

Ellensburg Community 2025 Report



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Executive Summary

The Ellensburg Community Report provides community information, demographic data, greenhouse gas emissions data, and information about criteria air pollutant levels (CAPs) and their health impacts. This document provides information about air quality and health impacts to those who live, work, and play in the Ellensburg community.

For more information about the background and methodology of this document, please visit the *2025 Report: Overburdened Communities Highly Impacted by Air Pollution (2025 Report)*.



Community Overview

The Ellensburg community was identified as overburdened and highly impacted by air pollution because it met the statewide screening criteria based on the EJScreen demographic index¹ and experiences elevated levels of short-term exposure to fine particulate matter (PM_{2.5}). Previous modeling results indicate that ozone (O₃) and nitrogen dioxide (NO₂) contribute to the air pollution in this community. Community identification is described in more detail in the [Overburdened Communities Highly Impacted by Air Pollution StoryMap](#).

Land Area: 5.5 sq. mi

Population: 17,751

County: Kittitas

Municipal Government: Ellensburg City Council

Ecology Region: Central

Local Clean Air Authority: ECY Central Region Office

Local Health Jurisdiction: Kittitas County Public Health

Primary languages spoken: English, Spanish

Primary pollutant of concern: Short-term PM_{2.5}, cumulative criteria air pollution



Geographic characteristics

Ellensburg is a small city in Kittitas County, a predominantly agricultural county in the geographic center of the state. The identified community includes almost the entire area within the Ellensburg city limits and is located near Interstate 90 and Interstate 82. Ellensburg is home to Central Washington University and therefore has a large population of students for most of the year. Students living in dormitories or student housing are not counted as residents in the census.

¹ EJScreen demographic index <https://www.epa.gov/ejscreen>

may be more vulnerable to air pollution exposure, including schools, childcare facilities, healthcare clinics, and a hospital.

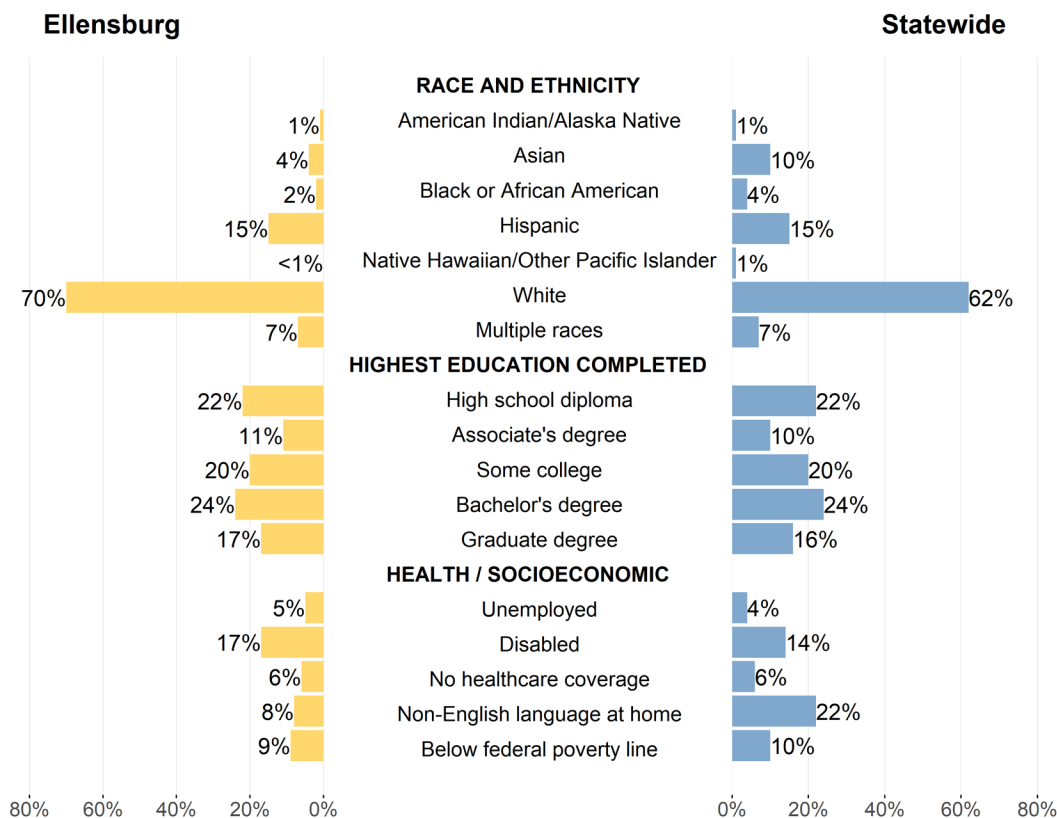


Figure 2. Sociodemographic characteristics of the Ellensburg community compared to statewide percentages, based on Washington's 2024 estimated population of 8,035,700.⁵

Health characteristics

Ellensburg has elevated prevalences of chronic health conditions among individuals ages 18 years and older relative to the statewide population, including asthma (12.6% vs. 11.4%) and COPD (5.9% vs. 5.7%), and lower prevalences of cardiovascular disease (5.3% vs. 5.7%), diabetes (7.6% vs. 9.6%), and stroke (2.9% vs. 3.1%). These prevalences are not necessarily attributable to air pollution. Community and statewide prevalences that have overlapping 95% confidence intervals, as shown in Figure 3, might not be statistically significant.

⁵ WA Office of Financial Management, Nov 2024 Data Tables, Population by age and sex https://ofm.wa.gov/wp-content/uploads/sites/default/files/public/dataresearch/pop/stfc/stfc_2024.xlsx

