

# Wenatchee and East Wenatchee Community 2025 Environmental Justice Report



## Publication Information

This report is available on the Department of Ecology's website at <https://apps.ecology.wa.gov/publications/summarypages/2502037.html>

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## Executive Summary

The Wenatchee and East Wenatchee 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 Wenatchee and East Wenatchee community.

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



## Community Overview

The Wenatchee and East Wenatchee community was identified as overburdened and highly impacted by air pollution because it met the statewide screening criteria based on the

Washington Environmental Health Disparities map<sup>1</sup> ranking and the EJScreen demographic index.<sup>2</sup> It also experiences elevated levels of short-term exposure to fine particulate matter (PM<sub>2.5</sub>). Community identification is described in more detail in the [Overburdened Communities Highly Impacted by Air Pollution StoryMap](#).

**Land Area:** 10 sq. mi

**Population:** 32,495

**County:** Chelan, Douglas

**Municipal Government:** Wenatchee, East Wenatchee City Councils

**Ecology Region:** Central

**Local Clean Air Authority:** ECY Central Region Office

**Local Health Jurisdiction:** Chelan-Douglas Health District

**Primary languages spoken:** English, Spanish

**Primary pollutant of concern:** Short-term PM<sub>2.5</sub>



## Geographic characteristics

The Wenatchee and East Wenatchee community is located on both sides of the Columbia River in Chelan County and Douglas County. The community includes portions of both the cities of Wenatchee and East Wenatchee. The part identified as highly impacted by air pollution includes the business districts in Wenatchee and surrounding higher-density housing, as well as the business district and surrounding residential area in the southern portion of East Wenatchee.

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<sup>1</sup> Washington Environmental Health Disparities map <https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/washington-environmental-health-disparities-map>

<sup>2</sup> EJScreen demographic index <https://www.epa.gov/ejscreen>

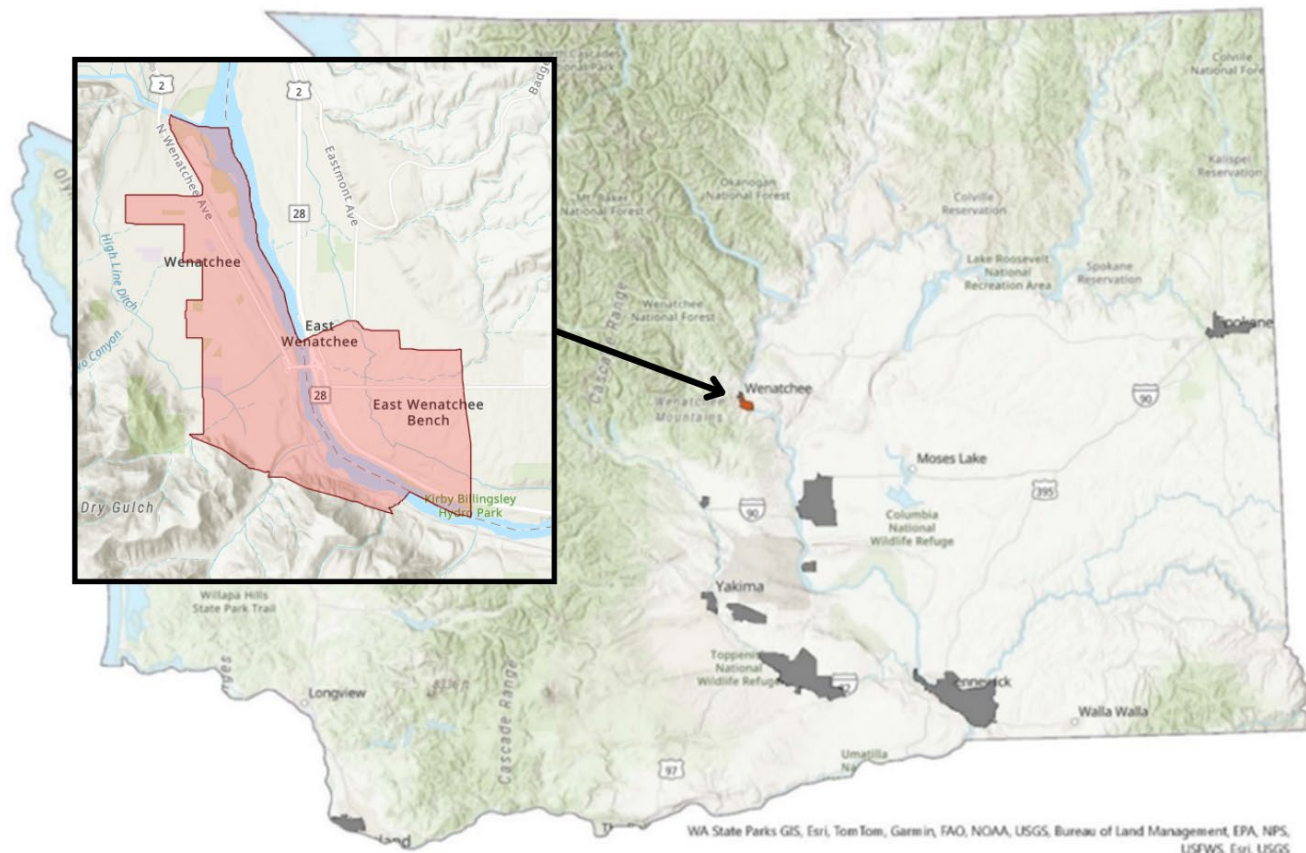


Figure 1. Map of the 16 overburdened communities highly impacted by air pollution in Washington state (gray), with Wenatchee and East Wenatchee highlighted (red).

## Socioeconomic characteristics

Nearly 4 in 10 households in this community speak a language other than English at home, with Spanish being the most common. The Wenatchee and East Wenatchee community has high rates of asthma, which can increase sensitivity to the health impacts of air pollution. This community also has a high proportion of children under age 18, nearly 3 in 10 residents, and includes many sensitive receptor locations such as schools, hospitals, healthcare clinics and long-term care facilities.<sup>3,4</sup>

<sup>3</sup> American Community Survey Data <https://www.census.gov/programs-surveys/acs/data.html>

<sup>4</sup> WA Office of Financial Management, Estimates of April 1 population by age, sex, race and Hispanic origin <https://ofm.wa.gov/data-research/population-demographics/forecasts-projections/age-sex-race-and-hispanic-origin/information/>

