George and West Grant County Community 2025 Environmental Justice Report

Publication Information

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Executive Summary

The George and West Grant County 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 George and West Grant County.

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

Community Overview

The George and West Grant County community was identified as overburdened and highly impacted by air pollution because it met the statewide screening criteria based on the EJScreen demographic index[1] and experiences elevated levels of short-term exposure to fine particulate matter ($PM_{2.5}$). Community identification is described in more detail in the Overburdened Communities Highly Impacted by Air Pollution StoryMap.

Land Area: 118 sq. mi

Population: 3,392

County: Grant

Municipal Government: George City Council

Ecology Region: Eastern

Local Clean Air Authority: ECY Eastern Region Office

Local Health Jurisdiction: Grant County Health District

Primary languages spoken: English, Spanish

Primary pollutant of concern: Short-term $PM_{2.5}$

Geographic characteristics

This community is in Grant County adjacent to the Columbia River. Most of the area designated as overburdened and highly impacted by air pollution is between Interstate 90 and State Route 26. This community's proximity to Interstate 90 and the Gorge Amphitheatre exposes it to additional traffic. It is predominantly an agricultural area with a low population density, and the only incorporated city in the community is George. The city has a population of about 900 residents.

[1] EJScreen demographic index https://www.epa.gov/ejscreen

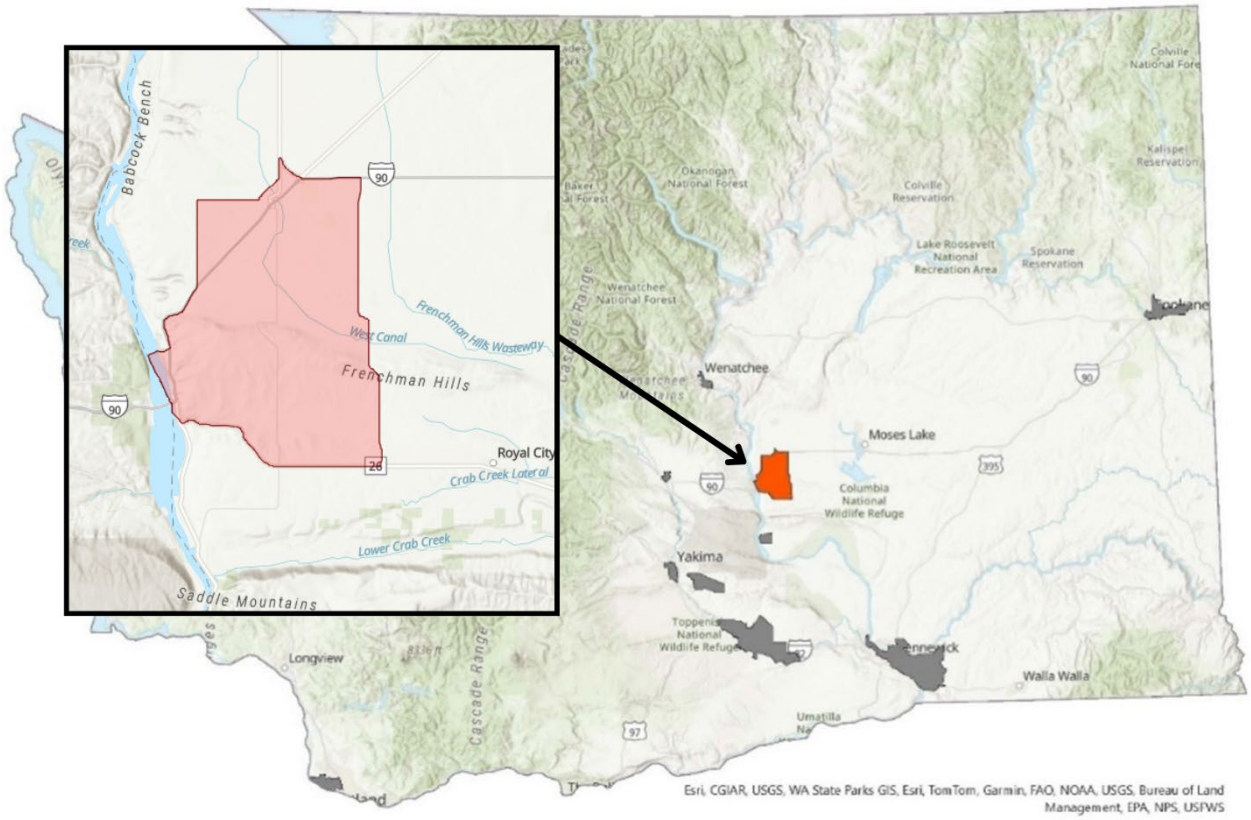

Figure 1. Map of the 16 overburdened communities highly impacted by air pollution in Washington State (gray), with George and West Grant County highlighted (red).

Socioeconomic characteristics

Over half of residents in George and West Grant County are Hispanic, and more than two-thirds of households in this community speak a language other than English at home.[2,3] Three-tenths of residents are uninsured. These factors present barriers to information and health care access. This community also has a relatively young population; 1 in 10 residents are children under age 6. There are no medical clinics in George, and the closest healthcare facilities for residents are in Quincy or Moses Lake.