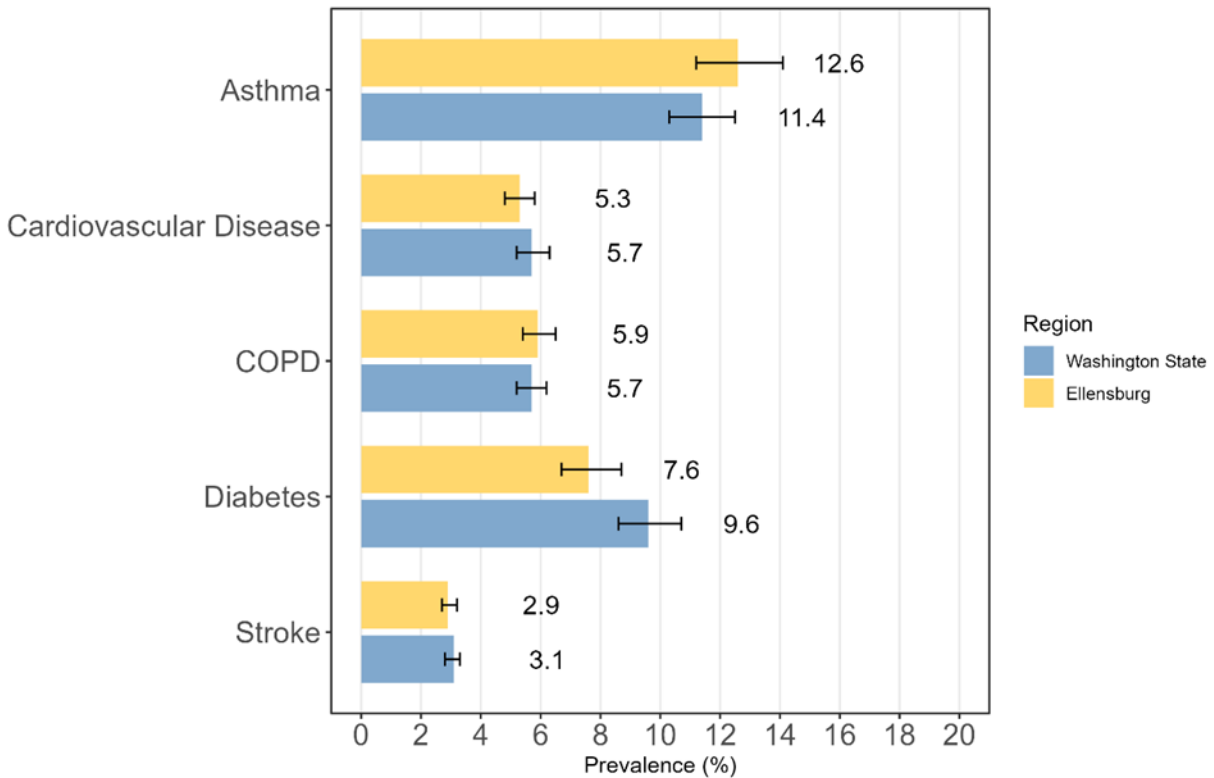
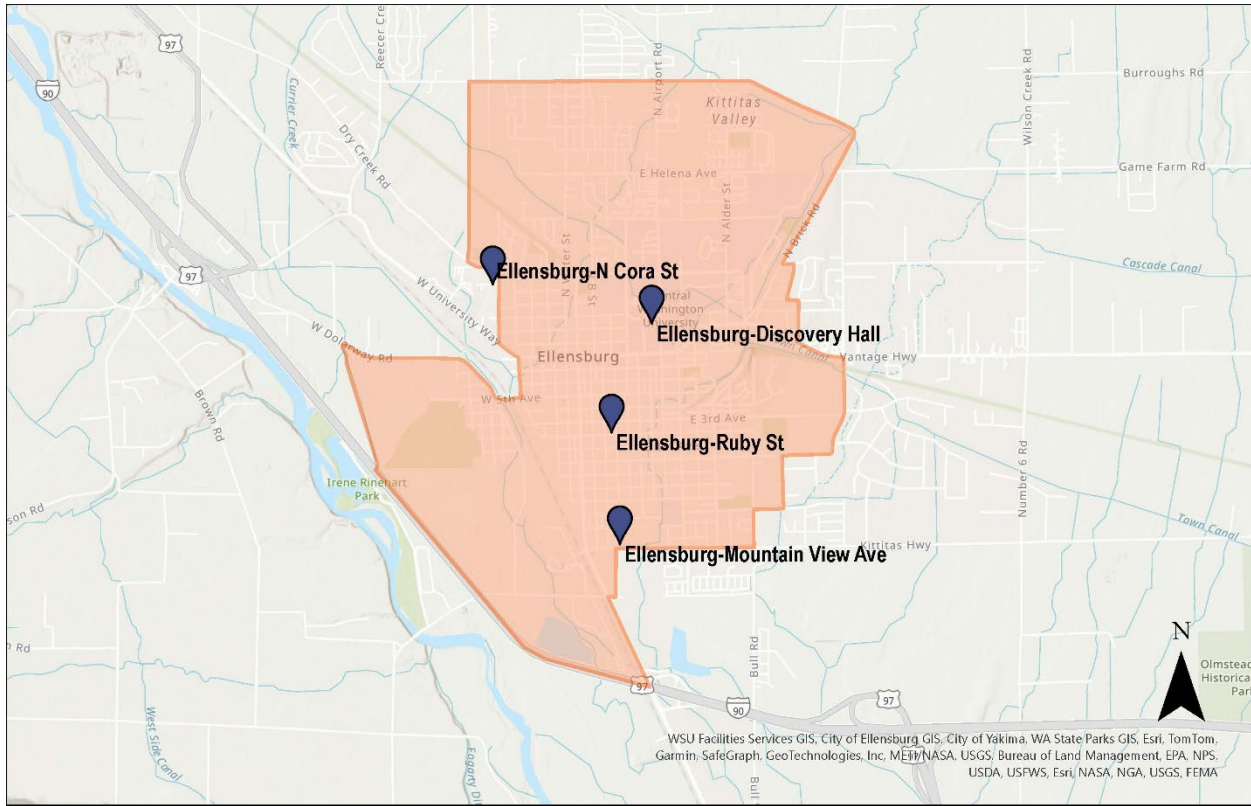


Figure 3. Prevalence of chronic health conditions among people ages 18 years and older in Ellensburg census tracts compared with Washington statewide.

Data come from CDC PLACES, 2024 release, which uses 2022 survey data.⁴ Yellow and blue bars indicate the estimated prevalence of each condition. Black lines indicate the 95% confidence interval.

Air Monitoring

In the Ellensburg community, Ecology’s Central Regional Office (CRO) has operated a regulatory PM_{2.5} monitor since 2004. Ecology also installed three low-cost, highly accurate PM_{2.5} sensors (SensWA) in 2024 using Climate Commitment Act (CCA) funding (Figure 4; Table 1). These sensors continuously measure PM_{2.5} concentrations, and partial-year data is included in this report. No other criteria air pollutants are currently monitored in the Ellensburg community.



 Air monitoring sites - Included in analysis

 Ellensburg community boundary

0 0.5 1 Miles

Figure 4. Map of Ellensburg air monitoring sites.

Table 1. Ellensburg criteria air pollutant monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
Ellensburg-Ruby St	Regulatory	Ecology-CRO	PM _{2.5}
Ellensburg-N Cora St	SensWA ¹	Ecology-CRO	PM _{2.5}
Ellensburg-Mountain View Ave	SensWA ¹	Ecology-CRO	PM _{2.5}
Ellensburg-Discovery Hall	SensWA ¹	Ecology-CRO	PM _{2.5}

¹ Installed as part of Climate Commitment Act (CCA) implementation

Criteria Air Pollution

This report summarizes criteria air pollution (CAPs) concentrations in the Ellensburg community from 2022 through 2024. CAPs concentrations for PM_{2.5} are calculated using data from the Washington Ambient Air Monitoring Network and reported according to the Environmental Protection Agency’s (EPA) methodology. More information can be found in the background and methods sections of the 2025 Report.

In addition to analyzing monitored criteria air pollution concentrations, we calculated the number of days per year residents of the Ellensburg community experienced unhealthy air quality, according to EPA’s Air Quality Index (AQI). The AQI is a six-category color-coded scale used to communicate daily air quality levels to the public. Days when an AQI above 100 are considered “unhealthy for sensitive groups” or worse.

Between 2022-2024, the Ellensburg community experienced an annual average of 3 days with unhealthy air (Figure 5). In comparison, between 2020-2022, the annual average was 5.7 days. Wildfire smoke was the predominant cause of these exceedances.

