Air Quality and Hotspots in Montgomery County

Memorandum Report 2023-13

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Outdoor air pollution exposure has detrimental effects on environmental and human health and is associated with heart attacks, asthma attacks, bronchitis, respiratory symptoms, and premature mortality.[1] Outdoor air pollution can also contribute to acid rain and diminish the protective ozone layer in the upper atmosphere which can cause higher ultraviolet light exposure, leading to higher skin cancer rates and damaging of crops.[2]

Further, Black, Indigenous, and People of Color (BIPOC) in the United States both disproportionately and majorly[3] experience higher air pollution exposure compared to White people.[4] Racial inequities in air pollution exposure are due to historical racial discrimination which led to the siting of industrial sites, highways, truck routes, ports, and other high emission facilities located near and around BIPOC neighborhoods.[5] Due to this historical racial discrimination that targeted Black communities, Black people are 75% more likely than White people to live in communities near commercial facilities that produce emissions, noise, odor, and traffic.[6] This exposure has contributed to racial health inequities and data show there are higher rates of asthma and premature death due to air pollution exposure in BIPOC neighborhoods, especially Black communities, compared to their White counterparts.[7]

This Office of Legislative Oversight (OLO) report responds to the Council's request to better understand the quality of air in the County and whether the quality is consistent throughout the County. In particular, this report investigates the possibility of "hot spots" in the County where air quality is significantly lower than other parts of the County. This report does not focus on air quality events such as wildfires and instead focuses on identifying air quality hot spots in the County where air pollution is consistently and significantly higher than the average air quality. Most air quality data explored in this report are annual data by block group[8], which reports average daily levels of pollutants in the air.

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[1] United States Environmental Protection Agency, "Outdoor Air Quality", Accessed 10/15/23.
[2] U.S. EPA, "Outdoor Air Quality", Accessed 10/15/23.; U.S EPA, "Basic Ozone Layer Science", Accessed 10/15/23.
[3] Black people both disproportionately and majorly experience higher air pollution exposure compared to White people. This means a greater number of Black people are exposed to air pollution than White people, even though Black people make up 13.6% of the U.S population compared to White people (58.9%). See: Tessum, C., "PM2.5 Polluters Disproportionately and Systemically Affect People of Color in the United States", Science Advances, 4/28/21.
[4] U.S EPA, "Study Finds Exposure to Air Pollution Higher for People of Color Regardless of Region or Income", 11/20/21.
[5] Miranda, M., et al., "Making the Environmental Justice Grade: The Relative Burden of Air Pollution Exposure in the United States", International Journal of Environmental Research and Public Health, 5/25/11.
[6] NAACP, "Fumes Across the Fence Line", November 2017.
[7] American Lung Association, "Disparities in the Impact of Air Pollution", Accessed 11/17/2023.
[8] A block group is the smallest unit for which the U.S. Census Bureau publicly reports a full range of demographic statistics. A block group is a subdivision of a census tract with about 700 residents, on average, per block group.

Major Findings

1. Exposure to outdoor air pollution is associated with multiple negative health impacts and diseases.
2. Decades of research and data show racial inequities in the spatial distribution of air pollution, which has exacerbated racial health inequities. Research further shows race and ethnicity, independent of income, drives inequities in exposure to air pollution.
3. The Environmental Protection Agency's (EPA) 17 air monitors in Montgomery County measure ozone levels and particulate matter, two of the major air pollutants regulated by the federal Clean Air Act.
4. In Montgomery County, exposure to ozone pollution is higher than exposure to particulate matter, compared to national averages.
5. Demographic data overlayed with ozone pollution data show apparent racial inequities in the distribution of pollution in the County.
6. A review of data from 2010-2023 show the County's overall "unhealthy days" have decreased over time.