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

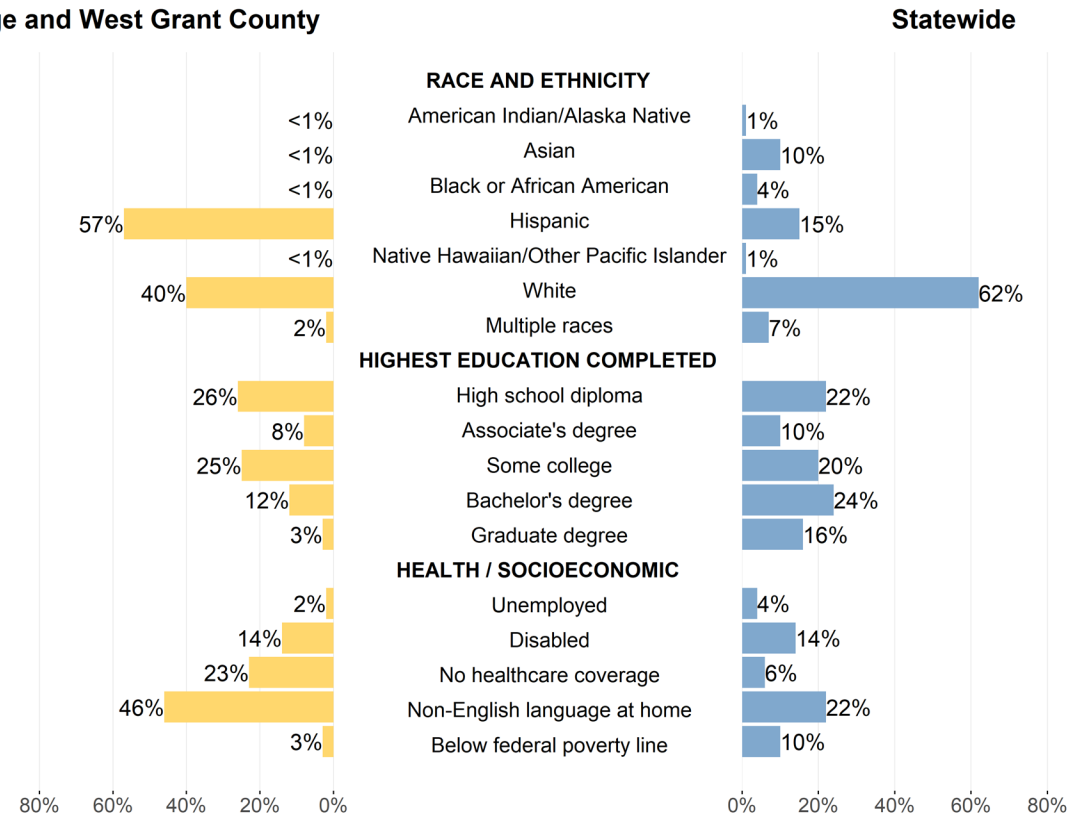

Figure 2. Sociodemographic characteristics of the George and West Grant County community compared to statewide percentages, based on Washington State's 2024 estimated population of 8,035,700.[4]

Health characteristics

According to 2022 CDC health survey data,[5] George and West Grant County has elevated prevalences of chronic health conditions among individuals ages 18 years and older relative to the statewide population, including asthma (11.5% vs. 11.4%), cardiovascular disease (6.9% vs. 5.7%), COPD (7.0% vs. 5.7%), diabetes (11.9% vs. 9.6%), and stroke (3.6% 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.

[4] 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
[5] U.S. Centers for Disease Control and Prevention, PLACES Data Portal https://www.cdc.gov/places/tools/data-portal.html

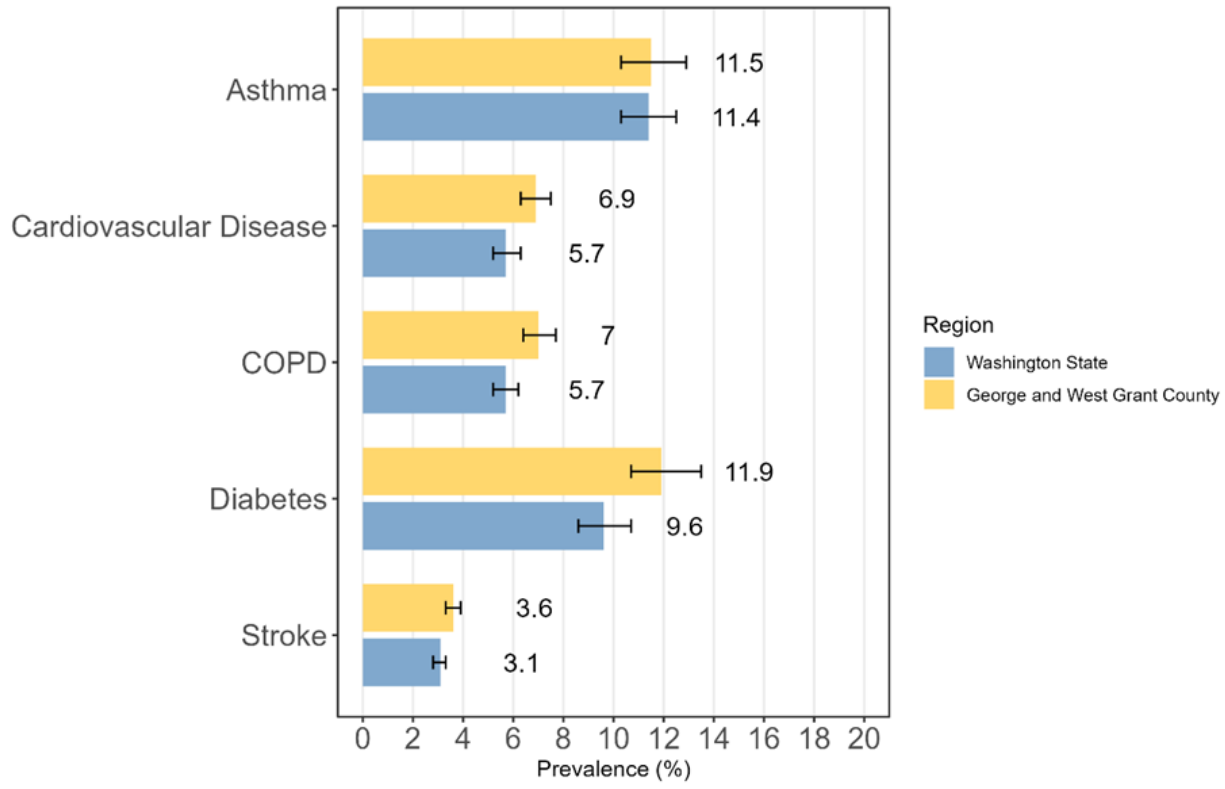

Figure 3. Prevalence of chronic health conditions among people ages 18 years and older in George and West Grant County census tracts compared with Washington State.

