East Yakima Community
2025 Environmental Justice Report

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Executive Summary

The East Yakima 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 East Yakima community.

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

Community Overview

The East Yakima 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[1] ranking, the EJScreen demographic index,[2] and experiences elevated levels of short-term and long-term exposure to fine particulate matter ($PM_{2.5}$) year-round. Previous modeling results indicate that ozone (O_3) and nitrogen dioxide (NO_2) contribute to the air pollution in this community. Community identification is described in more detail in the Overburdened Communities Highly Impacted by Air Pollution Story Map.

Land Area: 15.8 sq. mi

Population: 59,938

County: Yakima

Municipal Government: Yakima, Union Gap City Councils

Ecology Region: Central

Local Clean Air Authority: Yakima Regional Clean Air Agency

Local Health Jurisdiction: Yakima Health District

Primary Languages Spoken: English, Spanish

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

Geographic characteristics

East Yakima is in the upper Yakima Valley. It includes most of the mid-sized city of Yakima, which is the largest in Yakima County and one of the most populous in Central Washington. In addition, the designated community contains the neighboring municipality of Union Gap on the south end. It is bounded by Interstate 82 and the Yakima River to the east and State Route 12 and the Naches River to the north.

[1] Washington Environmental Health Disparities map https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/washington-environmental-health-disparities-map
[2] EJScreen demographic index https://www.epa.gov/ejscreen

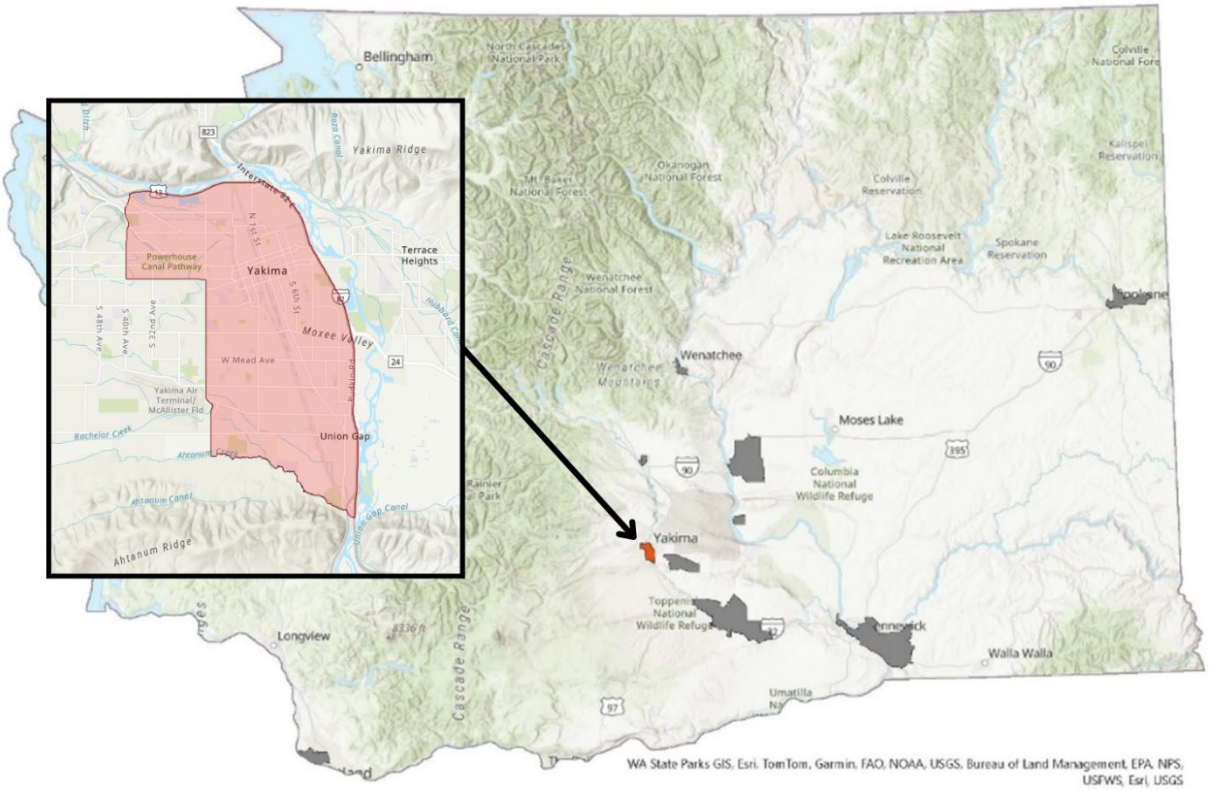


Figure 1. Map of the 16 overburdened communities highly impacted by air pollution in Washington state (gray), with East Yakima highlighted (red).

Socioeconomic characteristics

The community includes a downtown commercial area and mixed single-family and multi-family housing. There are many agricultural and food processing facilities connected to the rail lines that run north-south through the middle of the community. The city of Yakima is surrounded by smaller towns and agricultural lands elsewhere in Yakima County.

Nearly half the population of East Yakima is Hispanic, and over half of households speak a language other than English, predominantly Spanish.[3,4] The community also has a younger population compared to Washington state; 3 out of 10 residents are children. More than double the statewide average (16%) of residents lack health insurance coverage. East Yakima also has many schools, childcare facilities, health clinics, long-term care facilities, and migrant

[3] American Community Survey Data https://www.census.gov/programs-surveys/acs/data.html
[4] 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/

farmworker housing. One-fifth of workers are in natural resources, construction, and maintenance occupations; of these, over half work in agriculture, fishing, and forestry.