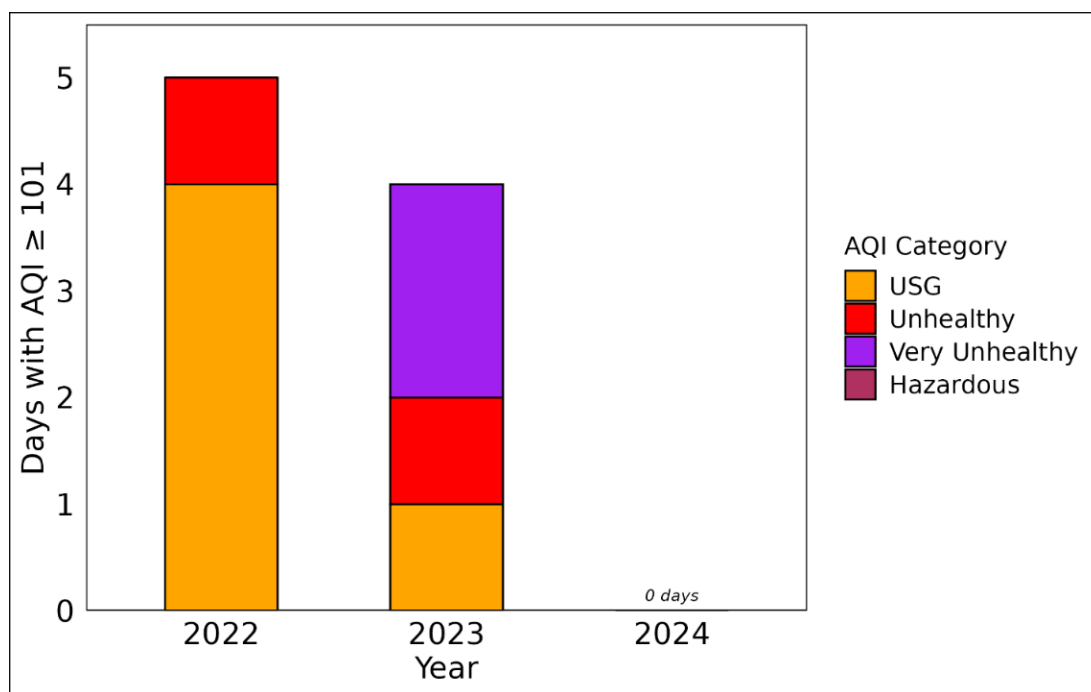


Figure 5. Number of days 2022-2024 with unhealthy air quality. Includes days impacted by wildfire smoke.

Table 2 includes 24-hour PM_{2.5} (98th percentile) summary statistics. PM_{2.5} concentrations are measured over 24-hour periods in micrograms per cubic meter (µg/m³). The EPA establishes national ambient air quality standards (NAAQS), which define the maximum allowable levels (thresholds) for each criteria pollutant. The NAAQS threshold for 24-hour PM_{2.5} (98th percentile) is 35 µg/m³. The design value for 24-hour PM_{2.5} (98th percentile) is a statistic that describes the air quality of a location relative to the NAAQS over a three-year period and is used to describe short-term fine particulate exposure.

From 2022 to 2024, the 24-hour PM_{2.5} (98th percentile) concentrations at the Ellensburg-Ruby St monitoring site ranged from 14.7 to 25.1 µg/m³. The 2024 design value is 19 µg/m³, which is below the NAAQS. Wildfire-impacted days on which the 24-hour average PM_{2.5} concentrations exceeded 35.4 µg/m³ were excluded. The annual 98th percentile of 24-hour PM_{2.5}, excluding wildfire-impacted days, was approximately 5% lower than when all days were included. At the other three monitoring sites in this community, there was only partial-year data available from 2024, which all values were below the NAAQS.

Table 2. 24-hour PM_{2.5} (98th percentile) summary statistics (2024) and 2024 design values (2022–2024). Units are in µg/m³. Brackets [] exclude wildfire days when 24-hour average PM_{2.5} concentration exceeded 35.4 µg/m³. 24-hour PM_{2.5} (98th percentile) NAAQS is 35 µg/m³.

Monitoring Site	2022 24-hour 98 th Percentile	2023 24-hour 98 th Percentile	2024 24-hour 98 th Percentile	2024 Design Value
Ellensburg- Ruby St	25.1 [24.5]	18.4 [17.0]	14.7 [14.7]	19 [19]
Ellensburg- Discovery Hall	DNC	DNC	13.8 [13.8]	*
Ellensburg- Mountain View Ave	DNC	DNC	11.4 [11.4]	*
Ellensburg-N Cora St	DNC	DNC	15.4 [15.4]	*

Italics indicate incomplete data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m³ = micrograms per cubic meter, * = incomplete data for 3-year design value

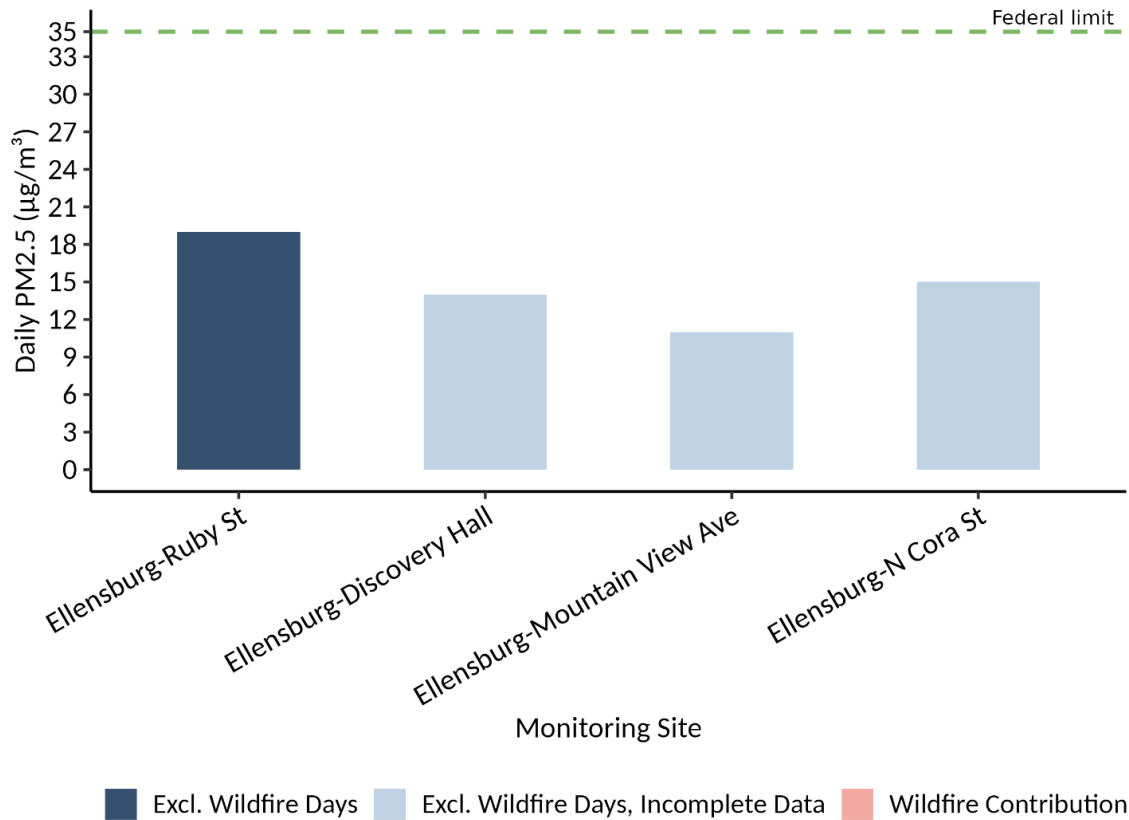


Figure 6. 24-hour PM_{2.5} (98th percentile) summary statistics, 2022-2024. Annual summary statistics calculated with and without days elevated from wildfire smoke. Dark blue bar includes three complete years of data, 2022-2024; light blue bars include average of available data from 2024. Dashed line is the federal limit (NAAQS) for 24-hr PM_{2.5}.

Table 3 includes annual mean PM_{2.5} concentrations between 2022 to 2024 and 2024 design values. The annual PM_{2.5} design value is a three-year average of annual mean PM_{2.5} concentrations used to describe long-term exposure. Annual mean PM_{2.5} concentrations from three of the four monitoring sites in this community only have partial data from 2024. The Ellensburg-Ruby St monitoring site remained below the NAAQS throughout 2022 to 2024, with only slight influences from wildfire smoke. The 2024 design value remained below the NAAQS both including and excluding wildfire-impacted days (Table 3).