Data come from CDC PLACES, 2024 release, which uses 2022 survey data.[5] Yellow and blue bars indicate the estimated prevalence of each condition. Black lines indicate the 95% confidence interval.

Air Monitoring

In 2023, Ecology's Eastern Regional Office (ERO) installed a $PM_{2.5}$ sensor (SensWA) in George using Climate Commitment Act (CCA) funds. This report includes partial-year $PM_{2.5}$ data from 2023 and all of 2024. The George and West Grant County sensor is located close to Interstate 90 in an area which experiences frequent traffic from passenger and commercial vehicles. No other criteria air pollutants are currently monitored in this community.

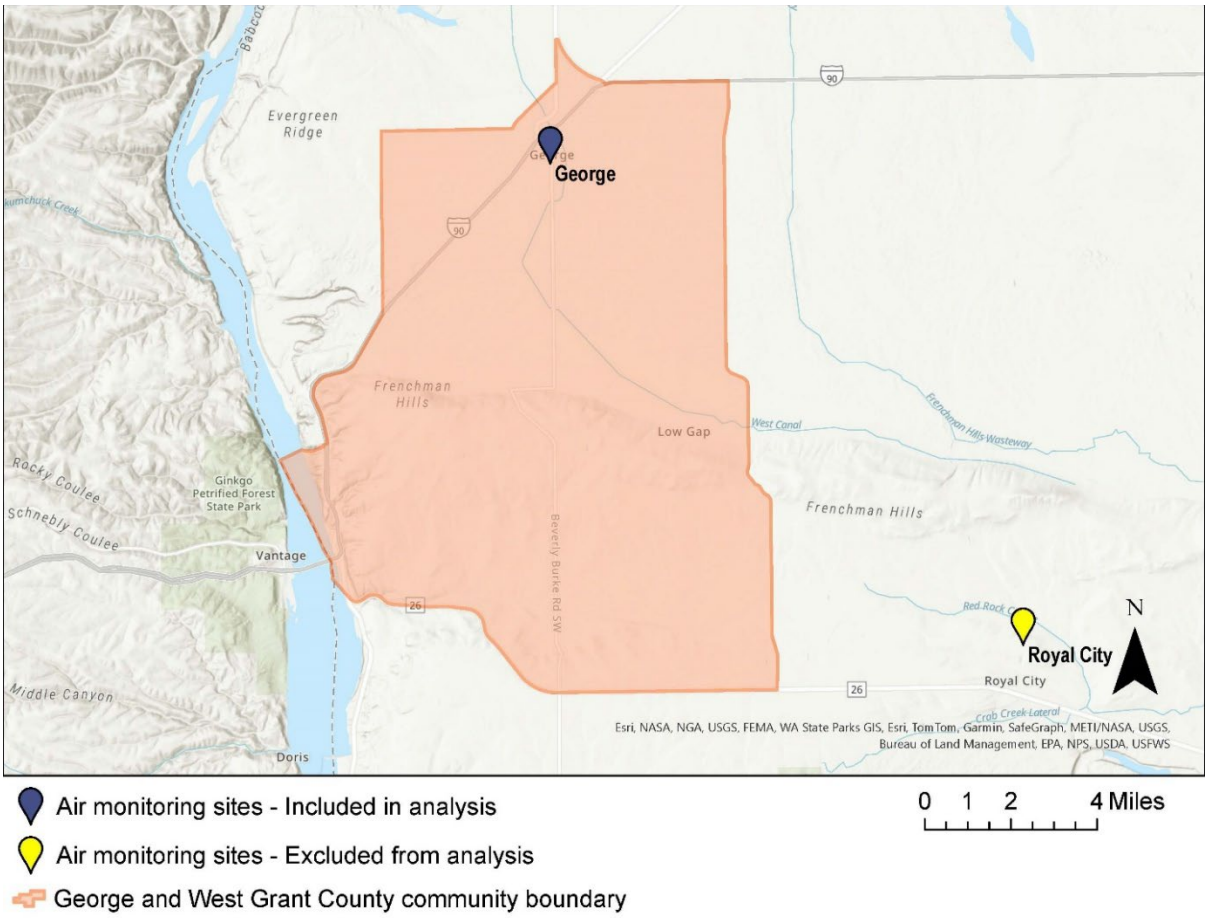

Figure 4. Map of George and West Grant County air monitoring sites.

Table 1. George and West Grant County air monitors.

Monitoring Site	Type	Site Owner	Pollutants Monitored
George	SensWA[1]	Ecology-ERO	$PM_{2.5}$

[1] Installed as part of Climate Commitment Act implementation

Criteria Air Pollution

This report summarizes criteria air pollution (CAPs) concentrations in the George and West Grant County community. 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 2025 EJ Report.

In addition to analyzing monitored criteria air pollution concentrations, we calculated the number of days per year residents of the George and West Grant County 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.

After the George monitor was installed in 2023, there were four days with unhealthy air quality (Figure 5), primarily caused by wildfire smoke. In 2024, no days exceeded an AQI of 100.