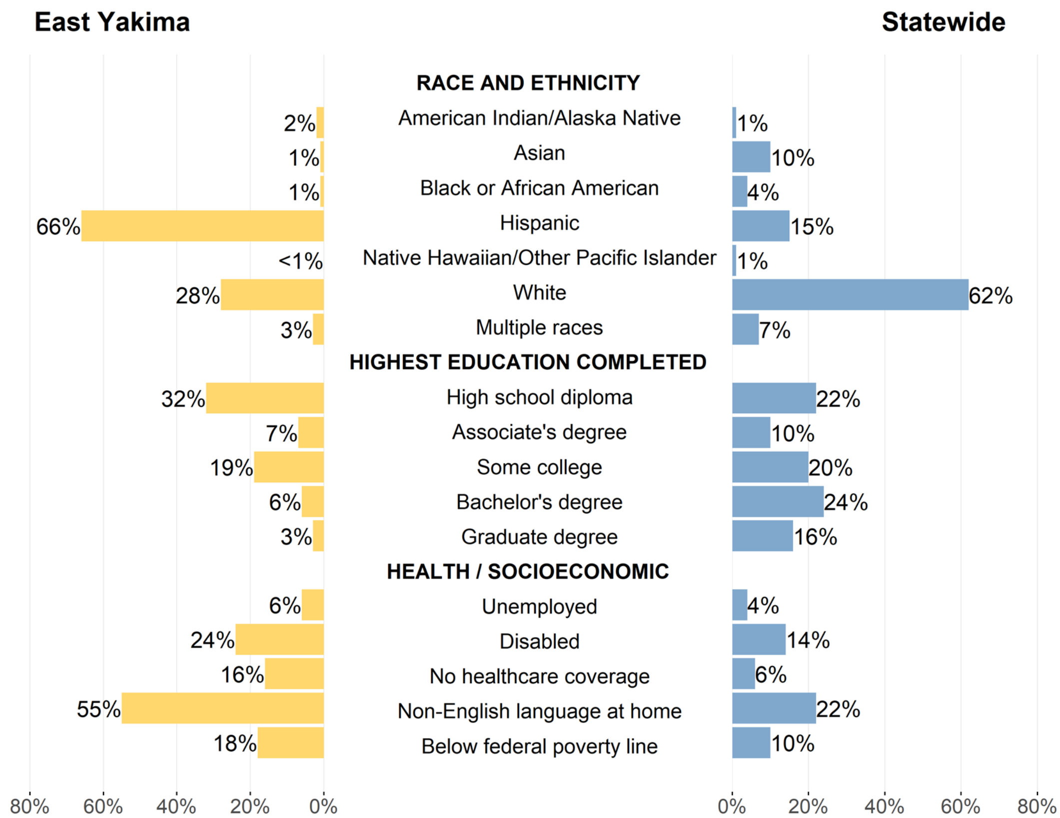


Figure 2. Sociodemographic characteristics of East Yakima compared to statewide percentages, based on Washington State's 2024 estimated population of 8,035,700.[5]

Health characteristics

According to 2022 CDC health survey data,[6] East Yakima has elevated prevalences of chronic health conditions among individuals aged 18 years and older relative to the statewide population, including asthma (12.9% vs. 11.4%), cardiovascular disease (7.4% vs. 5.7%), COPD (8.5% vs. 5.7%), diabetes (14.3% vs. 9.6%), and stroke (4.6% vs. 3.1%). These prevalences are

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

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.

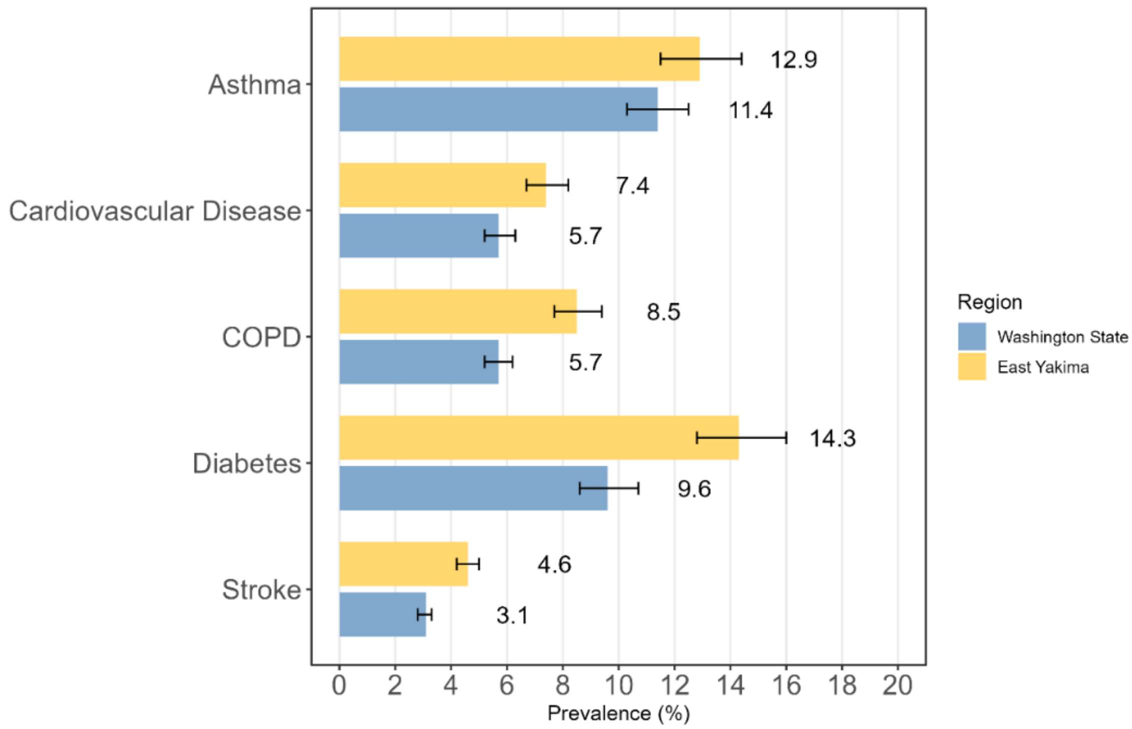


Figure 3. Prevalence of chronic health conditions among people ages 18 years and older in East Yakima census tracts compared with Washington State.

Data come from CDC PLACES, 2024 release, which uses 2022 survey data.[6] Yellow and blue bars indicate the estimated prevalence of each condition, and the black lines indicate the 95% confidence interval.