Table 3. Annual mean PM_{2.5} concentrations and 2024 design values, 2022–2024. Units are in µg/m³. Brackets [] exclude wildfire days when the average PM_{2.5} concentration exceeded 15.0 µg/m³. Annual PM_{2.5} NAAQS is 9.0 µg/m³.

Monitoring Site	2022	2023	2024	2024 Design Value
Ellensburg-Ruby St	7.07 [6.46]	6.49 [5.54]	4.70 [4.59]	6.1 [5.5]
Ellensburg-Discovery Hall	DNC	DNC	3.74 [3.66]	*
Ellensburg-Mountain View Ave	DNC	DNC	3.46 [3.46]	*
Ellensburg-N Cora St	DNC	DNC	4.05 [3.87]	*

Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m³ = micrograms per cubic meter, * = incomplete data for 3-year design value

Health Impacts of Criteria Air Pollution

We estimated the number and rate of deaths and morbidities associated with PM_{2.5} and O₃ concentrations by age range and using health effect estimates from peer-reviewed studies (Appendix B, Table 2 in the 2025 Report). All estimates are rounded to the nearest whole number. We present ranges of deaths or morbidities where multiple studies assessed that health outcome.

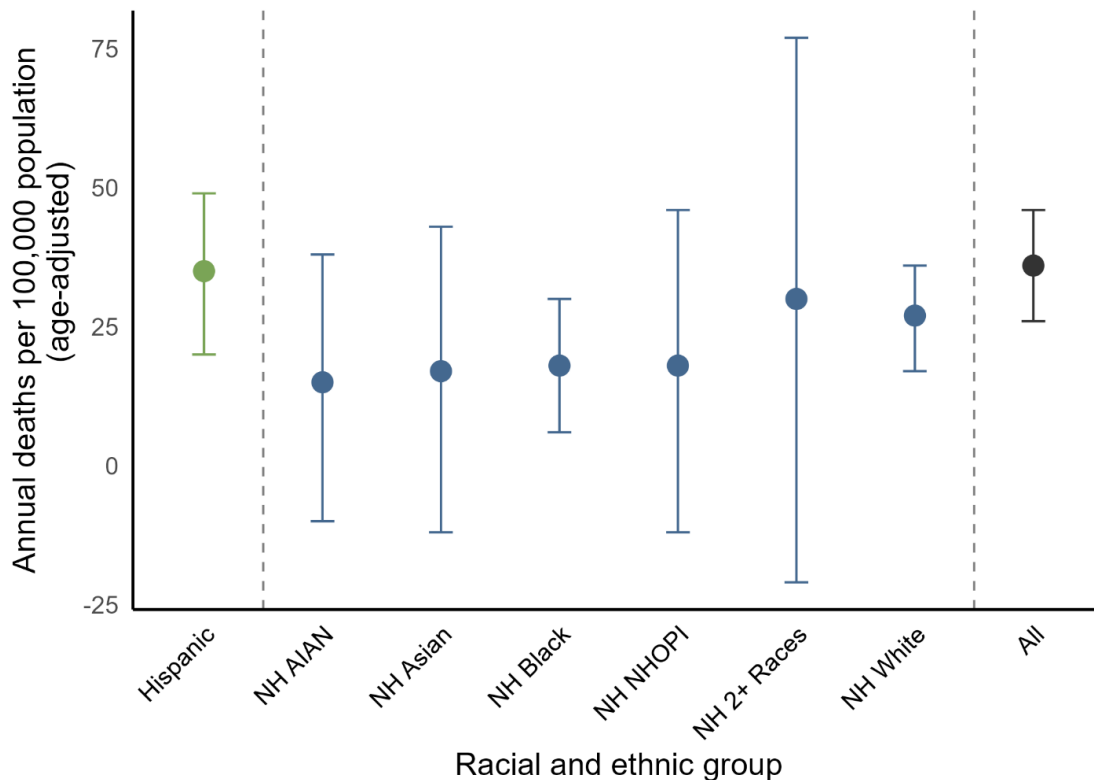
PM_{2.5}

We estimated 5 deaths by any cause (28 deaths per 100,000 population, Table B1) related to yearly PM_{2.5} exposure. Among older adults, which is a smaller portion of the population, we estimated 4 total deaths (120 deaths per 100,000 population) each year associated with yearly PM_{2.5} exposure (Table B2).

Among different racial and ethnic groups (Figure 7), we estimated most PM_{2.5}-related deaths by any cause per year to be among non-Hispanic White people (3 deaths among 18–84-year-olds).

However, when accounting for the ages of people in each racial and ethnic group⁶, the annual age-adjusted mortality rate was highest among Hispanic people (35 deaths per 100,000 population) followed by non-Hispanic people of two and more races (30 deaths per 100,000 population).

Figure 7 is based on the study by Pope et al. (2019),⁷ where AIAN refers to American Indian and Alaska Native; NH to non-Hispanic; and NHOPI to Native Hawaiian and Other Pacific Islander. The bars indicate the 95% confidence interval (CI) for each rate.



⁶ Age-adjusted mortality rates represent the mortality rate if the age distribution in that race category matched the age distribution of the total Washington population. This allows for better comparability given that different race groups can have different age distributions and the risk of death is higher in older age groups. We see higher age-adjusted rates for race categories other than the non-Hispanic White group given that these groups are generally younger in overburdened communities compared to the statewide age distribution; when we standardize these groups to the state age distribution (which has a higher proportion of older people) the estimated mortality rates are higher. More information about our age-adjustment methods can be found in the 2025 Report.

⁷ Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

Figure 7. Age-adjusted annual death rates by any cause associated with annual PM_{2.5} exposure among ages 18-84 by racial and ethnic group in Ellensburg.

When assessing specific causes of death related to yearly PM_{2.5} concentrations (Table B3), we estimated 2 deaths due to cardiovascular disease (10 deaths per 100,000 population), 2 to 3 deaths due to ischemic heart disease (16 to 27 deaths per 100,000 population), and 0 deaths per year due to lung cancer (3 to 4 deaths per 100,000 population) among adults.

Regarding non-fatal health outcomes (Table B3), an estimated 2 hospital admissions (10 visits per 100,000 population) for acute non-fatal myocardial infarction were associated with yearly PM_{2.5} concentrations among adults. Additionally, 1 lung cancer diagnosis per year was associated with annual PM_{2.5} exposure among all people (7 diagnoses per 100,000 population).

Daily PM_{2.5} exposure (Table B4) was associated with <1 death by any cause (0 to 11 per 100,000 population) among all people. For non-fatal conditions, daily PM_{2.5} was associated with <1 acute non-fatal myocardial infarction admission (2 per 100,000 population) among all adults, 1 respiratory admission (40 per 100,000 population) among older adults, and 1 asthma hospital admission (3 per 100,000 population) among people ages 0 to 64. Additionally, 2 to 4 asthma-related emergency department (ED) visits (10 to 19 per 100,000 population) among all people and 3 asthma-related ED visits (56 per 100,000 population) among youths ages 0 to 17 years were associated with daily PM_{2.5} exposure.

Ozone

We estimated that O₃ exposure during the warm season (Table B5) was associated with 2 seasonal deaths by any cause among older adults ages 65 to 99 (47 deaths per 100,000 population). Daily O₃ exposure was associated with <1 death by any cause (2 per 100,000 population), 7 asthma-related ED visits (31 per 100,000 population) among all people, and 3 respiratory hospital admissions (104 per 100,000 population) among older adults ages 65 to 99.