## Wenatchee and East Wenatchee

## Statewide

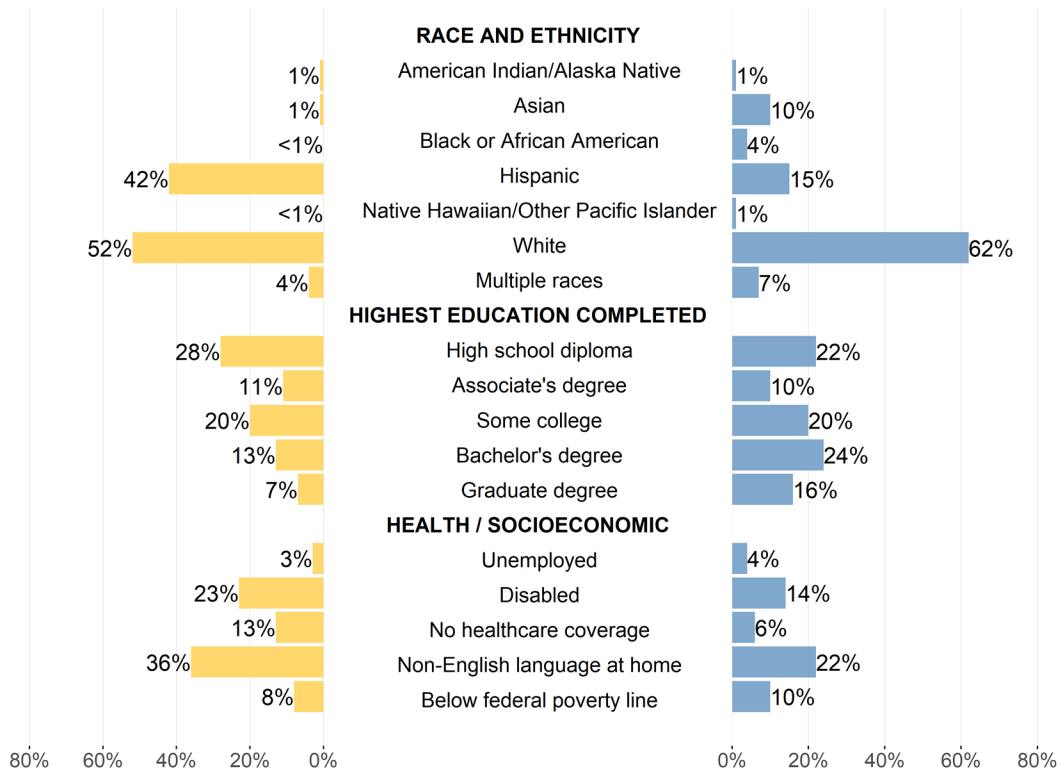


Figure 2. Sociodemographic characteristics of the Wenatchee and East Wenatchee community compared to statewide percentages, based on Washington State's 2024 estimated population of 8,035,700.<sup>5</sup>

## Health characteristics

According to 2022 CDC health survey data,<sup>6</sup> Wenatchee and East Wenatchee have elevated prevalences of chronic health conditions among individuals aged 18 years and older relative to the statewide population, including asthma (11.7% vs. 11.4%), cardiovascular disease (6.3% vs. 5.7%), COPD (6.8% vs. 5.7%), diabetes (10.7% vs. 9.6%), and stroke (3.5% 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.

<sup>5</sup> 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](https://ofm.wa.gov/wp-content/uploads/sites/default/files/public/dataresearch/pop/stfc/stfc_2024.xlsx)

<sup>6</sup> U.S. Centers for Disease Control and Prevention, PLACES Data Portal <https://www.cdc.gov/places/tools/data-portal.html>

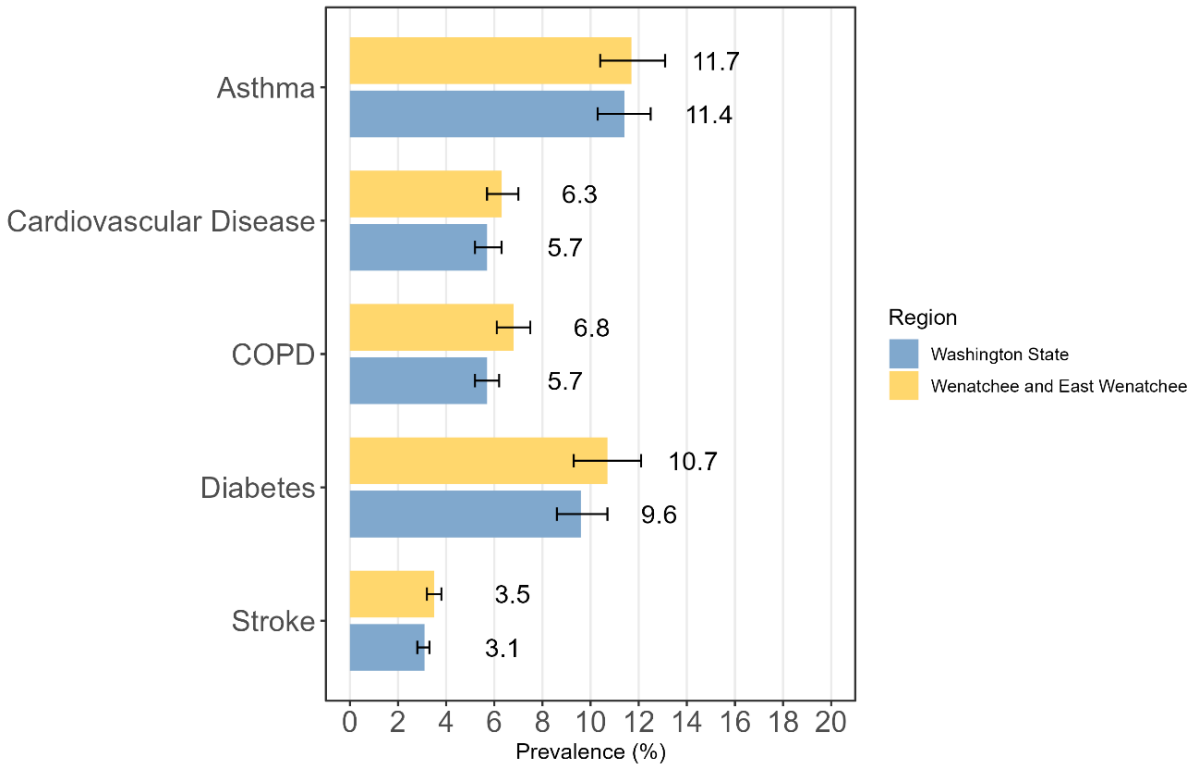
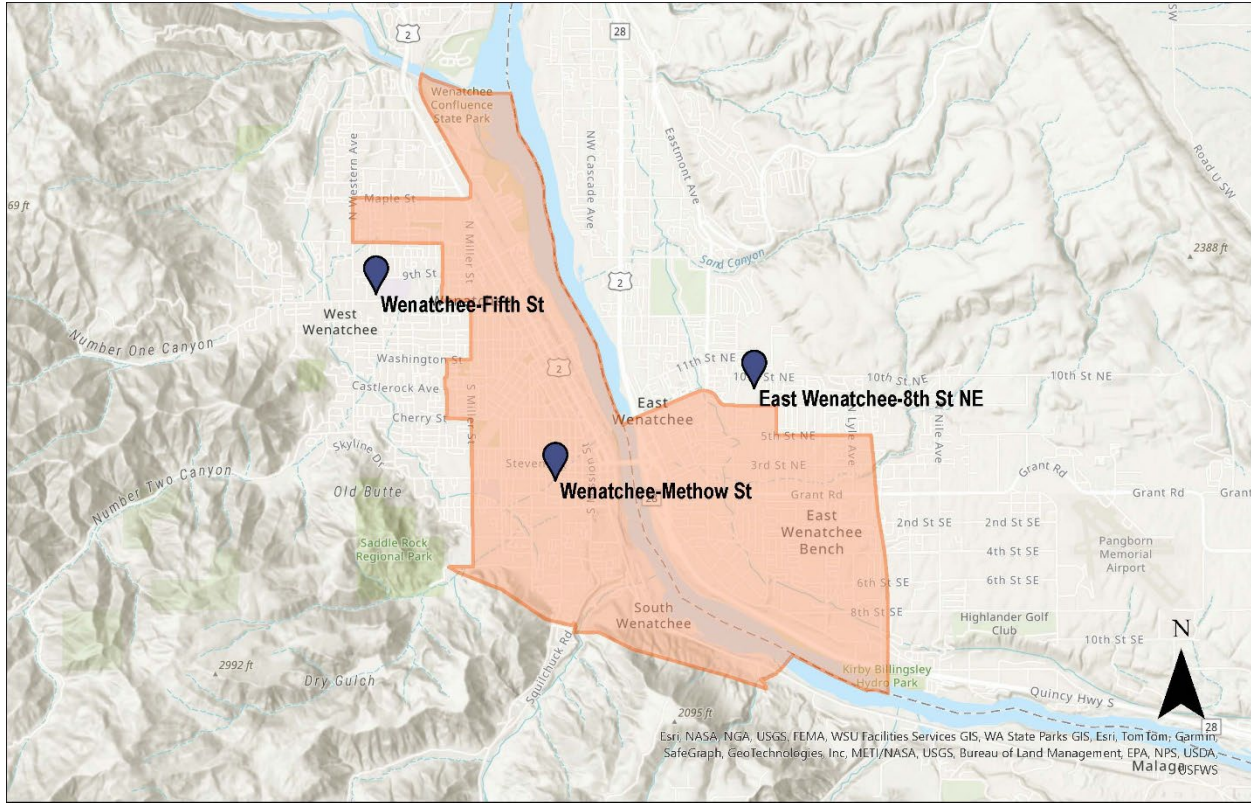