Air Monitoring

In the East Yakima community, $PM_{2.5}$ and PM_{10} have been continuously monitored at the Yakima-4th Ave monitoring site by Ecology and Yakima Regional Clean Air Agency (YRCAA). In 2025, Ecology installed four $PM_{2.5}$ sensors (SensWA) at Union Gap-4th St, Yakima-River Rd, Yakima-W Viola Ave, and Yakima-S 9th St using Climate Commitment Act (CCA) funds. Data from these sensors will be included in the next biennial EJ Report. For this reporting period, we assessed data from the Yakima-4th Ave monitoring site.

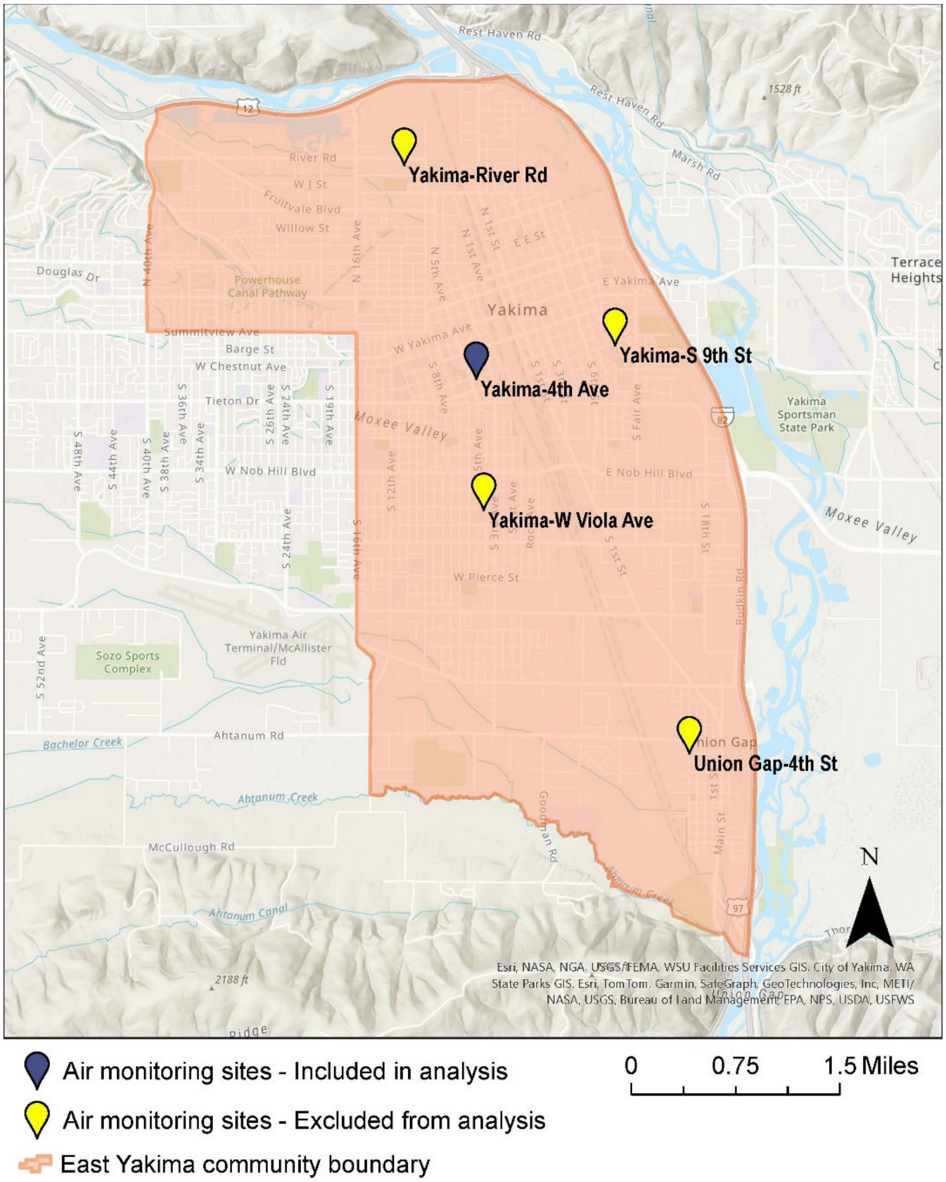


Figure 4. Map of East Yakima air monitoring sites.

Table 1. East Yakima criteria air pollutant monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
Yakima-4th Ave	Regulatory	YRCAA	$PM_{2.5}$, PM_{10}

Criteria Air Pollution

This report summarizes criteria air pollutant (CAPs) concentrations in the East Yakima community from 2022 through 2024. CAPs concentrations for $PM_{2.5}$ and PM_{10} 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 EJ Report.

In addition to analyzing monitored criteria air pollution concentrations, we calculated the number of days per year residents of the East Yakima 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 East Yakima community experienced an average of 2.7 days with unhealthy air quality (Figure 5). In comparison, between 2020-2022, the annual average was 11 days. Most unhealthy air quality days were primarily caused by wildfire smoke.