Greenhouse Gases

Greenhouse gas results for the Ellensburg overburdened community highly impacted by air pollution include: 1) Emissions from greenhouse gas reporting entities per RCW 70A.65⁸ and WAC 173-441⁹, -446;¹⁰ and 2) Mobile source emissions.¹¹

⁸ Greenhouse Gas Emissions – Cap-and-Invest Program <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65>

⁹ Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

¹⁰ Climate Commitment Act – Program Rule <https://app.leg.wa.gov/WAC/default.aspx?cite=173-446>

¹¹ Environmental Justice Review <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.020>

We did not collect information or model greenhouse gas emissions from other sources at this time. The greenhouse gas information provided in this report aligns with the Climate Commitment Act’s (CCA) requirements. For further information on methods and statewide results, refer to the 2025 Report.

Facilities

Washington requires certain businesses that emit more than 10,000 metric tons of carbon dioxide equivalents (MT CO₂e) to report to the Washington Greenhouse Gas Reporting Program.¹² Businesses that emit over 25,000 MT CO₂e are also subject to the Cap-and-Invest Program (covered sources). Each reporting facility is required to follow a compliance plan.

In the Ellensburg community, one facility (Figure 8; Table 4) within the community boundary reported their emissions in 2022 and 2023. The total emissions from this facility in 2022 was 13,700 MT CO₂e and 12,790 MT CO₂e in 2023, a 6.6% year-to-year decrease. Some facilities in other communities report biogenic carbon (biogenic CO₂)¹³ emissions, which are expected to be partially recaptured as part of the natural carbon cycle. For reporting purposes, biogenic CO₂ is subtracted from total metric tons of CO₂e, even though it has the same atmospheric warming effect as non-biogenic CO₂. There were no facilities that reported biogenic CO₂ in Ellensburg. Since 2020, total reported greenhouse gas emissions from facilities within and near OBCs have decreased by 20.3%, and by 6.3% after subtracting biogenic CO₂ emissions. Some year-to-year fluctuations in emissions from individual facilities are expected.

¹² Mandatory greenhouse gas reports <https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/mandatory-greenhouse-gas-reports>

¹³ Biogenic carbon refers to greenhouse gases released from the combustion, decomposition, or processing of materials derived from biological sources – such as wood, paper, biomass fuels, agriculture residues, food waste, or biogas. Under the Washington Greenhouse Gas Reporting Program, these emissions are reported separately from fossil-derived emissions because they result from carbon that circulates within the short-term natural carbon cycle rather than long-term carbon stores. Biogenic CO₂ acts the same way in the atmosphere as non-biogenic CO₂. Anthropogenic processes that include these emissions reduce a facility’s environmental impact.

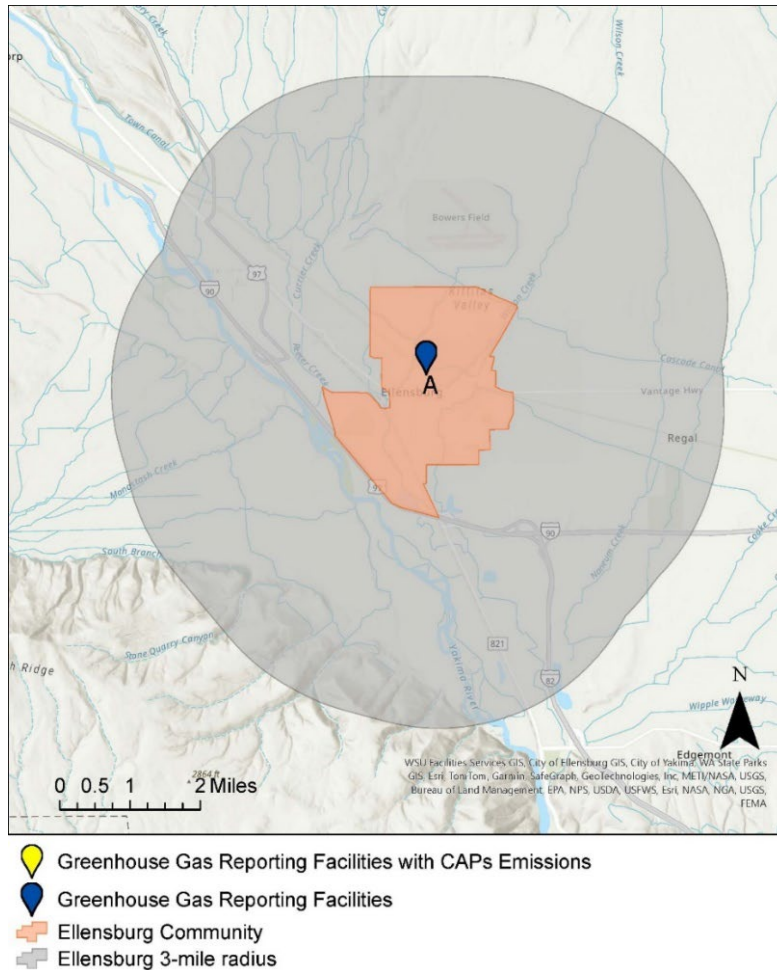


Figure 8. Reporting facilities as of 2023 that are in or near the Ellensburg community boundary. Facility letters correspond with Table 4.

The emissions in Table 4 are in MT CO₂e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR4 GWP¹⁴, to convert emissions into CO₂e. A GWP describes how much heat a greenhouse gas traps in the atmosphere relative to carbon dioxide over a specific time horizon (20, 100, or 500 years). AR4 GWPs are published in the 2007 Intergovernmental Panel on Climate Change (IPCC).¹⁵ The Greenhouse Gas Reporting Program uses AR4 GWPs mainly for regulatory stability, consistency, and alignment with other federal programs.

¹⁴ Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

¹⁵ Intergovernmental Panel on Climate Change <https://www.ipcc.ch/>

Table 4. Facility emissions in or nearby¹⁶ the Ellensburg community. Biogenic CO₂ is in brackets [].

	Facility Name/City	Facility Sector	Within Community Boundary	CCA-Covered Facility ¹⁷	Source of CAPs ¹⁸	2022 Emissions (MT CO ₂ e)	2023 Emissions (MTCO ₂ e)
A	Central Washington University-Ellensburg	Government	Yes	No	No	13,700 [0]	12,790 [0]

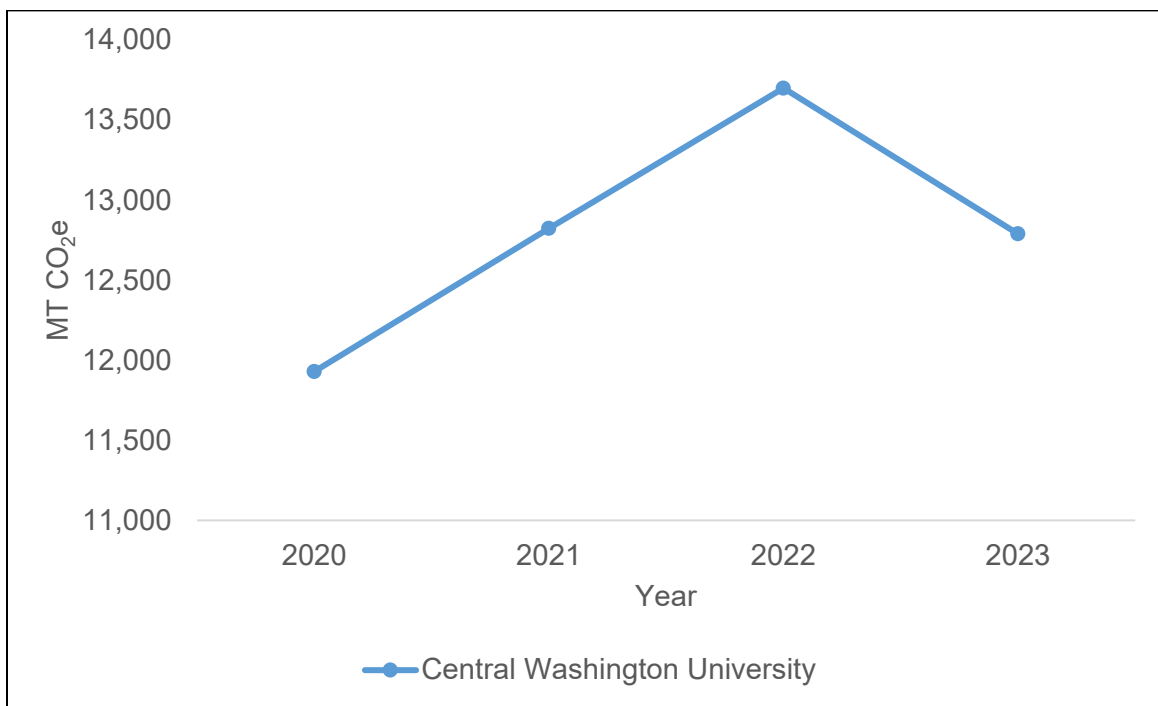


Figure 9. Greenhouse gas reporting facilities and their emissions from 2020-2023.

