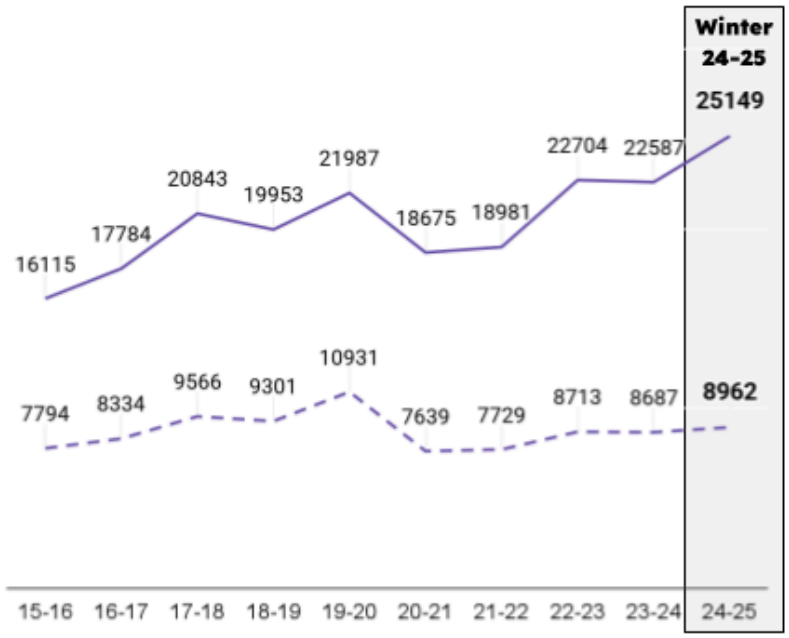
Community exposure to air pollution can increase during the winter. This is a time of year when people tend to burn wood more often (Kotchenruther, 2016) and let vehicles idle for longer periods to warm up (Wine et al., 2022).

There are also more thermal inversions that trap cold air and emissions near the ground. Cold temperatures and dry conditions can also cause respiratory problems like shortness of breath, wheezing, and coughing. The combination of cold temperatures and air pollution can worsen non-infectious respiratory illnesses (NIRI) like asthma or bronchitis (D'Amato et al., 2018).

*For resources for care and prevention of carbon monoxide poisoning, visit the County **Care for When it's Cold** webpage.*

Non-infectious respiratory illness outcome counts and rates increased in winter 24-25.

Multnomah County, ESSENCE, solid line = counts, dashed line = rates per 100k all-cause visits