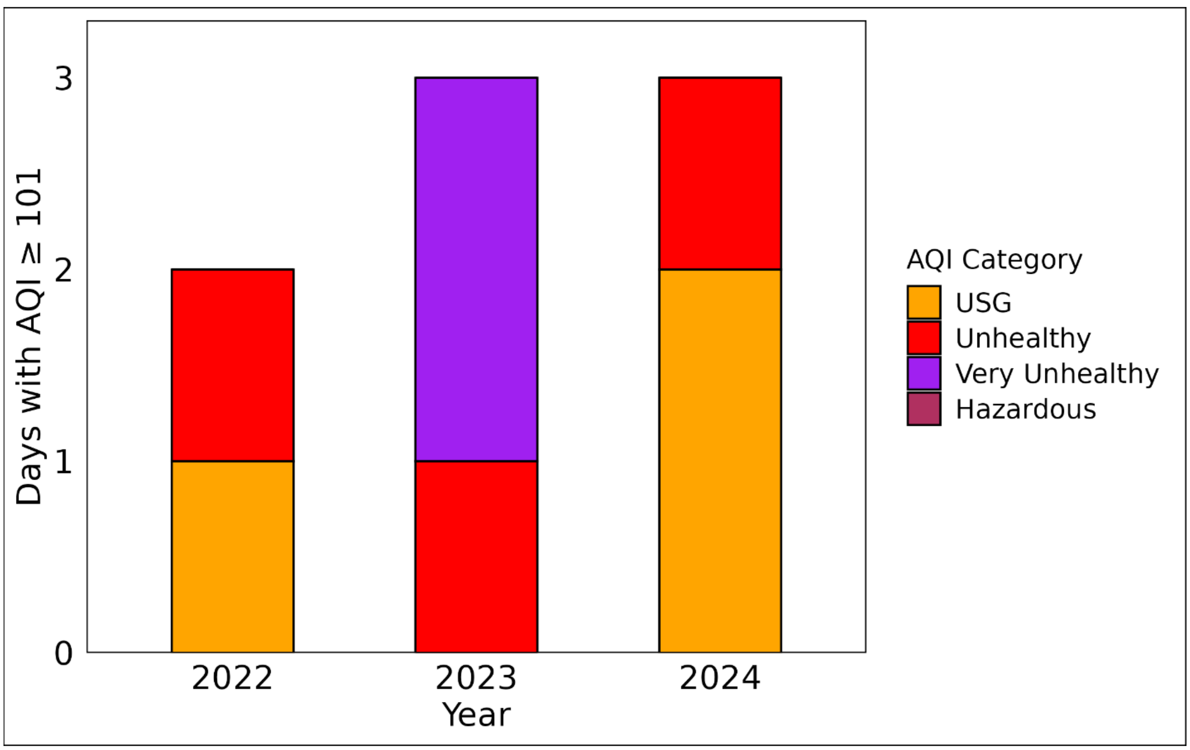


Figure 5. Number of days 2022-2024 with unhealthy air quality. Includes days impacted by wildfire smoke.

Table 2 includes 24-hour $PM_{2.5}$ (98th percentile) concentrations. $PM_{2.5}$ 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 Yakima-4th Ave monitoring site ranged from 25.4 to 29.4 µg/m³. The 2024 design value was below the NAAQS threshold (Table 2; Figure 6). Wildfire-impacted days when the 24-hour average $PM_{2.5}$ concentration exceeded 35.4 µg/m³ were excluded from these calculations. The annual (98th percentile) of 24-hour $PM_{2.5}$, excluding wildfire-impacted days, was approximately 8% lower than when all days were included.

Table 2. ***24-hour $PM_{2.5}$ (98th percentile) concentrations 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 98th Percentile	2023 24-hour 98th Percentile	2024 24-hour 98th Percentile	2024 Design Value
Yakima-4th Ave	29.4 [29.0]	25.4 [23.0]	26.4 [22.1]	27 [25]

NAAQS = national ambient air quality standards, PM = particulate matter, µg/m^3 = micrograms per cubic meter

Figure 6. ***24-hour PM$_{2.5}$ (98th percentile) concentrations, 2022-2024.*** *Annual concentrations calculated with and without days elevated from wildfire smoke. Dark blue bar includes three complete years of data, 2022-2024; 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 concentrations used to describe long-term exposure. At the Yakima-4th Ave monitoring site, the 2024 design value remained below the NAAQS threshold of 9.0 µg/m³. In contrast, the 2022 annual mean concentration exceeded the threshold, primarily due to wildfire smoke (Table 3). Overall, annual PM$_{2.5}$ concentrations show a slight downward trend from 2022-2024.

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
Yakima-4th Ave	9.14 [8.43]	8.79 [7.78]	7.13 [6.36]	8.4 [7.5]

NAAQS = national ambient air quality standards, PM = particulate matter, µg/m³ = micrograms per cubic meter

For PM_{10}, the 24-hour standard is 150 µg/m³, which should not be exceeded more than once per year on average over a three-year period. In 2023, two days at the Yakima-4th Ave monitoring site exceeded the PM_{10} standard due to wildfire smoke (Table 4). Aside from these wildfire-impacted days, monitored PM_{10} concentrations remained below the NAAQS.

Table 4. ***Annual number of exceedances of PM_{10} (µg/m³) and 2024 design values, 2022-2024.***

Monitoring Site	Pollutant	2022	2023	2024	2024 Design Value	NAAQS Level	Form
Yakima-4th Ave	PM_{10}	0	2	0	0.7	1 (µg/m³)	# of annual exceedances >150 µg/m³, averaged over 3 years

µg/m³ = micrograms per cubic meter

Health Impacts of Criteria Air Pollution

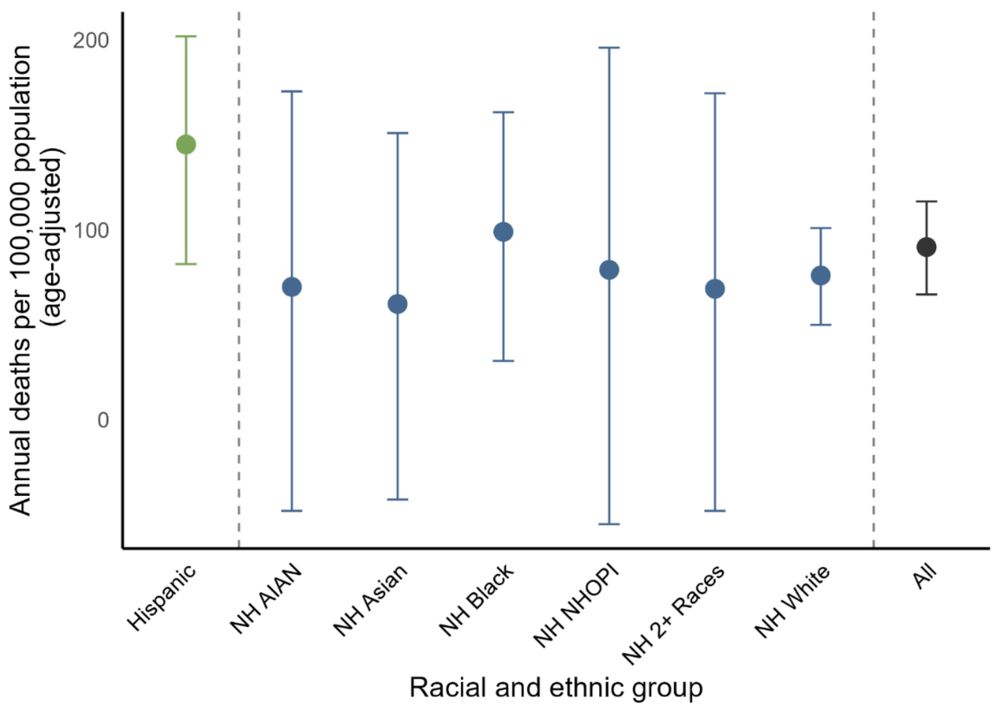
We estimated the number and rate of deaths and morbidities associated with $PM_{2.5}$ and O_3 concentrations by age range and using health effect estimates from peer-reviewed studies (Appendix B, Table 2 in the 2025 EJ Report). All estimates are rounded to the nearest whole number. We present ranges of deaths or morbidities where multiple studies assessed that health outcome.