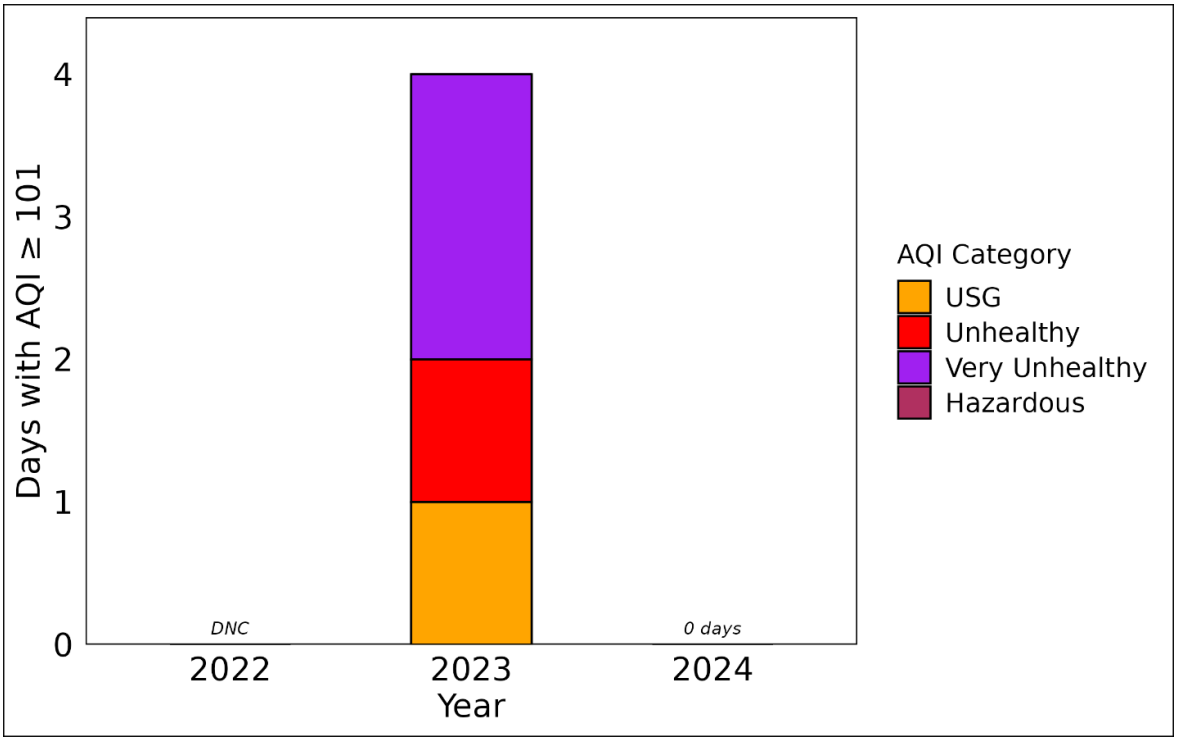

Figure 5*. Number of days 2022-2024 with unhealthy air quality. Includes days impacted by wildfire smoke. DNC = Data Not Collected.*

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.

In the George and West Grant County community, data from the George monitoring data were available from August 2023 through December 2024. The 24-hour $PM_{2.5}$ (98th percentile) concentration exceeded the NAAQS threshold in 2023, primarily due to wildfire smoke (Table 2; Figure 6). When wildfire-impacted days when the 24-hour average $PM_{2.5}$ concentrations exceeded 35.4 µg/m³ were excluded, the average concentration dropped substantially, from 105.5 to 18 µg/m³. With wildfire days excluded, the 24-hour $PM_{2.5}$ averages for both 2023 and 2024 were below the NAAQS.

Table 2. ***24-hour $PM_{2.5}$ (98th percentile) summary statistics, 2023-2024.*** *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
George	DNC	*105.5* *[18.0]*	15.1 [15.1]	*