Figure 3. Prevalence of chronic health conditions among people ages 18 years and older in Wenatchee and East Wenatchee census tracts compared with Washington State.

Data are from CDC PLACES, 2024 release, which uses 2022 survey data.<sup>6</sup> Yellow and blue bars indicate the estimated prevalence of each condition. Black lines indicate the 95% confidence interval.

## Air Monitoring

There is one non-regulatory PM<sub>2.5</sub> monitor and two PM<sub>2.5</sub> sensors (SensWA) within and just outside the Wenatchee and East Wenatchee community boundary operated by Ecology’s Central Regional Office (CRO) (Figure 4; Table 1). The Wenatchee-Fifth St monitor is within 700 meters of the boundary, which Ecology determined is representative of air quality in the community. In 2024, the two low-cost, high-accuracy PM<sub>2.5</sub> sensors were installed using Climate Commitment Act (CCA) funding. Partial-year data from the PM<sub>2.5</sub> sensors are included in this report and future biennial EJ Reports will have additional years of data. No other criteria air pollutants are currently monitored in this community.



📍 Air monitoring sites - Included in analysis  
  Wenatchee and East Wenatchee community boundary

Figure 4. Map of Wenatchee and East Wenatchee air monitoring sites.

Table 1. Wenatchee and East Wenatchee criteria air pollutant monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
Wenatchee-Methow St	SensWA <sup>1</sup>	Ecology-CRO	PM <sub>2.5</sub>
East Wenatchee-8 <sup>th</sup> St NE	SensWA <sup>1</sup>	Ecology-CRO	PM <sub>2.5</sub>
Wenatchee-Fifth St <sup>2</sup>	Non-regulatory	Ecology-CRO	PM <sub>2.5</sub>

<sup>1</sup> Installed as part of Climate Commitment Act implementation  
<sup>2</sup> Within 700 meters of community boundary

## Criteria Air Pollution

This report summarizes criteria air pollution (CAPs) concentrations in the Wenatchee and East Wenatchee community from 2022 through 2024. CAPs concentrations for PM<sub>2.5</sub> are reported using data from the Washington State Air Monitoring Network and calculated according to the Environmental Protection Agency’s (EPA) methodology. More information about the methods can be found in the methods section of the 2025 EJ Report.

In addition to analyzing monitored criteria air pollution concentrations, we calculated the number of days per year residents of the Wenatchee and East Wenatchee 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 Wenatchee and East Wenatchee community experienced an annual average of 8.3 days with unhealthy air (Figure 5). In comparison, between 2020-2022, the annual average was 12 days. Most unhealthy air quality days were primarily caused by wildfire smoke.

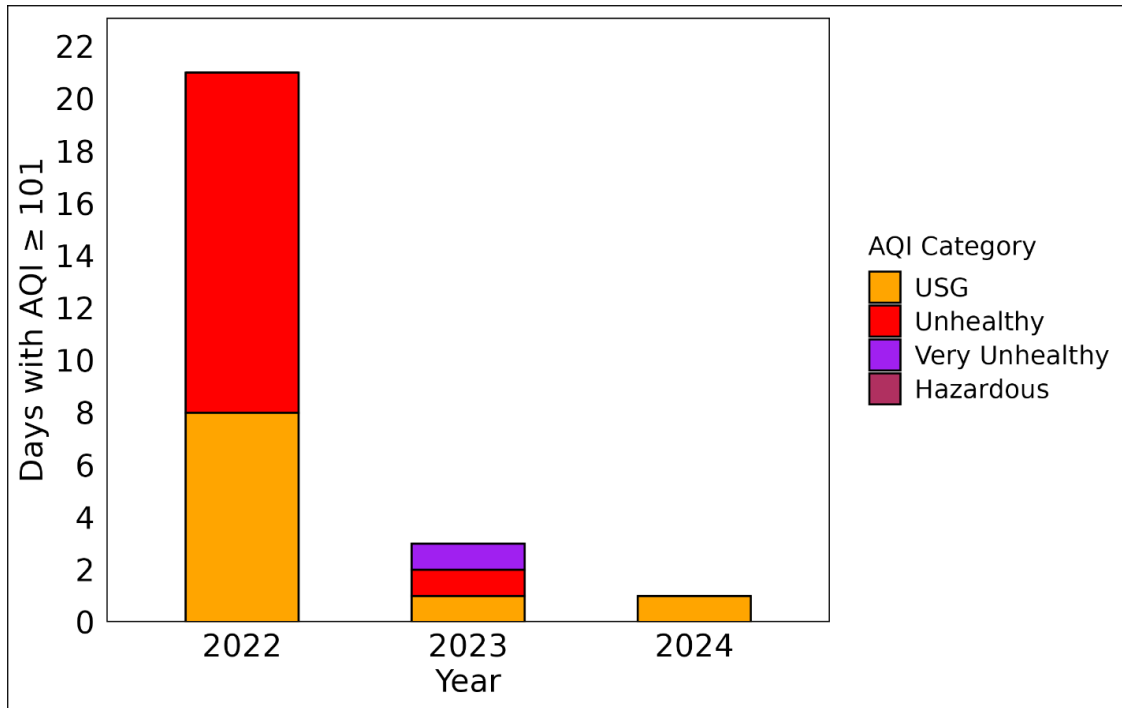


Figure 5. Number of days between 2022-2024 with unhealthy air quality. Includes days impacted by wildfire smoke.

Table 2 includes 24-hour PM<sub>2.5</sub> (98<sup>th</sup> percentile) summary statistics. PM<sub>2.5</sub> concentrations are measured over 24-hour periods in micrograms per cubic meter (µg/m<sup>3</sup>). 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<sub>2.5</sub> (98<sup>th</sup> percentile) is 35 µg/m<sup>3</sup>. The design value for 24-hour PM<sub>2.5</sub> (98<sup>th</sup> 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.

At the Wenatchee-Fifth St monitoring site, the 24-hour PM<sub>2.5</sub> (98<sup>th</sup> percentile) design value was above the NAAQS threshold due to significant wildfire smoke contribution in 2022. The Wenatchee-Methow St and East Wenatchee-8<sup>th</sup> St PM<sub>2.5</sub> sensors were installed in June 2024, and summary statistics for both monitors were below the NAAQS. The values in brackets in Table 2 exclude wildfire-impacted days when the 24-hour average PM<sub>2.5</sub> concentrations exceeded 35.4 µg/m<sup>3</sup>. With wildfire-impacted days excluded, the 2024 design value at Wenatchee-Fifth St was significantly below the NAAQS.