¹⁶ “Nearby” refers to facilities within a three-mile radius of the community boundary that were included in this analysis.

¹⁷ Large emitters of greenhouse gases, specifically those emitting 25,000 or more MT CO₂e annually in Washington that are part of the Cap-and-Invest program established by the Climate Commitment Act.

¹⁸ Major sources of criteria air pollutants are designated in the Air Operating Permit program. A major source is any stationary source that has the actual or potential to emit ≥100 tons per year for any air pollutant. More information can be found at <https://ecology.wa.gov/regulations-permits/permits-certifications/air-quality-permits/air-operating-permit>

Mobile sources

In the Ellensburg community, greenhouse gas emissions from mobile sources increased by 21% from 2020 to 2021 (Table 5) but have decreased by 5.4% between 2019 to 2021.¹⁹ Mobile sources consist of on-road and non-road emissions. The drop in emissions in 2020 was largely due to a decrease in vehicle traffic that was attributed to the COVID-19 pandemic.^{20,21}

The rate of MT CO₂e per capita is relatively high compared to the population because the identified community includes a more densely populated area and borders Interstate 90. Ellensburg is a major transportation hub.

Similar to Table 4, the results in Table 5 use AR5 GWPs to convert greenhouse gas emissions into CO₂e. In 2013-2014, the IPCC published AR5 GWPs and AR6 GWPs in 2021-2022. The Washington Greenhouse Gas Emissions Inventory²² uses AR5 GWPs in mobile source emission estimates, as the inventory models for greenhouse gas accounting are revised as science improves.

Table 5. Greenhouse gas emissions from mobile sources per capita from 2020-2021.

Population	2020 Emissions (MT CO₂e)	2020 Per Capita MT CO₂e	2021 Emissions (MT CO₂e)	2021 Per Capita MT CO₂e
16,273	225,579	13.9	272,884	16.8

¹⁹ Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report <https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html>

²⁰ Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 <https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

²¹ Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024 <https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf>

²² Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 <https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

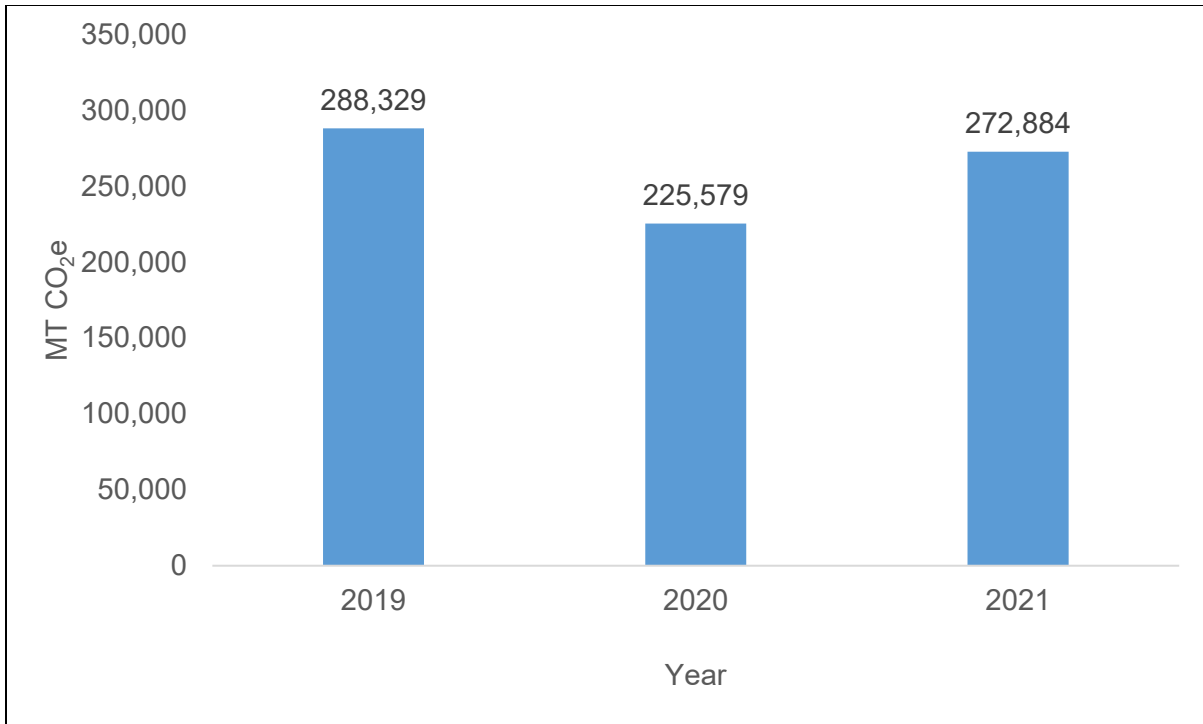


Figure 10. Annual greenhouse gas emissions from mobile sources in the Ellensburg community, 2019-2021.

Community Resources

These resources provide more information about air quality and health in the Ellensburg community:

- [Kittitas County Public Health Department - Assessment information page](#)²³
- [Kittitas County Public Health Department 2024-2029 Community Health Improvement Plan](#)²⁴
- [Kittitas County Public Health Department 2022 Community Health Assessment](#)²⁵
- [Zero-emission and electric vehicles mapping tool | WSDOT](#)²⁶

²³ <https://www.co.kittitas.wa.us/health/programs/assessment/default.aspx>

²⁴ <https://www.co.kittitas.wa.us/uploads/documents/health/assessment/2024-2029%20Community%20Health%20Improvement%20Plan.pdf>

²⁵

<https://www.co.kittitas.wa.us/uploads/documents/health/assessment/2022%20Community%20Health%20Assessment.pdf>