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

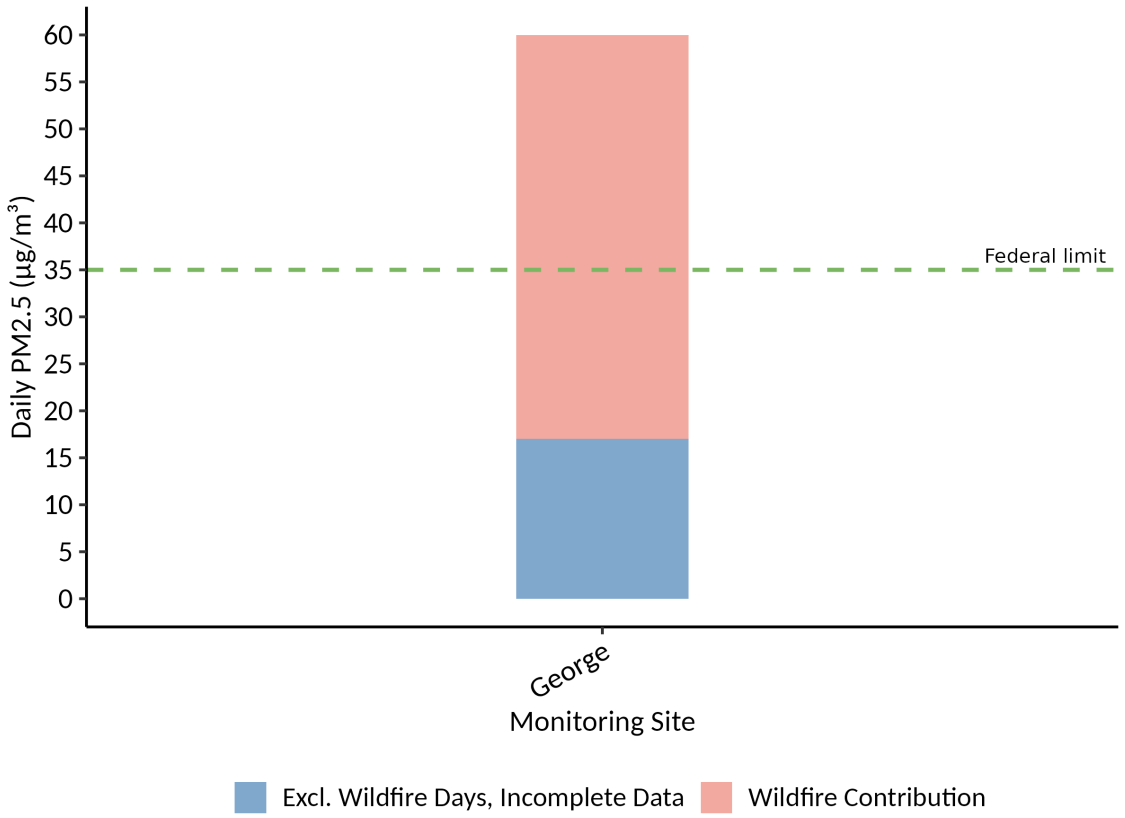

Figure 6. ***24-hour $PM_{2.5}$ (98^{th} percentile) summary statistics, 2023-2024.*** *Annual summary statistics calculated with and without days elevated from wildfire smoke. Blue bar includes average of available data from August 2023-December 2024. Dashed line is the federal limit (NAAQS) for 24-hr $PM_{2.5}$.*

Table 3 includes annual mean $PM_{2.5}$ concentrations for 2023 and 2024. 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; however, we did not have three-years of data available. In 2023, the annual mean concentration exceeded the NAAQS threshold of 9.0 µg/m³ due to wildfire smoke (Table 3). Wildfire impacts in 2024 were negligible, and the annual mean remained below the NAAQS.

Table 3. ***Annual mean $PM_{2.5}$ concentrations, 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
George	DNC	*9.61* *[5.93]*	3.84 [3.68]	*

Italics indicate incomplete annual data, DNC = data not collected, NAAQS = national ambient air quality standards, PM = particulate matter, µg/m^3 = 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 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.

$PM_{2.5}$

We estimated 1 death by any cause (22 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 1 total death (72 deaths per 100,000 population) each year associated with annual $PM_{2.5}$ exposure (Table B2).

Among different racial and ethnic groups (Figure 7), we estimated 1 $PM_{2.5}$-related death by any cause per year among all people (1 deaths among 18–84-year-olds). When accounting for the ages of people in each racial and ethnic group[6], the annual age-adjusted mortality rate was highest among Hispanic people (34 deaths per 100,000 population) and non-Hispanic AIAN people (18 deaths per 100,000 population).

[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 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.

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.

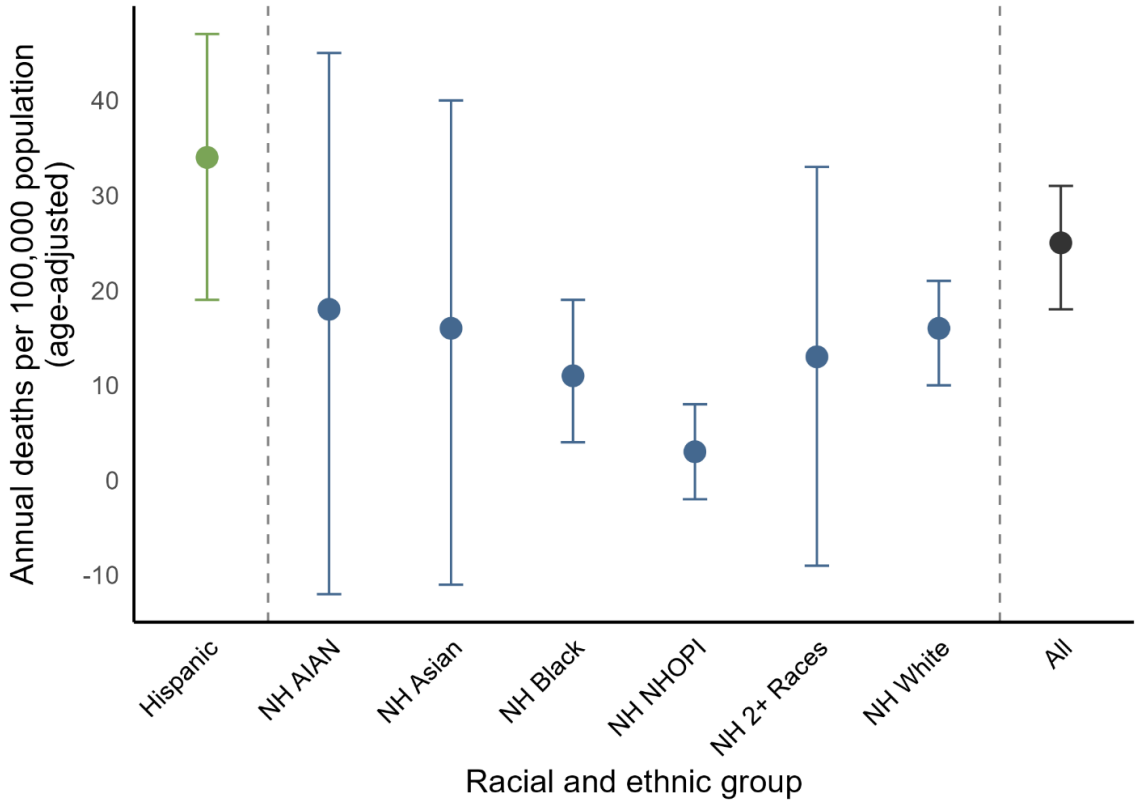

Figure 7. Age-adjusted annual death rates by any cause associated with annual $PM_{2.5}$ exposure among ages 18-84 by racial and ethnic group in George and West Grant County.

When assessing specific causes of death related to annual $PM_{2.5}$ concentrations (Table B3), we estimated <1 death due to cardiovascular disease (6 deaths per 100,000 population), <1 death due to ischemic heart disease (6 to 10 deaths per 100,000 population), and <1 death per year due to lung cancer (2 to 3 deaths per 100,000 population) among adults.