**Table 2. 24-hour PM<sub>2.5</sub> (98<sup>th</sup> percentile) summary statistics (2024) and 2024 design values (2022–2024).** Units are in µg/m<sup>3</sup>. Brackets [ ] exclude wildfire days when 24-hour average PM<sub>2.5</sub> concentration exceeded 35.4 µg/m<sup>3</sup>. 24-hour PM<sub>2.5</sub> (98<sup>th</sup> percentile) NAAQS is 35 µg/m<sup>3</sup>.

Monitoring Site	2022 24-hour 98 <sup>th</sup> Percentile	2023 24-hour 98 <sup>th</sup> Percentile	2024 24-hour 98 <sup>th</sup> Percentile	2024 Design Value
Wenatchee-Fifth St	70.9 [21.7]	19.9 [16.8]	16.8 [16.8]	36 [18]
Wenatchee-Methow St	DNC	DNC	<i>16.4</i> [16.4]	*
East Wenatchee-8 <sup>th</sup> St	DNC	DNC	<i>15.8</i> [15.8]	*

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

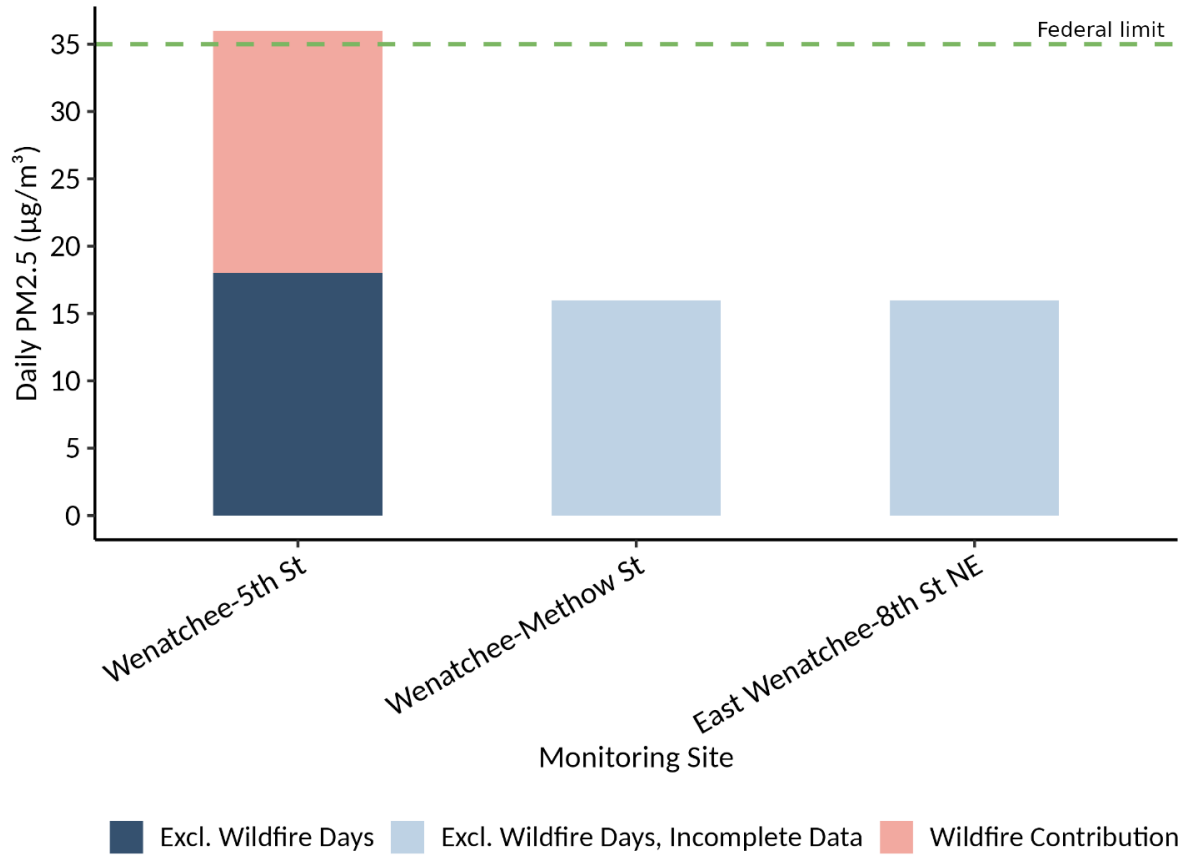


Figure 5. **24-hour PM<sub>2.5</sub> (98<sup>th</sup> percentile) summary statistics, 2022-2024.** Annual summary statistics calculated with and without days elevated from wildfire smoke. Dark blue bar includes three complete years of data, 2022-2024; light blue bars include average of available data from 2024; dashed line is the federal limit (NAAQS) for 24-hr PM<sub>2.5</sub>.

Table 3 includes annual mean PM<sub>2.5</sub> concentrations between 2022 to 2024 and 2024 design values. The annual PM<sub>2.5</sub> design value is a three-year average of annual mean PM<sub>2.5</sub> concentrations used to describe long-term exposure. The 2024 design value at the Wenatchee-Fifth St monitoring site was below the federal standard of 9.0 µg/m<sup>3</sup>.

*Table 3. Annual mean PM<sub>2.5</sub> concentrations and 2024 design values, 2022–2024. Units are in µg/m<sup>3</sup>. Brackets [ ] exclude wildfire days when the average PM<sub>2.5</sub> concentration exceeded 15.0 µg/m<sup>3</sup>. Annual PM<sub>2.5</sub> NAAQS is 9.0 µg/m<sup>3</sup>.*

Monitoring Site	2022	2023	2024	2024 Design Value
Wenatchee-Fifth St	10.21 [6.10]	7.20 [6.21]	5.19 [5.19]	7.5 [5.8]
Wenatchee-Methow St	DNC	DNC	3.35 [3.18]	*
East Wenatchee-8 <sup>th</sup> St NE	DNC	DNC	3.72 [3.53]	*

*Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m<sup>3</sup> = 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<sub>2.5</sub> and ozone concentrations by age range and using health effect estimates from peer-reviewed studies (Appendix B, Table 2 in the 2025 EJ 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<sub>2.5</sub>

We estimated 10 deaths by any cause (33 deaths per 100,000 population, Table B1) related to yearly PM<sub>2.5</sub> exposure. Among older adults, we estimated 7 total deaths (113 deaths per 100,000 population) each year associated with annual PM<sub>2.5</sub> exposure (Table B2).

Among different racial and ethnic groups (Figure 6), we estimated most PM<sub>2.5</sub> related deaths by any cause per year to be among non-Hispanic White people (6 deaths among 18–84-year-olds). However, when accounting for the ages of people in each race and ethnicity group<sup>7</sup>, the annual

<sup>7</sup> Age-adjusted mortality rates represent the mortality rate if the age distribution in that race category matched the age distribution of the total Washington State 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 EJ Report.

age-adjusted mortality rate was highest among Hispanic people (55 deaths per 100,000 population) and non-Hispanic Black people (38 deaths per 100,000 population).

Figure 6 is based on the study by Pope et al. (2019),<sup>8</sup> 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.