²⁶ <https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool>

- [Home | Washington Climate Action](#)²⁷

²⁷ <https://climate.wa.gov/>

Appendix A. Criteria Air Pollution

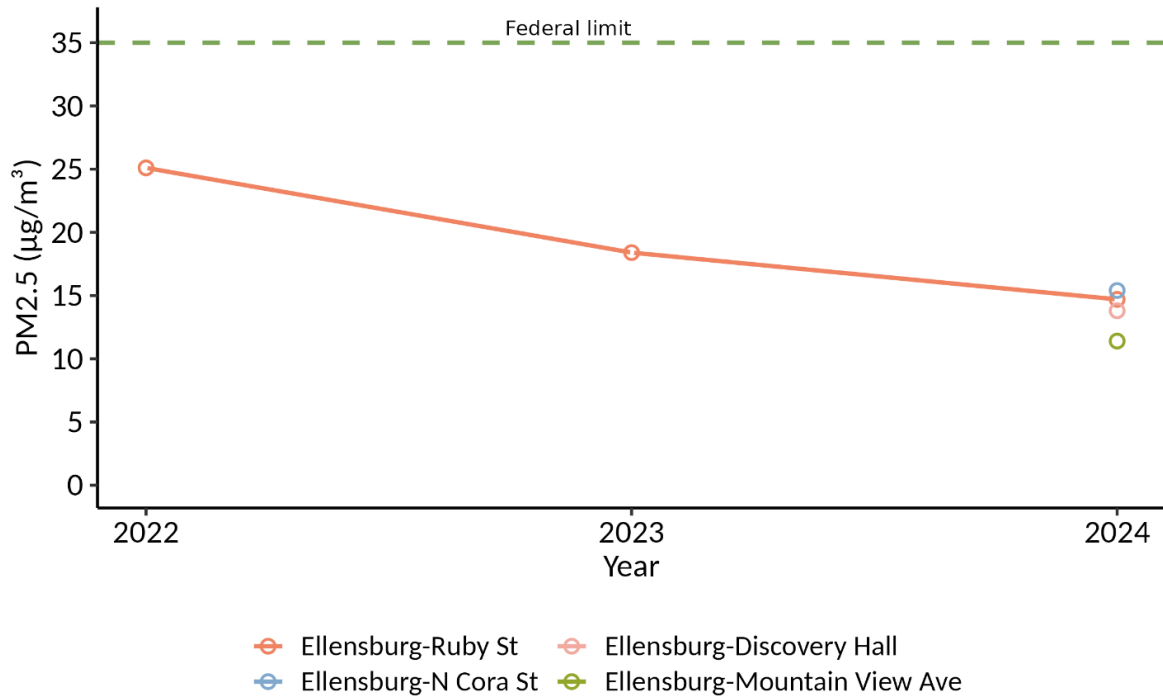


Figure A1. 24-hour $PM_{2.5}$ (98th percentile) concentrations at Ellensburg monitoring sites. Days impacted by wildfire smoke are included. Dashed line is the federal limit for 24-hr $PM_{2.5}$ ($35 \mu g/m^3$).

Appendix B. Supplemental Health Impacts Tables

Table B1. Estimated annual deaths by any cause related to yearly $PM_{2.5}$ exposure among 18–84-year-olds in Ellensburg by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019⁷).

Racial and Ethnic Group	Population (18-84-year-olds)	Estimated Annual Deaths [95% CI]	Estimated annual deaths per 100,000 population [95% CI]	Estimated age-adjusted annual deaths per 100,000 population [95% CI]
All	17,746	5 [4 to 6]	28 [20 to 35]	36 [26 to 46]
Hispanic	2,357	<1 [range <1]	12 [7 to 17]	35 [20 to 49]
Non-Hispanic AIAN	229	<1 [range <1]	7 [-5 to 17]	15 [-10 to 38]
Non-Hispanic Asian	679	<1 [range <1]	6 [-4 to 14]	17 [-12 to 43]
Non-Hispanic Black	353	<1 [range <1]	12 [4 to 20]	18 [6 to 30]
Non-Hispanic NHOPI	51	<1 [range <1]	30 [-20 to 76]	18 [-12 to 46]
Non-Hispanic 2+ races	1,149	<1 [range <1]	12 [-8 to 29]	30 [-21 to 77]
Non-Hispanic White	12,928	3 [2 to 4]	25 [16 to 33]	27 [17 to 36]

AIAN: American Indian and Alaska Native; CI: confidence interval; NHOPI: Native Hawaiian and Other Pacific Islander.

Race categories only include people who identify as non-Hispanic to reflect the race categories used in the study by Pope, et al.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington statewide.

Table B2. Estimated annual deaths by any cause related to yearly $PM_{2.5}$ exposure among 65–99-year-olds in Ellensburg by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017²⁸).

Racial and Ethnic Group	Population (65-99-year-olds)	Estimated Annual Deaths [95% CI]	Estimated annual deaths per 100,000 population [95% CI]	Estimated age-adjusted annual deaths per 100,000 population [95% CI]
All	3,274	4 [4 to 4]	120 [117 to 124]	108 [105 to 111]
Hispanic	112	<1 [range <1]	92 [80 to 104]	95 [82 to 108]
AIAN	21	<1 [range <1]	61 [37 to 83]	84 [52 to 115]
Asian	47	<1 [range <1]	48 [38 to 58]	49 [39 to 59]
Black	29	<1 [range <1]	197 [189 to 204]	128 [123 to 133]
NHOPI	18	<1 [range <1]	134 [82 to 183]	83 [51 to 114]
2+ races	138	<1 [range <1]	103 [63 to 140]	124 [76 to 169]
White	3,021	2 [2 to 2]	69 [67 to 72]	61 [59 to 64]

AIAN: American Indian and Alaska Native; CI: confidence interval; NHOPI: Native Hawaiian and Other Pacific Islander.

Race categories include people who identify as Hispanic and non-Hispanic to reflect the race categories used in the study by Di, et al.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington.

Table B3. Annual mortality and morbidity associated with yearly $PM_{2.5}$ exposure (yearly 24-hour average concentrations) in Ellensburg, 2022-2023. Brackets [] include 95% confidence interval.

²⁸ Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
Deaths – Any cause	65 to 99	Di et al., 2017 ²⁹	3,274	4 [4 to 4]	120 [117 to 124]
Deaths – Any cause	18 to 84	Pope et al., 2019 ³⁰	17,746	5 [4 to 6]	28 [20 to 35]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023 ³¹	18,204	2 [1 to 3]	10 [4 to 15]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017 ³²	10,167	2 [1 to 2]	18 [13 to 22]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009 ³³	10,167	3 [2 to 3]	27 [22 to 31]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019 ³⁴	10,167	2 [1 to 2]	16 [12 to 21]
Deaths – Lung Cancer	30 to 99	Krewski, et al., 2009 ³⁵	10,167	<1 [0 to 1]	4 [2 to 6]

²⁹ Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

³⁰ Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

³¹ Alexeeff SED, K.Van Den Eeden, S.Schwartz, J.Liao, N. S.Sidney, S. Association of Long-term Exposure to Particulate Air Pollution with Cardiovascular Events in California. *JAMA Network Open*. 2023;6(2):e230561.

³² Jerrett, 2017. Comparing the Health Effects of Ambient Particulate Matter Estimated Using Ground-Based Versus Remote Sensing Exposure Estimates. *Environmental Health Perspectives*. 2017 Apr;125(4):552-559. doi: 10.1289/EHP575. Epub 2016 Sep 9.

³³ Krewski D, Jerrett M, Burnett R, et al. 2009. Extended Follow-Up and Spatial analysis of the American Cancer Society Linking Particulate Air Pollution and Mortality. Health Effects Institute, Cambridge MA

³⁴ Pope, C.A., 3rd, Lefler, J.S., Ezzati, M., Higbee, J.D., Marshall, J.D., Kim, S.Y., Bechle, M., Gilliat, K.S., Vernon, S.E., Robinson, A.L., & Burnett, R.T. (2019). Mortality Risk and Fine Particulate Air Pollution in a Large, Representative Cohort of U.S. Adults. *Environmental Health Perspectives*, 127(7), 77007.

³⁵ Krewski D, Jerrett M, Burnett R, et al. 2009. Extended Follow-Up and Spatial analysis of the American Cancer Society Linking Particulate Air Pollution and Mortality. Health Effects Institute, Cambridge MA

Deaths – Lung Cancer	30 to 99	Turner et al., 2016 ³⁶	10,167	<1 [range <1]	3 [1 to 4]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023 ³⁷	18,204	2 [1 to 3]	10 [6 to 15]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016 ³⁸	10,167	1 [0 to 1]	7 [2 to 11]

CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with PM_{2.5} in this group in this community.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington statewide.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 Report for more information.