Regarding non-fatal health outcomes (Table B3), we estimated that <1 hospital admission (7 visits per 100,000 population) for acute non-fatal myocardial infarction was associated with

[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.

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 (11 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 <1 (7 per 100,000 population) death by any cause among older adults ages 65 to 99. For non-fatal conditions, daily $PM_{2.5}$ was associated with <1 acute non-fatal myocardial infarction admission (1 per 100,000 population) among all adults, <1 respiratory admission (35 per 100,000 population) among older adults, <1 asthma hospital admission (2 per 100,000 population) among people ages 0 to 64. Additionally, 0 to 1 asthma-related emergency department (ED) visit (8 to 15 per 100,000 population) among all people and <1 asthma-related ED visit (24 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 <1 seasonal death by any cause among older adults ages 65 to 99 (38 deaths per 100,000 population). Daily O_3 exposure was associated with <1 death by any cause (2 per 100,000 population), 2 asthma-related ED visits (34 per 100,000 population) among all people and 1 respiratory hospital admission (134 per 100,000 population) among older adults ages 65–99.

Greenhouse Gas Emissions

Greenhouse gas results for the George and West Grant County overburdened community highly impacted by air pollution include: 1) Emissions from greenhouse gas reporting entities per RCW 70A.65[8] and WAC 173-441,[9] -446;[10] and 2) Mobile source emissions.[11]

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.

[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

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.[12] 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.

There are no major stationary sources of greenhouse gas emissions in or nearby[13] the George and West Grant County community. There were no facilities reported in the 2023 report[14] or in 2022 and 2023, resulting in no change from year-to-year. The absence of reporting facilities does not mean that industrial sectors do not exist.

There are some facilities in other communities that report biogenic carbon (biogenic CO_2) [15] 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 George and West Grant County. 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.

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

[13] "Nearby" refers to facilities within a three-mile radius of the community boundary that were included in this analysis.

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

[15] 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.

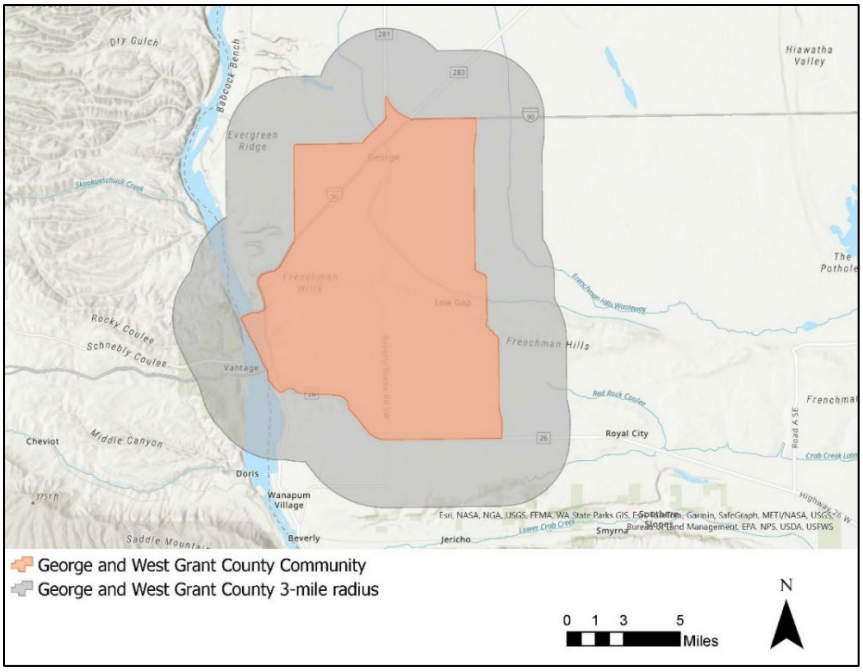

Figure 8. George and West Grant County community boundary and 3-mile radius include no greenhouse gas reporting facilities.

Mobile sources

In the George and West Grant County community, greenhouse gas emissions from mobile sources increased by 21% from 2020 to 2021 (Table 4) but have decreased by 5.4% between 2019 to 2021.[16] 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.[17,18]

The results in Table 4 are in units of MT CO_2e. Each greenhouse gas uses a conversion factor known as its Global Warming Potential (GWP), in this case AR5 GWP[19], 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). In 2013-2014, the Intergovernmental Panel on Climate Change (IPCC)[20] published AR5 GWPs and AR6 GWPs in

[16] Improving Air Quality in Overburdened Communities Highly Impacted by Air Pollution 2023 Report https://apps.ecology.wa.gov/publications/SummaryPages/2302115.html
[17] Washington State Greenhouse Gas Emissions Inventory: 1990-2021, Jan 2025 https://apps.ecology.wa.gov/publications/SummaryPages/2414077.html
[18] Reducing Greenhouse Gas Emissions from the Transportation Sector through Climate Planning, Dec 2024 https://www.epa.gov/system/files/documents/2024-12/420f24042.pdf
[19] Reporting of Emissions of Greenhouse Gases https://app.leg.wa.gov/WAC/default.aspx?cite=173-441
[20] Intergovernmental Panel on Climate Change https://www.ipcc.ch/

2021-2022. The Washington Greenhouse Gas Emissions Inventory 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.