$PM_{2.5}$

We estimated 33 deaths by any cause (78 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 20 total deaths (256 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 Hispanic people (22 deaths among 18–84 year-olds) as was the highest annual age-adjusted mortality rate (145 deaths per 100,000 population), after adjusting for age distribution.[7] Non-Hispanic Black people had the second highest annual age-adjusted mortality rate (99 deaths per 100,000 population).

Figure 7 is based on the study by Pope et al. (2019),[8] 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.



[7] 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.

[8] 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 East Yakima.

When assessing specific causes of death related to yearly $PM_{2.5}$ concentrations (Table B3), we estimated 12 deaths due to cardiovascular disease (28 deaths per 100,000 population), 13 to 21 deaths due to ischemic heart disease (41 to 66 deaths per 100,000 population), and 2 deaths per year due to lung cancer (5 to 7 deaths per 100,000 population) among adults.

Regarding non-fatal health outcomes (Table B3), an estimated 16 hospital admissions (38 visits per 100,000 population) for acute non-fatal myocardial infarction were associated with yearly $PM_{2.5}$ concentrations among adults. Additionally, 7 lung cancer diagnoses per year were associated with annual $PM_{2.5}$ exposure among all people (23 diagnoses per 100,000 population).

Daily $PM_{2.5}$ exposure (Table B4) was associated with 1 death by any cause (1 per 100,000 population) among all people and 2 deaths by any cause (23 per 100,000 population) among older adults ages 65 to 99. For non-fatal conditions, daily $PM_{2.5}$ was associated with 3 acute non-fatal myocardial infarction admissions (7 to 8 per 100,000 population) among all adults, and 10 respiratory admissions (134 per 100,000 population) among older adults ages 65 to 99, 3 asthma hospital admissions (6 per 100,000 population) among people ages 0 to 64. Additionally, 14 to 26 asthma-related emergency department (ED) visits (24 to 44 per 100,000 population) among all people and 17 asthma-related ED visits (99 per 100,000 population) among youths ages 0 to 17 years were associated with daily $PM_{2.5}$ exposure.

Ozone

We estimated that O_3 exposure during the warm season (Table B5) was associated with 6 seasonal deaths by any cause among older adults ages 65 to 99 (73 deaths per 100,000 population). Daily O_3 exposure was associated with 2 deaths by any cause (3 per 100,000 population), 33 asthma-related ED visits (55 per 100,000 population) among all people and 21 respiratory hospital admissions (277 per 100,000 population) among older adults ages 65 to 99.

Greenhouse Gas Emissions

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

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 CCA's requirements. For further information on methods and statewide results, refer to the 2025 EJ Report.

Facilities

Washington State requires certain businesses that emit more than 10,000 metric tons of carbon dioxide equivalents (MT CO_2e) to report to the Washington Greenhouse Gas Reporting Program.[13] Businesses that emit over 25,000 MT CO_2e are also subject to the Cap-and-Invest Program (covered sources). Each reporting facility is required to follow a compliance plan.

In the East Yakima community, two facilities (Figure 8; Table 5) within and near the community boundary reported their emissions in 2022 and 2023. The total reported emissions from these facilities was 26,444 MT CO_2e in 2022 and 27,628 MT CO_2e in 2023, a 4.5% year-to-year increase. Some facilities in other communities report biogenic carbon (biogenic CO_2) [14] emissions, which are expected to be partially recaptured as part of the natural carbon cycle. For reporting purposes, biogenic CO_2 is subtracted from total metric tons of CO_2e, even though it has the same atmospheric warming effect as non-biogenic CO_2. There were no facilities that reported biogenic CO_2 in East Yakima. 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_2 emissions. Some year-to-year fluctuations in emissions from individual facilities are expected.

[9] Greenhouse Gas Emissions – Cap-and-Invest Program https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65
[10] Reporting of Emissions of Greenhouse Gases https://app.leg.wa.gov/WAC/default.aspx?cite=173-441
[11] Climate Commitment Act – Program Rule https://app.leg.wa.gov/WAC/default.aspx?cite=173-446
[12] Environmental Justice Review https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.020
[13] Mandatory greenhouse gas reports https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/mandatory-greenhouse-gas-reports
[14] 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_2 acts the same way in the atmosphere as non-biogenic CO_2. Anthropogenic processes that include these emissions reduce a facility's environmental impact.