Table B4. Annual mortality and morbidity associated with daily PM_{2.5} exposure (daily 24-hour average concentrations) in Ellensburg, 2022-2023. Brackets [] include 95% confidence interval.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
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³⁶ Turner, M.C., Jerrett, M., Pope, C.A., III, Krewski, D., Gapstur, S.M., Diver, W.R., Beckerman, B.S., Marshall, J.D., Su, J., Crouse, D.L., & Burnett, R.T. (2016). Long-term ozone exposure and mortality in a large prospective study. *American Journal of Respiratory Critical Care Medicine* 193(10): 1134-1142.

³⁷ Alexeeff SED, K. Van Den Eeden, S. Schwartz, J. Liao, N. S. Sidney, S. Association of Long-term Exposure to Particulate Air Pollution with Cardiovascular Events in California. *JAMA Network Open*. 2023;6(2):e230561.

³⁸ Gharibvand, L., Shavlik, D., Ghamsary, M., Beeson, W.L., Soret, S., Knutsen, R., & Knutsen, S.F. (2016). The association between ambient fine particulate air pollution and lung cancer incidence: results from the AHSMOG-2 study. *Environmental Health Perspectives* 125 (3): 378-384

Deaths – Any cause	0 to 99	Ito et al., 2013 ³⁹	22,829	<1 [range <1]	<1 [0 to 1]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014 ⁴⁰	3,274	<1 [range <1]	11 [7 to 14]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022 ⁴¹	22,829	<1 [range <1]	1 [0 to 1]
Deaths – Respiratory	0 to 99	Liu et al., 2022 ⁴²	22,829	<1 [range <1]	1 [0 to 2]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005 ⁴³	18,204	<1 [0 to 1]	2 [-2 to 6]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Zanobetti et al., 2009 ⁴⁴	18,204	<1 [0 to 1]	2 [1 to 3]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009 ⁴⁵	3,274	1 [1 to 2]	40 [23 to 56]

³⁹ Ito, K., Ross, Z., Zhou, J., Nádas, A., Lippmann, M. and Thurston, G.D., 2013. NPACT Study 3. Time-series analysis of mortality, hospitalizations, and ambient PM_{2.5} and its components. National Particle Component Toxicity (NPACT) Initiative. <https://www.healtheffects.org/publication/national-particle-component-toxicity-npact-initiative-integrated-epidemiologic-and>

⁴⁰ Zanobetti, A., Dominici, F., Wang, Y. and Schwartz, J.D., 2014. A national case-crossover analysis of the short-term effect of PM_{2.5} on hospitalizations and mortality in subjects with diabetes and neurological disorders. *Environmental Health*, 13(1), p.38.

⁴¹ Liu, R.A., Wei, Y., Qiu, X., Kosheleva, A. and Schwartz, J.D., 2022. Short term exposure to air pollution and mortality in the US: a double negative control analysis. *Environmental Health*, 21(1), p.81.

⁴² Liu, R.A., Wei, Y., Qiu, X., Kosheleva, A. and Schwartz, J.D., 2022. Short term exposure to air pollution and mortality in the US: a double negative control analysis. *Environmental Health*, 21(1), p.81.

⁴³ Sullivan, J., L. Sheppard, A. Schreuder, N. Ishikawa, D. Siscovick and J. Kaufman. 2005. Relation between short-term fine-particulate matter exposure and onset of myocardial infarction. *Epidemiology*. Vol. 16 (1): 41-8.

⁴⁴ Zanobetti, A., Franklin, M., Koutrakis, P. and Schwartz, J., 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. *Environmental Health*, 8(1), p.58.

⁴⁵ Zanobetti, A., Franklin, M., Koutrakis, P. and Schwartz, J., 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. *Environmental Health*, 8(1), p.58.

Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003 ⁴⁶	19,555	1 [0 to 1]	3 [1 to 4]
ED Visits – Asthma	0 to 99	Mar et al., 2010 ⁴⁷	22,829	4 [1 to 8]	19 [5 to 33]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005 ⁴⁸	22,829	2 [-2 to 6]	10 [-9 to 28]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999 ⁴⁹	4,625	3 [1 to 4]	56 [29 to 81]

ED: emergency department; CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with PM_{2.5} in this group in this community.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

The age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington statewide.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 Report for more information.

Table B5. Annual mortality and morbidity associated with seasonal and daily O₃ exposure (seasonal and daily 8-hour maximum concentrations) in Ellensburg, 2022-2023. Brackets [] include 95% confidence interval.

⁴⁶ Sheppard, L. Ambient Air Pollution and Nonelderly Asthma Hospital Admissions in Seattle, Washington, 1987-1994. In: Revised Analyses of Time-Series Studies of Air Pollution and Health. 2003, Health Effects Institute: Boston, MA. p. 227-230.

⁴⁷ Mar, T. F., J. Q. Koenig and J. Primomo. 2010. Associations between asthma emergency visits and particulate matter sources, including diesel emissions from stationary generators in Tacoma, Washington. *Inhalation Toxicology*. Vol. 22 (6): 445-8.

⁴⁸ Slaughter, J. C., E. Kim, L. Sheppard, J. H. Sullivan, T. V. Larson and C. Claiborn. 2005. Association between particulate matter and emergency room visits, hospital admissions and mortality in Spokane, Washington. *Journal of Exposure Analysis and Environmental Epidemiology*. Vol. 15

⁴⁹ Norris, G., et al. An association between fine particles and asthma emergency department visits for children in Seattle. *Environmental Health Perspectives*, 1999. 107(6): p. 489-93.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
Deaths – Any cause (Seasonal)	65 to 99	Di, et al. 2017 ⁵⁰	3,274	2 [1 to 2]	47 [32 to 60]
Deaths – Any cause (Daily)	0 to 99	Zanobetti and Schwartz, 2008 ⁵¹	22,829	<1 [0 to 1]	2 [1 to 3]
ED Visits – Asthma (Daily)	0 to 99	Mar and Koenig, 2009 ⁵²	22,829	7 [2 to 12]	31 [8 to 51]
Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995 ⁵³	3,274	3 [1 to 6]	104 [30 to 172]

ED: emergency department; CI: confidence interval. CIs are inversely proportional to population sizes reflecting higher uncertainty when estimating effects with smaller numbers of people. CIs that include 0 indicate that it is plausible that no deaths are associated with O₃ in this group in this community.

Population is the average of the 2022 and 2023 Washington State Office of Financial Management estimates for the census tracts that comprise this overburdened community.

Age-adjusted rate indicates the expected rate if the age distribution in this overburdened community matched that of Washington statewide.

Health outcomes were selected based on the availability of effect estimates for that outcome relevant to the Washington population in the scientific literature. Where multiple effect estimates exist, we listed the model results separately for each. See the 2025 Report for more information.

⁵⁰ Di, Q., Wang Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F., Schwartz, J.D. 2017. Air Pollution and Mortality in the Medicare Population. *The New England Journal of Medicine*, 376(26), pp. 2513-2522.

⁵¹ Zanobetti, A. and Schwartz, J., 2008. Mortality displacement in the association of ozone with mortality: an analysis of 48 cities in the United States. *American Journal of Respiratory and Critical Care Medicine*, 177(2), pp.184-189.

⁵² Mar, T.F. and Koenig, J.Q. (2009). Relationship between visits to emergency departments for asthma and ozone exposure in greater Seattle, Washington. *Annals of Allergy, Asthma & Immunology*, 103, 474-479.

⁵³ Schwartz, J., 1995. Short term fluctuations in air pollution and hospital admissions of the elderly for respiratory disease. *Thorax*, 50(5), pp.531-538.