Population	2020 Emissions (MT CO_2e)	2020 Per Capita MT CO_2e	2021 Emissions (MT CO_2e)	2021 Per Capita MT CO_2e
2,206	15,243	6.9	18,439	8.4

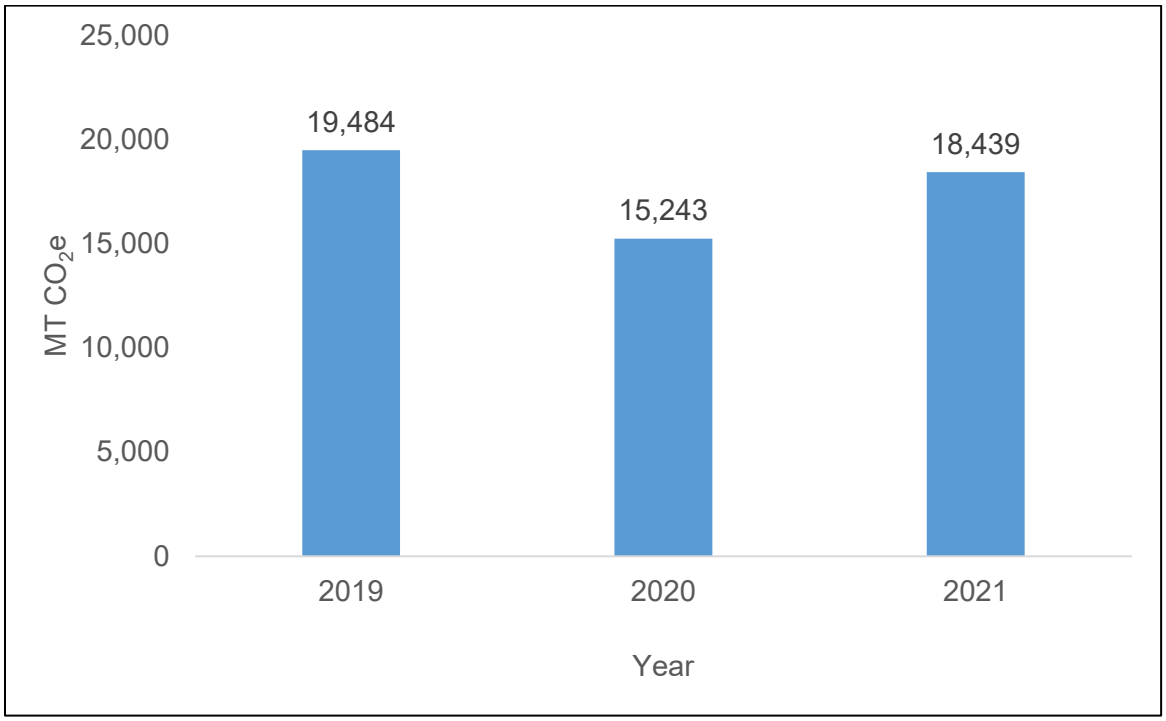

Figure 9. Annual greenhouse gas emissions from mobile sources in the George and West Grant County community, 2019-2021.

Community Resources

These resources provide more information about air quality and health in the George and West Grant County community:

- Grant County Health District Data and Assessment page[21]
- Grant County 2023-2024 Community Health Assessment[22]
- Grant County Trends - Health indicators[23]
- Zero-emission and electric vehicles mapping tool | WSDOT[24]
- Home | Washington Climate Action[25]

[21] https://granthealth.org/249/Health-Data-and-Assessment
[22] https://granthealth.org/DocumentCenter/View/241/Community-Health-Assessment-2023-to-2024-PDF?bidId=
[23] https://grantcountytrends.org/category.cfm?id=5
[24] https://wsdot.wa.gov/business-wsdot/grants/zero-emission-vehicle-grants/zero-emission-and-electric-vehicles-mapping-tool
[25] https://climate.wa.gov/

Appendix A. Criteria Air Pollution

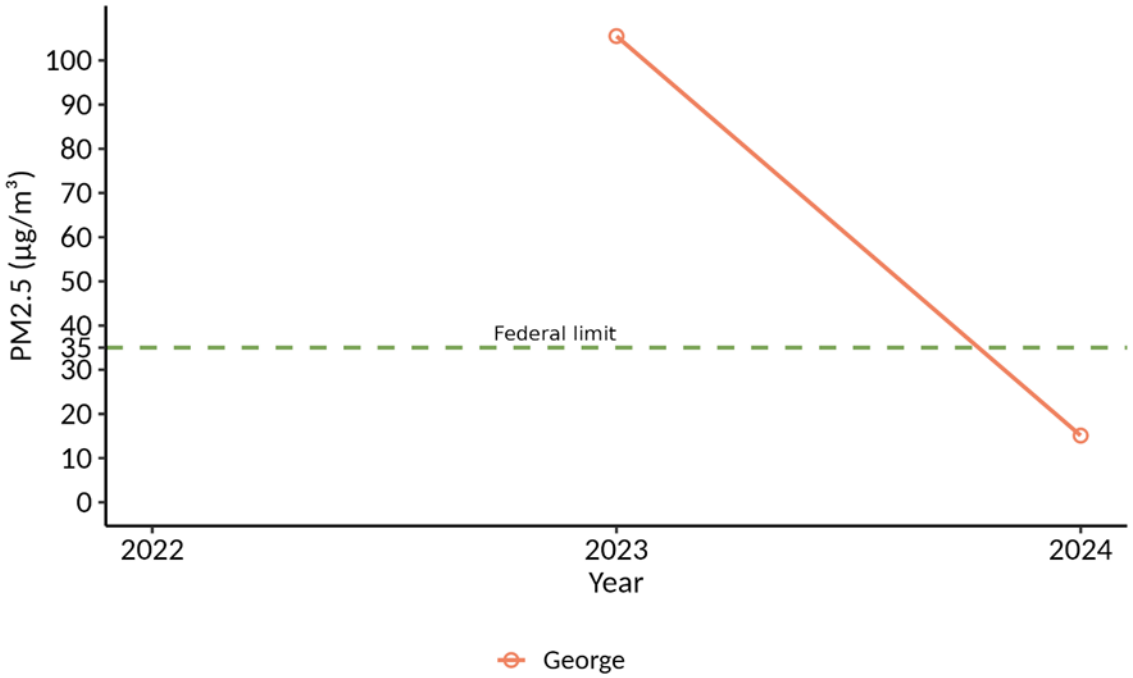

Figure A1. 24-hour PM2.5 (98th percentile) concentrations at the George and West Grant County monitoring site, August 2023-December 2024. Days impacted by wildfire smoke are included. Dashed line is the 24-hr PM2.5 NAAQS (35 µg/m³).