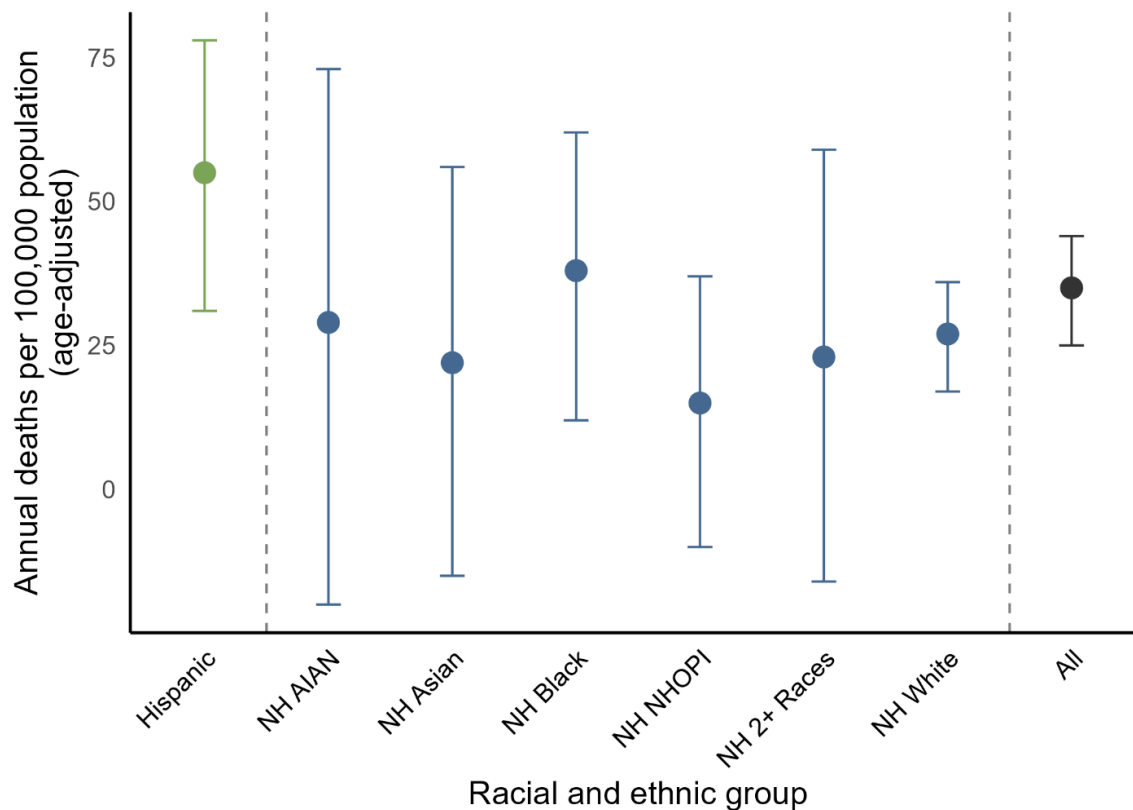


Figure 6. Age-adjusted annual death rates by any cause associated with annual  $PM_{2.5}$  exposure among ages 18-84 by racial and ethnic group in Wenatchee and East Wenatchee.

When assessing specific causes of death related to yearly  $PM_{2.5}$  concentrations (Table B3), we estimated 3 deaths due to cardiovascular disease (10 deaths per 100,000 population), 2 to 4 deaths due to ischemic heart disease (11 to 17 deaths per 100,000 population), and 1 death per year due to lung cancer (3 to 5 deaths per 100,000 population) among adults.

<sup>8</sup> 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.

Regarding non-fatal health outcomes (Table B3), we estimated that 3 hospital admissions (11 visits per 100,000 population) for acute non-fatal myocardial infarction were associated with yearly PM<sub>2.5</sub> concentrations among adults. Additionally, 4 lung cancer diagnoses per year were associated with annual PM<sub>2.5</sub> exposure among all people (18 diagnoses per 100,000 population).

Daily PM<sub>2.5</sub> exposure (Table B4) was associated with <1 death by any cause (<1 per 100,000 population) among all people and 1 death by any cause (10 per 100,000 population) among older adults ages 65 to 99. For non-fatal conditions, daily PM<sub>2.5</sub> was associated with 1 acute non-fatal myocardial infarction admission (2 per 100,000 population) among all adults, 3 respiratory admissions (53 per 100,000 population) among older adults ages 65 to 99, 1 asthma hospital admission (2 per 100,000 population) among people ages 0 to 64 years. Additionally, 7 to 12 asthma-related emergency department (ED) visits (17 to 32 per 100,000 population) among all people and 8 asthma-related ED visits (86 per 100,000 population) among youths ages 0 to 17 years were associated with daily PM<sub>2.5</sub> exposure.

## Ozone

We estimated O<sub>3</sub> exposure during the warm season (Table B5) was associated with 2 seasonal deaths by any cause among older adults ages 65 to 99 (40 deaths per 100,000 population). Daily O<sub>3</sub> exposure was associated with 1 death by any cause (2 per 100,000 population), 18 asthma-related ED visits (46 per 100,000 population) among all people, and 8 respiratory hospital admissions (128 per 100,000 population) among older adults ages 65–99.

## Greenhouse Gas Emissions

Greenhouse gas emissions data for the Wenatchee and East Wenatchee overburdened community highly impacted by air pollution include: 1) Emissions from greenhouse gas reporting entities per RCW 70A.65<sup>9</sup> and WAC 173-441,<sup>10</sup> -446;<sup>11</sup> and 2) Mobile source emissions.<sup>12</sup>

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 EJ Report.

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<sup>9</sup> Greenhouse Gas Emissions – Cap-and-Invest Program <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65>

<sup>10</sup> Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

<sup>11</sup> Climate Commitment Act – Program Rule <https://app.leg.wa.gov/WAC/default.aspx?cite=173-446>

<sup>12</sup> Environmental Justice Review <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.020>

## Facilities

Washington State requires certain businesses that emit more than 10,000 metric tons of carbon dioxide equivalents (MT CO<sub>2</sub>e) to report to the Washington Greenhouse Gas Reporting Program.<sup>13</sup> Businesses that emit over 25,000 MT CO<sub>2</sub>e are also subject to the Cap-and-Invest Program (covered sources). Each reporting facility is required to follow a compliance plan.

In the Wenatchee and East Wenatchee community, two facilities (Figure 7; Table 4) near the community boundary reported their emissions in 2022 and 2023. The total reported emissions from these facilities was 25,291 MT CO<sub>2</sub>e in 2022 and 22,202 MT CO<sub>2</sub>e in 2023, a 12.2% year-to-year decrease. Some facilities in other communities report biogenic carbon (biogenic CO<sub>2</sub>)<sup>14</sup> emissions, which are expected to be partially recaptured as part of the natural carbon cycle. For reporting purposes, biogenic CO<sub>2</sub> is subtracted from total metric tons of CO<sub>2</sub>e, even though it has the same atmospheric warming effect as non-biogenic CO<sub>2</sub>. There were no facilities that reported biogenic CO<sub>2</sub> in Wenatchee and East Wenatchee. 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 CO<sub>2</sub> emissions. Some year-to-year fluctuations in emissions from individual facilities are expected.

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<sup>13</sup> Mandatory greenhouse gas reports <https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/mandatory-greenhouse-gas-reports>

<sup>14</sup> 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 CO<sub>2</sub> acts the same way in the atmosphere as non-biogenic CO<sub>2</sub>. Anthropogenic processes that include these emissions reduce a facility's environmental impact.