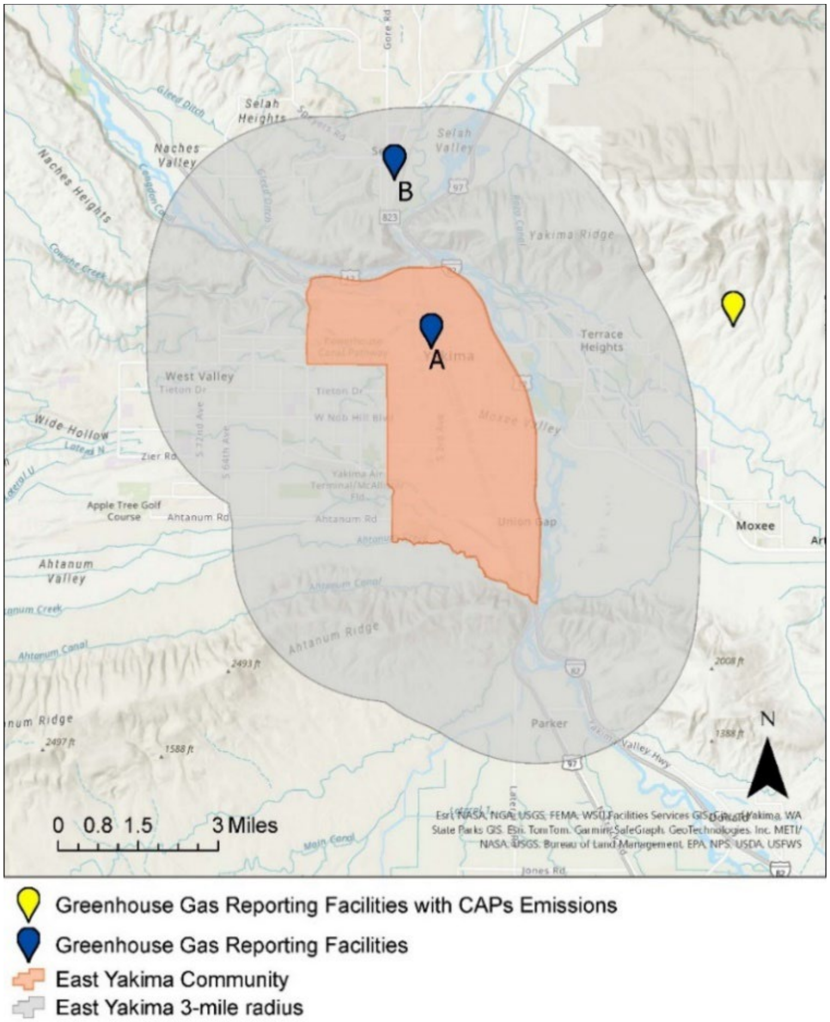


Figure 8. Reporting facilities as of 2023 that are in or near the East Yakima community boundary. Facility letters correspond with Table 5.

The emissions in Table 5 are in MT CO_2e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR4 GWP[15], to convert emissions into CO_2e. 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).[16] The Greenhouse Gas Reporting

[15] Reporting of Emissions of Greenhouse Gases https://app.leg.wa.gov/WAC/default.aspx?cite=173-441
[16] Intergovernmental Panel on Climate Change https://www.ipcc.ch/

Program uses AR4 GWPs mainly for regulatory stability, consistency, and alignment with other federal programs.

Table 5. Facility emissions in or nearby[17] the East Yakima community. Biogenic CO_2 is in brackets [ ].

	Facility Name/City	Facility Sector	Within Community Boundary	CCA-Covered Facility[18]	Source of CAPs[19]	2022 Emissions ($MTCO_2e$)	2023 Emissions ($MTCO_2e$)
A	Michelson Packaging – Yakima	Pulp and Paper	Yes	No	No	9,536 [0]	11,886 [0]
B	Tree Top – Selah	Food Production	Nearby	No	No	16,908 [0]	15,742 [0]

[17] "Nearby" refers to facilities within a three-mile radius of the community boundary that were included in this analysis.
[18] Large emitters of greenhouse gases, specifically those emitting 25,000 or more MT CO_2e annually in Washington State that are part of the Cap-and-Invest program established by the Climate Commitment Act.
[19] 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

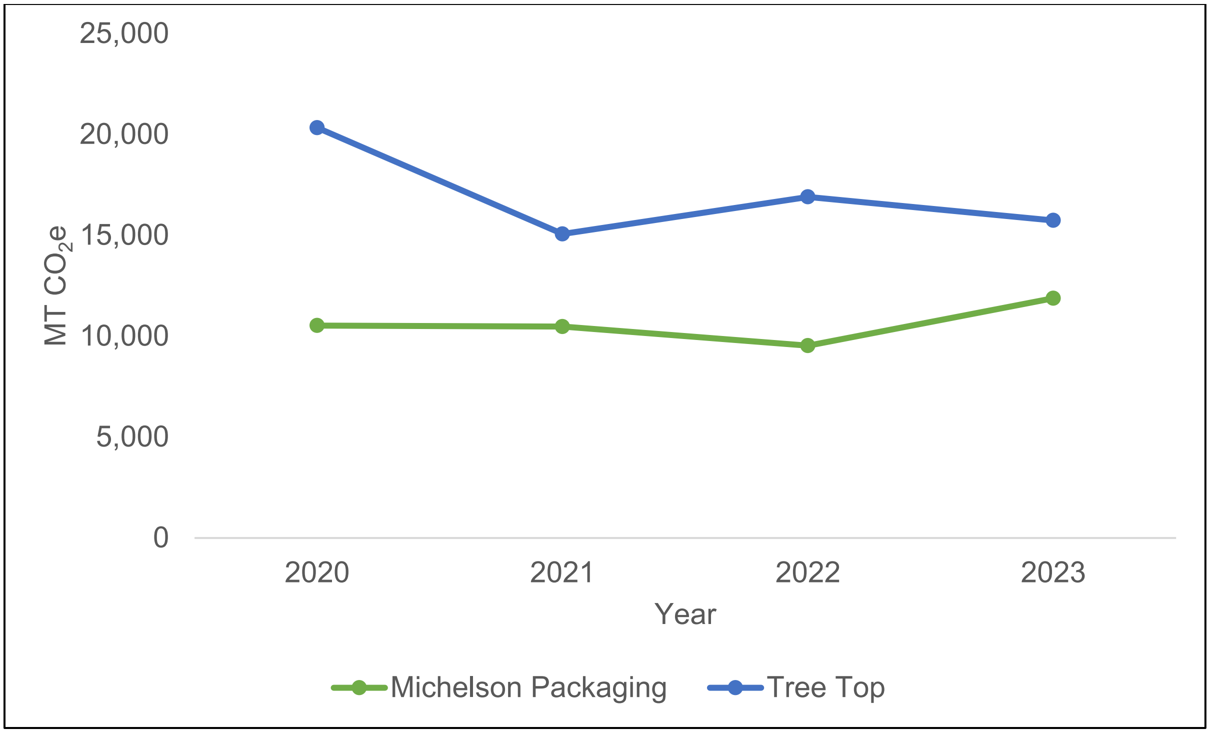


Figure 9. Greenhouse gas reporting facilities and their emissions from 2020-2023.