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 George and West Grant County by racial and ethnic group, 2022–2023 (based on effect estimates in study by Pope, et al., 2019[7]).

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	3,574	1 [1 to 1]	22 [16 to 28]	25 [18 to 31]
Hispanic	1,830	<1 [range <1]	15 [8 to 21]	34 [19 to 47]
Non-Hispanic AIAN	4	<1 [range <1]	5 [-3 to 13]	18 [-12 to 45]
Non-Hispanic Asian	15	<1 [range <1]	15 [-10 to 39]	16 [-11 to 40]
Non-Hispanic Black	7	<1 [range <1]	15 [5 to 25]	11 [4 to 19]
Non-Hispanic NHOPI	2	<1 [range <1]	3 [-2 to 8]	3 [-2 to 8]
Non-Hispanic 2+ races	46	<1 [range <1]	13 [-9 to 34]	13 [-9 to 33]
Non-Hispanic White	1,671	<1 [0 to 1]	25 [16 to 33]	16 [10 to 21]

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 George and West Grant County by racial and ethnic group, 2022–2023 (based on effect estimates in study by Di, et al., 2017[26]).

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	751	1 [1 to 1]	72 [70 to 74]	82 [80 to 84]
Hispanic	113	<1 [range <1]	74 [64 to 84]	94 [81 to 106]
AIAN	7	<1 [range <1]	86 [53 to 118]	74 [45 to 101]
Asian	5	<1 [range <1]	51 [40 to 61]	57 [45 to 69]
Black	10	<1 [range <1]	151 [145 to 157]	117 [112 to 121]
NHOPI	0	<1 [range <1]	109 [67 to 149]	72 [44 to 99]
2+ races	41	<1 [range <1]	112 [68 to 153]	67 [41 to 92]
White	687	<1 [range <1]	39 [37 to 40]	41 [39 to 42]

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.

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

[26] 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 Endpoint	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[27]	751	1 [1 to 1]	72 [70 to 74]
Deaths – Any cause	18 to 84	Pope et al., 2019[28]	3,574	1 [1 to 1]	22 [16 to 28]
Deaths – Cardiovascular disease	18 to 99	Alexeeff et al., 2023[29]	3,630	<1 [range <1]	6 [2 to 10]
Deaths – Ischemic heart disease	30 to 99	Jerrett et al., 2017[30]	2,800	<1 [range <1]	7 [5 to 9]
Deaths – Ischemic heart disease	30 to 99	Krewski et al., 2009[31]	2,800	<1 [range <1]	10 [9 to 12]
Deaths – Ischemic heart disease	30 to 99	Pope et al., 2019[32]	2,800	<1 [range <1]	6 [5 to 8]
Deaths – Lung Cancer	30 to 99	Krewski, et al., 2009[33]	2,800	<1 [range <1]	3 [1 to 5]
Deaths – Lung Cancer	30 to 99	Turner et al., 2016[34]	2,800	<1 [range <1]	2 [1 to 4]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Alexeeff, et al., 2023[35]	3,630	<1 [range <1]	7 [4 to 10]
Lung Cancer Diagnoses	30 to 99	Gharibvand et al., 2016[36]	2,800	<1 [range <1]	11 [3 to 18]

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.

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

Health Endpoint	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[37]	5,043	<1 [range <1]	<1 [0 to 1]
Deaths – Any cause	65 to 99	Zanobetti et al., 2014[38]	751	<1 [range <1]	7 [4 to 9]
Deaths – Cardiovascular disease	0 to 99	Liu et al., 2022[39]	5,043	<1 [range <1]	<1 [0 to 1]
Deaths – Respiratory	0 to 99	Liu et al., 2022[40]	5,043	<1 [range <1]	1 [0 to 1]
Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Sullivan et al., 2005[41]	3,630	<1 [range <1]	1 [-2 to 4]

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Hospital Admissions – Acute Non-Fatal Myocardial Infarction	18 to 99	Zanobetti et al., 2009[42]	3,630	<1 [range <1]	1 [1 to 2]
Hospital Admissions – All Respiratory	65 to 99	Zanobetti et al., 2009[43]	751	<1 [range <1]	35 [20 to 49]
Hospital Admissions – Asthma	0 to 64	Sheppard et al., 2003[44]	4,293	<1 [range <1]	2 [1 to 3]
ED Visits – Asthma	0 to 99	Mar et al., 2010[45]	5,043	1 [0 to 1]	15 [4 to 25]
ED Visits – Asthma	0 to 99	Slaughter, J. C., et al., 2005[46]	5,043	<1 [0 to 1]	8 [-7 to 21]
ED Visits – Asthma	0 to 17	Norris, G., et al., 1999[47]	1,413	<1 [range <1]	24 [12 to 35]

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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_3 exposure (seasonal and daily 8-hour maximum concentrations) in George and West Grant County, 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[48]	751	<1 [range <1]	38 [25 to 51]
Deaths – Any cause (Daily)	0 to 99	Zanobetti and Schwartz, 2008[49]	5,043	<1 [range <1]	2 [1 to 2]
ED Visits – Asthma (Daily)	0 to 99	Mar and Koenig, 2009[50]	5,043	2 [0 to 3]	34 [9 to 56]

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[50] 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.

Hospital Admissions – All Respiratory (Daily)	65 to 99	Schwartz, 1995[51]	751	1 [0 to 2]	134 [39 to 221]

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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