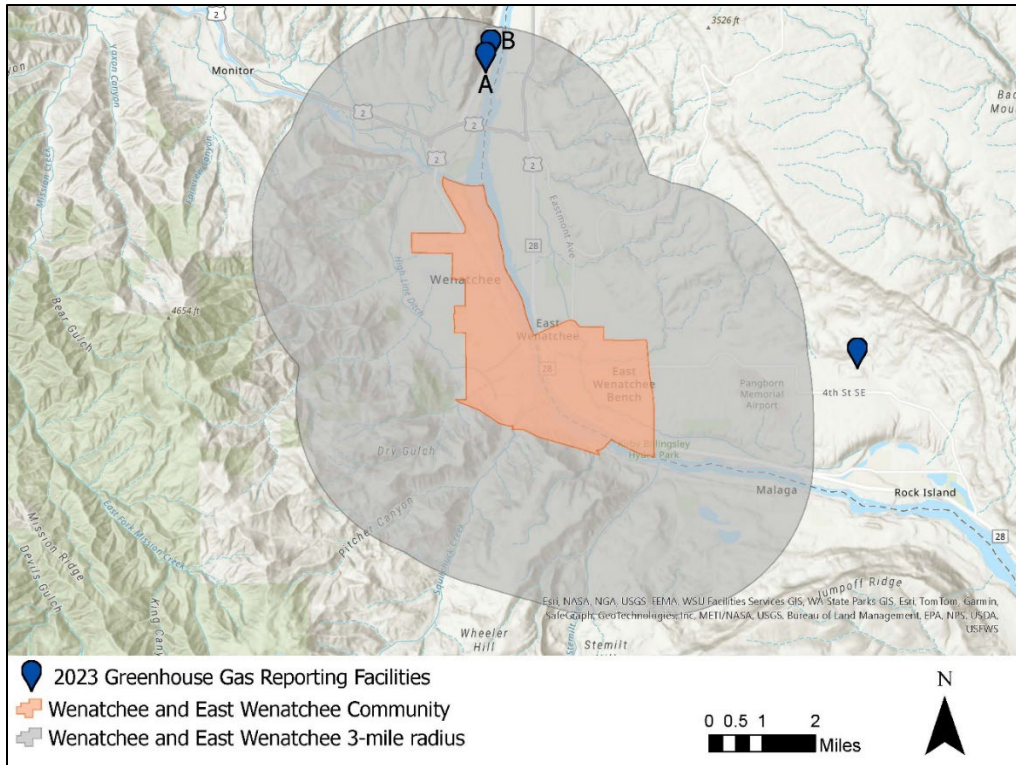


Figure 7. Reporting facilities as of 2023 that are in or near the Wenatchee and East Wenatchee community boundary. Facility letters correspond with Table 4.

The emissions in Table 4 are in MT CO<sub>2</sub>e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR4 GWP<sup>15</sup>, to convert emissions into CO<sub>2</sub>e. 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).<sup>16</sup> The Greenhouse Gas Reporting Program uses AR4 GWPs mainly for regulatory stability, consistency, and alignment with other federal programs.

<sup>15</sup> Reporting of Emissions of Greenhouse Gases <https://app.leg.wa.gov/WAC/default.aspx?cite=173-441>

<sup>16</sup> Intergovernmental Panel on Climate Change <https://www.ipcc.ch/>

Table 3. Facility emissions in or nearby<sup>17</sup> the Wenatchee and East Wenatchee community. Biogenic CO<sub>2</sub> is in brackets [ ].

	Facility Name/City	Facility Sector	Within Community Boundary	CCA-Covered Facility <sup>18</sup>	Source of CAPs <sup>19</sup>	2022 Emissions (MTCO <sub>2</sub> e)	2023 Emissions (MTCO <sub>2</sub> e)
<b>A</b>	Keyes Fibre Corporation-Wenatchee	Pulp and Paper	Nearby	No	No	14,113 [0]	12,427 [0]
<b>B</b>	Tree Top - Wenatchee	Food Production	Nearby	No	No	11,178 [0]	9,775 [0]

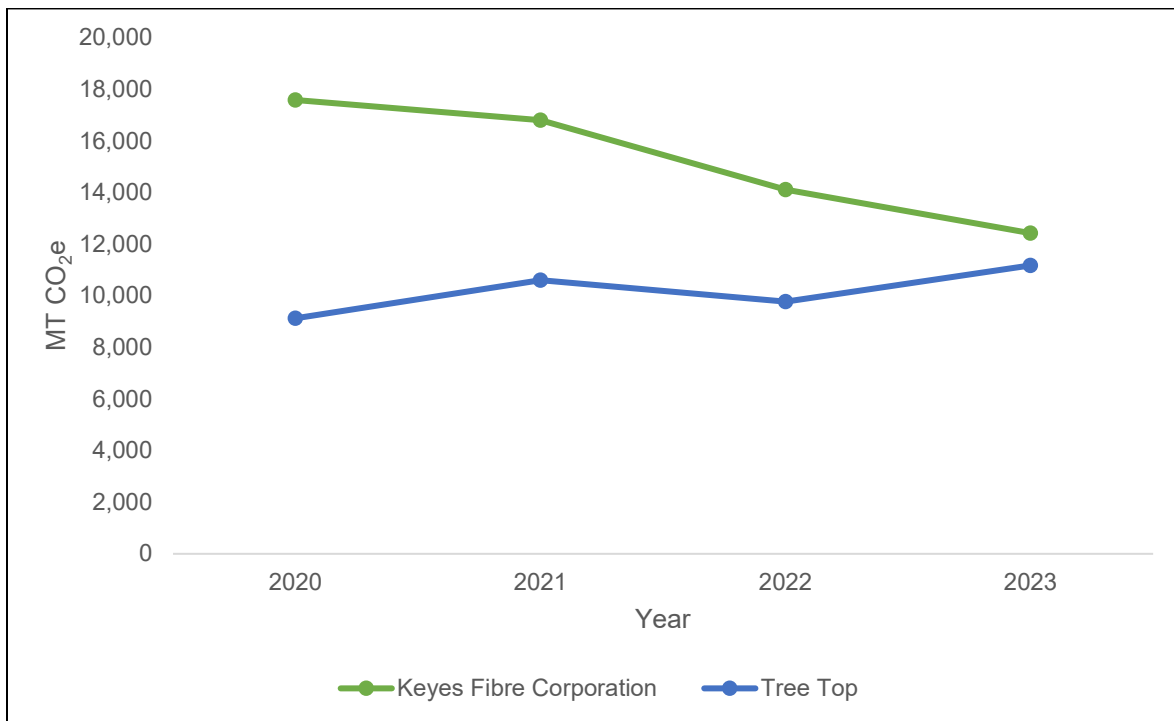


Figure 8. Greenhouse gas reporting facilities and their emissions from 2020-2023.

<sup>17</sup> “Nearby” refers to facilities within a three-mile radius of the community boundary that were included in this analysis.

<sup>18</sup> Large emitters of greenhouse gases, specifically those emitting 25,000 or more MT CO<sub>2</sub>e annually in Washington State that are part of the Cap-and-Invest program established by the Climate Commitment Act.

<sup>19</sup> 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. Many sources emit far below the threshold. More information can be found at <https://ecology.wa.gov/regulations-permits/permits-certifications/air-quality-permits/air-operating-permit>

## Mobile sources

In the Wenatchee and East Wenatchee 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.<sup>20</sup> 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.<sup>21,22</sup>

Similar to Table 4, the results in Table 5 use AR5 GWPs to convert greenhouse gas emissions into CO<sub>2</sub>e. In 2013-2014, the IPCC published AR5 GWPs and AR6 GWPs in 2021-2022. The Washington Greenhouse Gas Emissions Inventory<sup>23</sup> uses AR5 GWPs in mobile source emission estimates, as the inventory models for greenhouse gas accounting are revised as science improves.