Mobile sources

In the East Yakima community, greenhouse gas emissions from mobile sources increased by 21% from 2020 to 2021 (Table 6) but have decreased by 5.4% between 2019 to 2021.[20] 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.[21,22]

Similar to Table 5, the results in Table 6 use AR5 GWPs to convert greenhouse gas emissions into CO_2e. In 2013-2014, the IPCC published AR5 GWPs and AR6 GWPs in 2021-2022. The Washington Greenhouse Gas Emissions Inventory[23] uses AR5 GWPs in mobile source emission estimates, as the inventory models for greenhouse gas accounting are revised as science improves.

[20] Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html
[21] Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html
[22] Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024 https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf
[23] Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html

Table 6. Greenhouse gas emissions from mobile sources per capita from 2020-2021.

Population	2020 Emissions (MT CO_2e)	2020 Per Capita MT CO_2e	2021 Emissions (MT CO_2e)	2021 Per Capita MT CO_2e
59,803	256,838	4.3	310,698	5.2

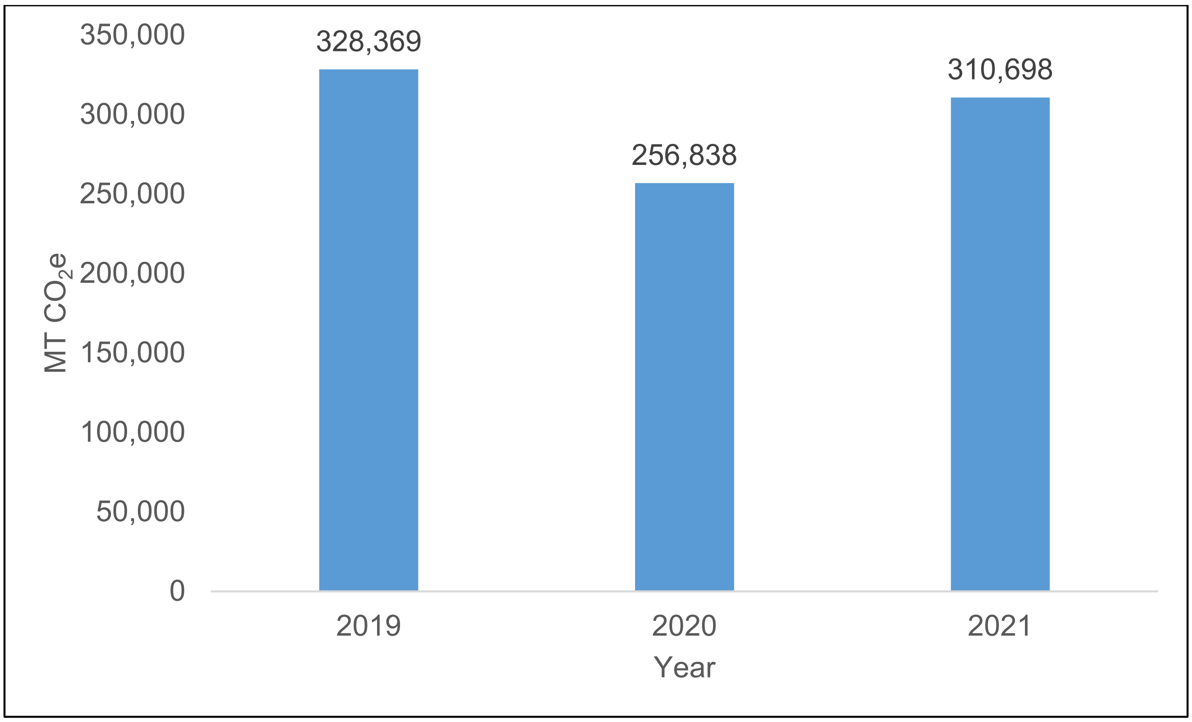


Figure 10. Annual greenhouse gas emissions from mobile sources in the East Yakima community, 2019-2021.

Community Resources

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

- Yakima Health District data and reports page[24]
- Yakima Memorial Hospital 2022 Community Health Needs Assessment[25]

[24] https://www.yakimacounty.us/277/Community
[25] https://www.multicare.org/wp-content/uploads/2024/05/yakima-chna-2022.pdf

- Yakima Valley Trends - Health indicators[26]
- Zero-emission and electric vehicles mapping tool | WSDOT[27]
- Home | Washington Climate Action[28]
- Climate Resilience Plan for Washington Agriculture | Washington State Department of Agriculture[29]

[26] https://yakimavalleytrends.org/category.cfm?id=7
[27] https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool
[28] https://climate.wa.gov/
[29] https://agr.wa.gov/washington-agriculture/climate-resilience-plan-for-washington-agriculture