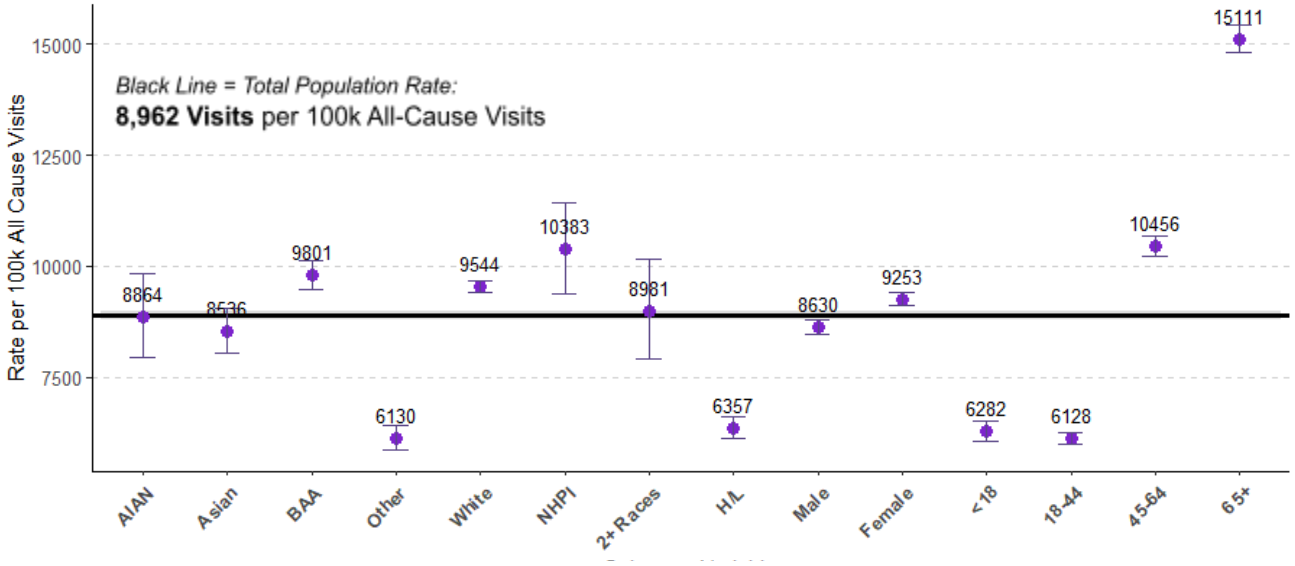


Emergency Department and Urgent Care Visit Counts increased compared to last winter and the average of the past five winters. Counts reached a record seasonal high.

Emergency Department and Urgent Care Visit Rates per 100k All-Cause Visits increased compared to last winter and the average of the past five winters.

People ages 65 and older had the highest n-infectious respiratory illness visit rate per 100K all-cause visits, at a rate 1.7 times higher than the total population.

Multnomah County, ESSENCE, winter 24-25, purple lines and grey shading show 95% confidence interval



A confidence interval is a range of values that help us understand how likely the rate is true. A wider range means we are less certain of the rate. This can be due to a small sample size or high variation.

Key Takeaways on Non-Infectious Respiratory Illnesses (NIRI)

Emergency Room and Urgent Care Visits

Counts. There were **25,149 NIRI visits** in winter 2024-25, the highest seasonal count over the past ten winters. This is:

- A 2,562 visit increase over the previous season (a 11% increase).
- A 4,162 visit increase over the average of the past five seasons (20,987 visits).

Rates. The NIRI visit rate was **8,962 visits per 100k all-cause visits** in winter 2024-25, the highest rate over the past five winters. This is:

- A 3% increase compared to the visit rate last season (8,687 visits per 100K all-cause visits).
- Comparable to the average visit rate over the past five winters (8,766 visits per 100k all-cause visits).

Season Trends. On average there were 118 visits per day for NIRI throughout the winter. The proportion of NIRI visits as a percentage of all visits was consistent throughout the season, ranging from 7% to 12% of all daily visits. There were no large increases in NIRI visits throughout the season.

Differences in Subgroups. There were significant differences in rates between subgroups, varied most widely by age group. People ages 65 and older had the highest NIRI visit rate per 100K all-cause visits of all subgroups (15,111), at a rate 1.7 times higher than the total population visit rate. Other subgroups with significantly higher rates included people between the ages of 45 and 64, and Native Hawaiian/Pacific Islanders, Whites, Blacks/African Americans and women.

Actions

Strategies to reduce exposure and improve the ability of communities to prepare for and recover from severe winter weather can improve community health. Public health interventions are commonly organized with the health impact pyramid model. The model organizes strategies by those that have greater individual impact to those that have greater population impact (Frieden, 2010).

Action ideas to reduce cold-related illnesses and injuries and carbon monoxide poisonings are below. Though these outcomes decreased compared to last winter, ED/UC visit rates were similar to past years. More assessment is needed to better understand specific conditions that add to winter respiratory trends. Additional information on winter safety can be found on the County Care for When it 's Cold webpage.

Pyramid Tier	Cold-Related Illness	Carbon Monoxide Poisoning
Educational interventions	• Expand communications around severe weather alerts, warming shelter availability, and impacts of severe weather on health and safety	• Expand outreach on CO poisoning symptoms and risk factors (Moberg et al., 2023), especially when temperatures first drop below 30F for the first time in the season. • Host community forums to share information and build community connections
Ongoing interventions	• Support resource distribution to keep people warm and dry, especially when daily highs drop below 50F for the first time in the season • Adopt a transitional support program to prevent further cold weather exposure after discharge and reduce frequent use (Fazel et al., 2014; Moe et al., 2017)	• Increase access to and distribution of CO detectors (Moberg et al., 2023)
Long-lasting protective interventions	• Increase drying and warming refuge in Downtown Portland zip code 97209 throughout the winter season • Continue operating warming shelters during severe weather (Akhanemhe et al., 2025)	• Reduce the prevalence of gas appliances (ie ranges, ovens, furnaces, and water heaters), as well as wood stoves and generators (Moberg et al., 2023)
Making the healthy option the default option	• Support immediate interventions that house people, keep people housed, and prevent displacement (Welcome Home, 2025)	• Support community transition to clean energy, heating, and cooking options • Support development of public and community-owned microgrids • Promote and enforce Oregon CO detector laws
Social and economic factors	• Support programs that maintain stable and thermally safe housing, like energy assistance and weatherization	• Support programs that maintain stable and thermally safe housing, like energy assistance and weatherization