*Table 4. Greenhouse gas emissions from mobile sources per capita from 2020-2021.*

	<b>2020</b>	<b>2020</b>	<b>2021</b>	<b>2021</b>
<b>Population</b>	<b>Emissions (MT CO<sub>2</sub>e)</b>	<b>Per Capita MT CO<sub>2</sub>e</b>	<b>Emissions (MT CO<sub>2</sub>e)</b>	<b>Per Capita MT CO<sub>2</sub>e</b>
32,183	157,956	5.0	191,079	6.0

<sup>20</sup> Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report  
<https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html>

<sup>21</sup> Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025  
<https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

<sup>22</sup> Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024  
<https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf>

<sup>23</sup> Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025  
<https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html>

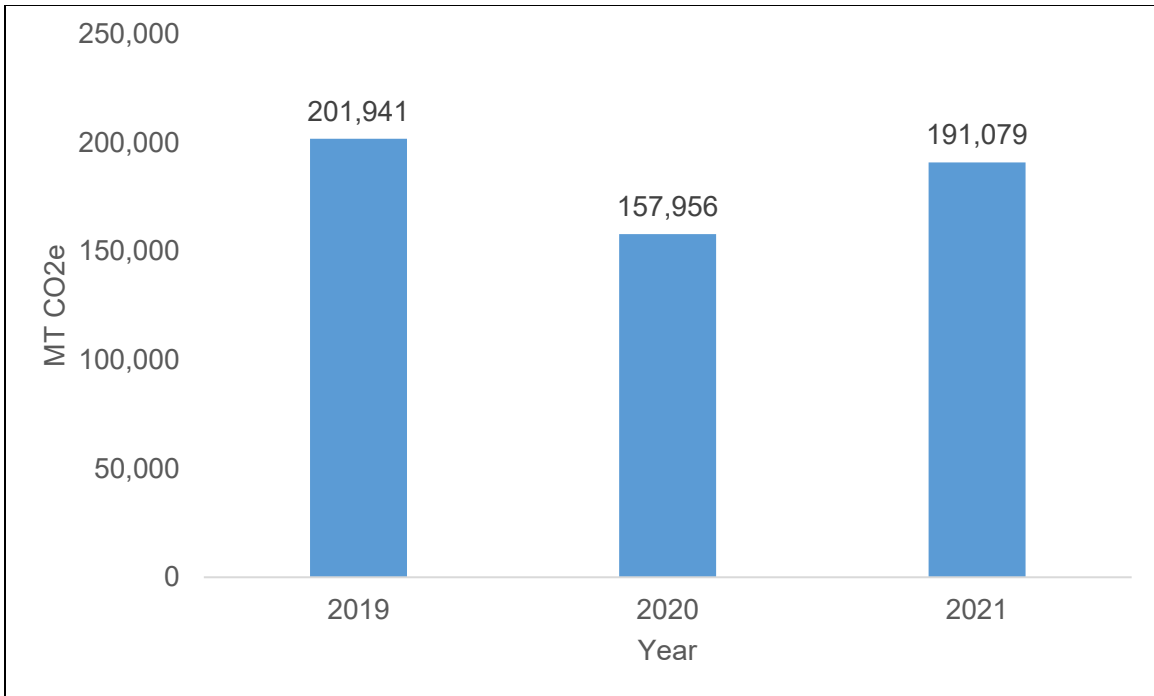


Figure 9. Annual greenhouse gas emissions from mobile sources in the Wenatchee and East Wenatchee community, 2019-2021.

## Community Resources

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

- [Chelan-Douglas Health District Community Health Needs Assessment information page](#)<sup>24</sup>
- [Chelan-Douglas Health District 2019 Community Health Needs Assessment](#)<sup>25</sup>
- [Chelan-Douglas Trends - Health indicators](#)<sup>26</sup>
- [Zero-emission and electric vehicles mapping tool | WSDOT](#)<sup>27</sup>
- [Home | Washington Climate Action](#)<sup>28</sup>

<sup>24</sup> <https://www.cdhd.wa.gov/health-data>

<sup>25</sup> [https://assets.website-files.com/60a40f06f9579848c295b9ae/60f750baef5962f0e9fa8ce5\\_2019-CHNA-No-Appendices.pdf](https://assets.website-files.com/60a40f06f9579848c295b9ae/60f750baef5962f0e9fa8ce5_2019-CHNA-No-Appendices.pdf)

<sup>26</sup> <https://chelandouglastrends.com/category.cfm?id=5>

<sup>27</sup> <https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool>

<sup>28</sup> <https://climate.wa.gov/>

## Appendix A. Criteria Air Pollution

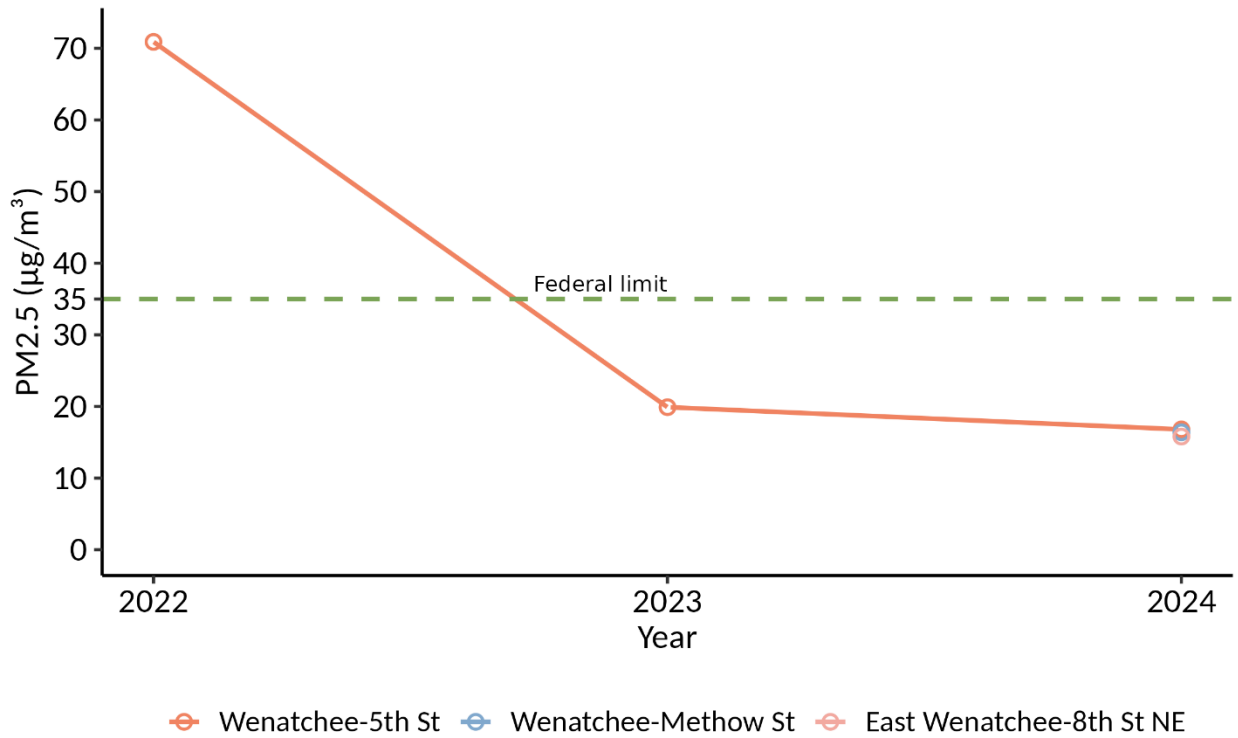


Figure A1. 24-hr PM<sub>2.5</sub> (98<sup>th</sup> percentile) concentrations at Wenatchee and East Wenatchee monitoring sites. Days impacted by wildfire smoke are included. Dashed line is the federal limit for 24-hr PM<sub>2.5</sub> (35 µg/m<sup>3</sup>).