Appendix A. Criteria Air Pollution

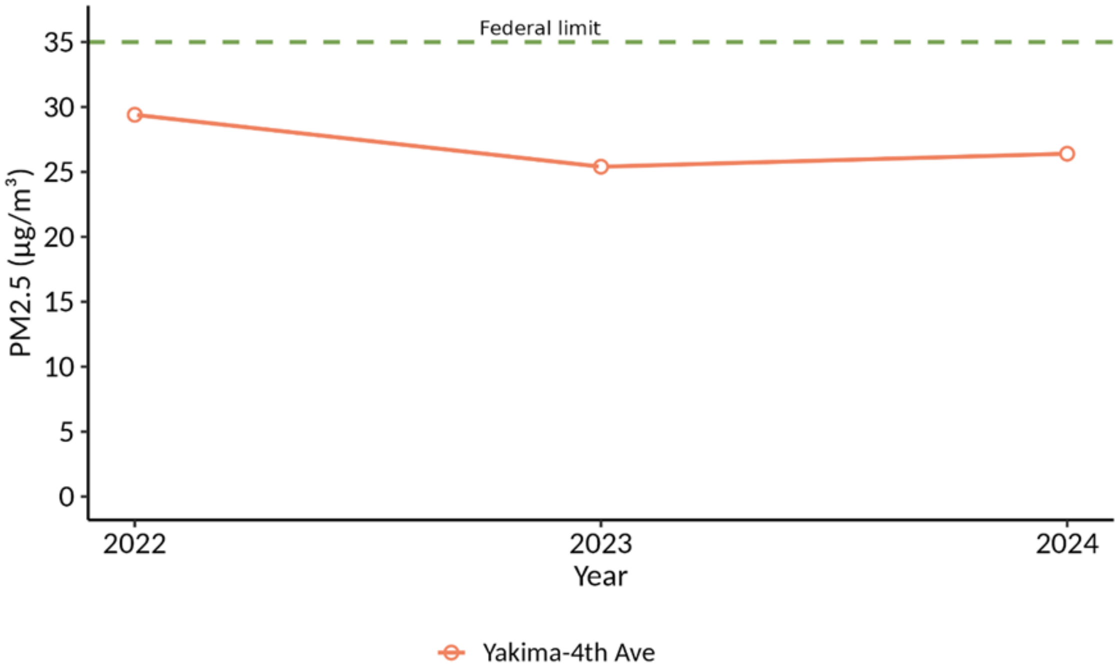


Figure A1. 24-hour $PM_{2.5}$ (98^{th} percentile) concentrations at the East Yakima monitoring site. Days impacted by wildfire smoke are included. Dashed line is the federal limit for 24-hr $PM_{2.5}$ (35 µg/m³).

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 East Yakima by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019[8]).

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	41,626	33 [24 to 41]	78 [57 to 99]	91 [66 to 115]
Hispanic	24,731	22 [13 to 31]	89 [51 to 124]	145 [82 to 202]
Non-Hispanic AIAN	728	<1 [0 to 1]	50 [-35 to 125]	70 [-48 to 173]
Non-Hispanic Asian	328	<1 [0 to 1]	62 [-43 to 153]	61 [-42 to 151]
Non-Hispanic Black	674	1 [0 to 1]	88 [27 to 143]	99 [31 to 162]
Non-Hispanic NHOPI	39	<1 [range<1]	45 [-31 to 113]	79 [-55 to 196]
Non-Hispanic 2+ races	1,200	1 [-1 to 2]	63 [-44 to 157]	69 [-48 to 172]
Non-Hispanic White	13,927	14 [9 to 19]	103 [67 to 137]	76 [50 to 101]

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 $PM_{2.5}$ exposure among 65–99-year-olds in East Yakima by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017[30]).

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	7,733	20 [19 to 20]	256 [249 to 263]	235 [229 to 241]
Hispanic	1,966	5 [5 to 6]	272 [235 to 306]	287 [248 to 324]
AIAN	301	1 [0 to 1]	179 [110 to 244]	191 [118 to 261]
Asian	94	<1 [range<1]	177 [140 to 212]	174 [138 to 209]
Black	163	1 [1 to 1]	383 [369 to 397]	383 [368 to 397]
NHOPI	15	<1 [range<1]	146 [90 to 199]	159 [98 to 217]
2+ races	629	1 [1 to 2]	211 [130 to 287]	212 [131 to 289]
White	6,532	11 [11 to 11]	169 [162 to 175]	153 [147 to 158]

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.

[30] 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 $PM_{2.5}$ exposure (yearly 24-hour average concentrations) in East Yakima, 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[31]	7,733	20 [19 to 20]	256 [249 to 263]
Deaths – Any cause	18 to 84	Pope et al., 2019[32]	41,626	33 [24 to 41]	78 [57 to 99]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023[33]	42,759	12 [5 to 19]	28 [11 to 43]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017[34]	32,008	14 [11 to 17]	44 [33 to 54]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009[35]	32,008	21 [17 to 25]	66 [54 to 78]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019[36]	32,008	13 [10 to 17]	41 [30 to 52]

[31] 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.
[32] 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.
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[34] 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.
[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
[36] 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[37]	32,008	2 [1 to 4]	7 [3 to 11]
Deaths – Lung Cancer	30 to 99	Turner et al., 2016[38]	32,008	2 [0 to 3]	5 [1 to 8]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023[39]	42,759	16 [9 to 23]	38 [22 to 54]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016[40]	32,009	7 [2 to 11]	23 [7 to 35]

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 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.

[37] 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

[38] 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.

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Table B4. Annual mortality and morbidity associated with daily $PM_{2.5}$ exposure (daily 24-hour average concentrations) in East Yakima, 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[41]	59,783	1 [0 to 1]	1 [0 to 2]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014[42]	7,733	2 [1 to 2]	23 [15 to 30]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022[43]	59,783	1 [0 to 2]	2 [0 to 4]
Deaths – Respiratory	0 to 99	Liu et al., 2022[44]	59,783	2 [0 to 3]	3 [0 to 5]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005[45]	42,759	3 [-4 to 9]	7 [-9 to 21]

[41] 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

[42] 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.

[43] 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.

[44] 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.

[45] 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[46]	42,759	3 [2 to 5]	8 [4 to 11]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009[47]	7,733	10 [6 to 15]	134 [76 to 189]
Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003[48]	52,050	3 [1 to 5]	6 [2 to 10]
ED Visits – Asthma	0 to 99	Mar et al., 2010[49]	59,783	26 [7 to 44]	44 [11 to 74]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005[50]	59,783	14 [-12 to 38]	24 [-20 to 63]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999[51]	17,024	17 [9 to 24]	99 [52 to 142]

[46] 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.
[47] 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.
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Health Outcome	Age Group	Source of Risk Estimate	Population	Estimated Annual Number [95% CI]	Estimated annual rate per 100,000 population [95% CI]

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 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_3 exposure (seasonal and daily 8-hour maximum concentrations) in East Yakima, 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[52]	7,733	6 [4 to 7]	73 [50 to 96]
Deaths – Any cause (Daily)	0 to 99	Zanobetti and Schwartz, 2008[53]	59,783	2 [1 to 3]	3 [2 to 5]

[52] 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.
[53] 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.

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 (Daily)	0 to 99	Mar and Koenig, 2009[54]	59,783	33 [8 to 54]	55 [14 to 91]
Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995[55]	7,733	21 [6 to 35]	277 [80 to 454]

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 O_3 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.

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