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Appendix A. Additional Methods

Data sources detail, variables, and data limitations

National Weather Service		
Description	**Variables**	**Limitations**
The NWS provides weather and climate information to inform decision-making to protect community well-being.	• Temperature • Rain • Snow • Wind chill	• Data used are collected from one site (PDX), while variation exists throughout the county depending on built and natural environment

Oregon ESSENCE		
Description	**Variables**	**Limitations**
The Oregon ESSENCE database tracks near-real time visits to local emergency departments and some urgent care clinics. Records include diagnoses, demographic information, and additional context from triage notes. Rates were calculated using the total visit count for a subgroup for all causes in the winter season.	• Cold-related illness visits • Carbon monoxide poisoning visits • All fall injury visits • Non-infectious respiratory illness visits (NIRI)	• Counts may include the same person visiting on separate occasions • Some triage notes not complete and completeness varies by provider • Counts <5 suppressed due to data use agreements • Race can be provider recorded or incomplete • Represents people able to access care, therefore a likely undercount of full illness and injury incidence • Sensitive to exposures that residents experience outside of the County (ex: falling on ice in Bend) • NIRI query may be sensitive to infectious respiratory trends, such as influenza and pneumonia

Oregon Health Authority Hospital Discharge Records		
Description	**Variables**	**Limitations**
This data includes information about residents who received inpatient care at a hospital. This includes why they were admitted and the care they received.	• Cold-related illness hospitalizations (T68, T33, T34, T69) • Fall injuries related to icy conditions (W00)	• Counts <10 are suppressed due to data use agreements • Represents people able to access care, therefore a likely undercount of full illness and injury incidence

Oregon Health Authority Emergency Discharge Records		
Description	**Variables**	**Limitations**
This data set is official and final emergency room data based on administrative claims and ICD-9/10 codes.	• Fall visits specific to ice and snow	• Only available since 2018 • Several month lag in reporting • Represents people able to access care, therefore a likely undercount of full illness and injury incidence

Oregon Health Authority Vital Records		
Description	**Variables**	**Limitations**
These records are the most stable source of information about death trends. It includes cause of death and some demographic information.	• Hypothermia deaths (underlying X31 or contributing T68-T69) • Carbon monoxide deaths (contributing cause of T58 when underlying cause is X47, Y17, X00, or Y26)	• Numbers are considered provisional and subject to change • Limited to Multnomah County residents that died in Oregon, excludes deaths of outside residents that occurred within Multnomah County

Defining Significance

“Significance” is a statistical term that means the outcome is likely not due to random chance. We define “significant” outcomes in two different ways in this report:

- Differences between demographic subgroups are significant when their 95% confidence intervals do not overlap.
- Influence of an environmental variable on an outcome is significant when the time-series model used has a p-value of less than 0.05.

Modeling Outputs

A generalized linear model using a poisson distribution was used to evaluate the relationship between ED/UC visits and environmental variables. The general formula was as follows:

Outcome ~ Maximum Temperature + Wind Chill + Precipitation + Snow + Weekend + Holiday

Outputs are included below. Significant p-values are highlighted in yellow.

Cold-Related Illness ED/UC Visits

variable	estimate	std.error	statistic	p.value
Weekend	-0.01438121	0.109069071	-1.32E-01	8.95E-01
Wind Chill	-0.02124508	0.008581773	-2.48E+00	1.33E-02
Maximum Temperature	-0.04300055	0.008812724	-4.88E+00	1.06E-06
Snow	-0.24664229	0.234003589	-1.05E+00	2.92E-01
Precipitation	0.6461893	0.189962941	3.40E+00	6.70E-04
Holiday	-0.46951484	0.299382162	-1.57E+00	1.17E-01
(Intercept)	3.74104905	0.328227033	1.14E+01	4.29E-30

AIC: 700.6

Data Tables

Available for download where this report is found.