## Appendix B. Supplemental Health Impacts Tables

Table B1. Estimated annual deaths by any cause related to yearly PM<sub>2.5</sub> exposure among 18–84-year-olds in Wenatchee and East Wenatchee by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019<sup>8</sup>).

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	29,115	10 [7 to 12]	33 [24 to 41]	35 [25 to 44]
Hispanic	10,595	3 [2 to 4]	27 [15 to 38]	55 [31 to 78]
Non-Hispanic AIAN	197	<1 [range <1]	20 [-14 to 52]	29 [-20 to 73]
Non-Hispanic Asian	388	<1 [range <1]	20 [-14 to 50]	22 [-15 to 56]
Non-Hispanic Black	135	<1 [range <1]	27 [8 to 44]	38 [12 to 62]
Non-Hispanic NHOPI	45	<1 [range <1]	7 [-5 to 18]	15 [-10 to 37]
Non-Hispanic 2+ races	1,076	<1 [range <1]	18 [-12 to 46]	23 [-16 to 59]
Non-Hispanic White	16,679	6 [4 to 8]	35 [23 to 47]	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 State.

Table B2. Estimated annual deaths by any cause related to yearly PM<sub>2.5</sub> exposure among 65–99-year-olds in Wenatchee and East Wenatchee by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017<sup>29</sup>).

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	6,205	7 [7 to 7]	113 [110 to 116]	105 [102 to 108]
Hispanic	710	1 [1 to 1]	124 [107 to 140]	152 [131 to 172]
AIAN	108	<1 [range <1]	65 [40 to 89]	70 [43 to 96]
Asian	63	<1 [range <1]	40 [32 to 48]	34 [26 to 40]
Black	24	<1 [range <1]	65 [62 to 67]	75 [72 to 78]
NHOPI	4	<1 [range <1]	56 [34 to 77]	53 [33 to 73]
2+ races	435	<1 [range <1]	60 [37 to 82]	66 [40 to 90]
White	5,570	2 [2 to 3]	44 [42 to 46]	41 [40 to 43]

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 State.

<sup>29</sup> 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.

Table B3. Annual mortality and morbidity associated with yearly PM<sub>2.5</sub> exposure (yearly 24-hour average concentrations) in Wenatchee and East Wenatchee, 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]
Deaths – Any cause	65 to 99	Di et al., 2017 <sup>30</sup>	6,205	7 [7 to 7]	113 [110 to 116]
Deaths – Any cause	18 to 84	Pope et al., 2019 <sup>31</sup>	29,115	10 [7 to 12]	33 [24 to 41]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023 <sup>32</sup>	29,828	3 [1 to 5]	10 [4 to 16]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017 <sup>33</sup>	22,930	3 [2 to 3]	11 [9 to 14]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009 <sup>34</sup>	22,930	4 [3 to 5]	17 [14 to 20]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019 <sup>35</sup>	22,930	2 [2 to 3]	11 [8 to 14]

<sup>30</sup> 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.

<sup>31</sup> 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.

<sup>32</sup> 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.

<sup>33</sup> 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.

<sup>34</sup> 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

<sup>35</sup> 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.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
Deaths – Lung Cancer	30 to 99	Krewski, et al., 2009 <sup>36</sup>	22,930	1 [0 to 2]	5 [2 to 7]
Deaths – Lung Cancer	30 to 99	Turner et al., 2016 <sup>37</sup>	22,930	1 [0 to 1]	3 [1 to 5]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023 <sup>38</sup>	29,828	3 [2 to 5]	11 [6 to 15]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016 <sup>39</sup>	22,930	4 [1 to 7]	18 [6 to 29]

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 PM2.5 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 State.

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 EJ Report for more information.

<sup>36</sup> 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

<sup>37</sup> 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.

<sup>38</sup> 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.

<sup>39</sup> 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

Table B4. Annual mortality and morbidity associated with daily PM<sub>2.5</sub> exposure (daily 24-hour average concentrations) in Wenatchee and East Wenatchee, 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]
Deaths – Any cause	0 to 99	Ito et al., 2013 <sup>40</sup>	39,547	<1 [range <1]	<1 [0 to 1]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014 <sup>41</sup>	6,205	1 [0 to 1]	10 [7 to 14]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022 <sup>42</sup>	39,547	<1 [0 to 1]	1 [0 to 1]
Deaths – Respiratory	0 to 99	Liu et al., 2022 <sup>43</sup>	39,547	<1 [0 to 1]	1 [0 to 2]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005 <sup>44</sup>	29,828	1 [-1 to 2]	2 [-2 to 6]

<sup>40</sup> 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<sub>2.5</sub> and its components. National Particle Component Toxicity (NPACT) Initiative. <https://www.healtheffects.org/publication/national-particle-component-toxicity-npact-initiative-integrated-epidemiologic-and>

<sup>41</sup> Zanobetti, A., Dominici, F., Wang, Y. and Schwartz, J.D., 2014. A national case-crossover analysis of the short-term effect of PM<sub>2.5</sub> on hospitalizations and mortality in subjects with diabetes and neurological disorders. *Environmental Health*, 13(1), p.38.

<sup>42</sup> 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.

<sup>43</sup> 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.

<sup>44</sup> 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.

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Zanobetti et al., 2009 <sup>45</sup>	29,828	1 [0 to 1]	2 [1 to 3]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009 <sup>46</sup>	6,205	3 [2 to 5]	53 [30 to 75]
Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003 <sup>47</sup>	33,342	1 [0 to 1]	2 [1 to 3]
ED Visits – Asthma	0 to 99	Mar et al., 2010 <sup>48</sup>	39,547	12 [3 to 21]	32 [8 to 54]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005 <sup>49</sup>	39,547	7 [-6 to 18]	17 [-14 to 46]

<sup>45</sup> 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.

<sup>46</sup> 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.

<sup>47</sup> 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.

<sup>48</sup> 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.

<sup>49</sup> 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

Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999 <sup>50</sup>	9,719	8 [4 to 12]	86 [44 to 124]

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 PM2.5 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 State.

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 EJ Report for more information.

*Table B5. Annual mortality and morbidity associated with seasonal and daily O<sub>3</sub> exposure (seasonal and daily 8-hour maximum concentrations) in Wenatchee and East Wenatchee, 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]
Deaths – Any cause (Seasonal)	65 to 99	Di, et al. 2017 <sup>51</sup>	6,205	2 [2 to 3]	40 [28 to 52]

<sup>50</sup> 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.

<sup>51</sup> 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 (Daily)	0 to 99	Zanobetti and Schwartz, 2008 <sup>52</sup>	39,547	1 [0 to 1]	2 [1 to 3]
ED Visits – Asthma (Daily)	0 to 99	Mar and Koenig, 2009 <sup>53</sup>	39,547	18 [4 to 30]	46 [11 to 77]
Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995 <sup>54</sup>	6,205	8 [2 to 13]	128 [37 to 212]

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 State.

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 EJ Report for more information.

<sup>52</sup> 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.

<sup>53</sup> 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.

<sup>54</sup> Schwartz, J., 1995. Short term fluctuations in air pollution and hospital admissions of the elderly for respiratory disease. *Thorax*, 50(5), pp.531-538.