Methodology

OLO reviewed air quality data from: (1) Airnow.gov, which reports air quality using the Air Quality Index (AQI); (2) Environmental Protection Agency's (EPA) outdoor air quality data; and (3) air quality data overlayed with demographic and socioeconomic data, provided by EPA's EJScreen tool, which is an interactive map that allows users to see the intersection of environmental pollution and racial inequities in the United States. Further, OLO conducted a literature review of the following: (1) air quality and its impacts on human and environmental health and (2) racial inequities in air pollution exposure.

Scope of Memorandum

This memorandum report focuses on better understanding air quality in the County and investigating any "hot spots" of air quality, where air quality is significantly lower than other parts of the County. The report is organized as follows:

Section I presents an overview on air quality, how it is measured, and major pollutants that contribute to outdoor air pollution;

Section II provides a literature review of racial inequities in the spatial distribution of air pollution;

Section III presents County air quality data;

Section IV describes policy tools that local governments can utilize to decrease air pollution; and

Section V presents OLO's findings and discussion items.

Acknowledgements

Office of Legislative (OLO) staff member Kaitlyn Simmons conducted this study, with assistance from Marlysa D. Gamblin (Racial Equity Expert) Karen Pecoraro (OLO Staff), and Leslie Rubin (OLO Staff). OLO received a great level of cooperation from everyone involved in this study.

Section I. Overview of Air Quality Measurements and Major Pollutants

This section describes how air quality is measured using the U.S. Environmental Protection Agency's (EPA) Air Quality Index (AQI) and identifies the environmental and health impacts of major pollutants that contribute to lower air quality.

Air Quality and Impacts on Human Health. Research shows that exposure to outdoor air pollution has a detrimental effect on human health. Air pollution is classified as a human carcinogen by the World Health Organization (WHO)[9] and is estimated to cause 4.2 million premature deaths per year worldwide from stroke, heart disease, respiratory disease, and lung cancer. Further, exposure to outdoor air pollution is associated with dementia, low birthweight, and type 2 diabetes.[10] Increases in asthma cases, both in count and severity, are linked to outdoor air pollution, particularly for children exposed to ozone and particulate matter pollution.[11]

Older adults, children, and people with preexisting respiratory issues are especially susceptible to air pollution exposure. Levels of air pollution that may not be harmful to the general public could cause health effects for people in susceptible groups.[12]

Further, Black, Indigenous, and People of Color (BIPOC) in the United States are more likely to live in communities with higher exposure to air pollution[13] due to historical racial discrimination. BIPOC, especially Black people, experience higher rates of illness and death caused by air pollution, compared to their White counterparts.[14] Data from a recent study shows older Black adults are three times more likely to die of air pollution than older White adults.[15] . Further data show that approximately 13.4% of Black children are diagnosed with asthma compared to 7.3% of White children.[16] Overall, data show Black individuals experience disproportionate health disparities directly linked to air pollution exposure compared to White individuals.[17]

Measuring Air Quality. The EPA developed the Air Quality Index (AQI) to quickly communicate information on air pollution levels and associated health impacts and is one of the most common ways that air pollution is reported on a daily basis. The AQI communicates the health effects one may

[9] National Institute of Environmental Health Sciences, "Air Pollution and Your Health", Accessed 10/16/23.
[10] Ward, F., et. al., "Engaging Communities in Addressing Air Quality: A Scoping Review", Environmental Health, 11/19/22.
[11] U.S. Department of Health and Human Services, "National Toxicology Program Monograph on the Systematic Review of Traffic-Related Air Pollution and Hypertensive Disorders of Pregnancy", December 2019.; National Institute of Environmental Health Sciences, "Air Pollution and Your Health", Accessed 10/16/23.
[12] Cheeseman, M., et. al., "Disparities in Air Pollutants Across Racial, Ethnic, and Poverty Groups at US Public Schools", Geohealth, 12/1/2022.
[13] See Section II of this report for more information on racial inequities in exposure to air pollution and the historical reasons for the disproportionate racial impact of air pollution exposure.
[14] Center for Disease Control and Prevention, "Racism and Health", Accessed 11/15/2023.
[15] Environmental Defense Fund, "Analysis of PM2.5 Related Health Burdens Under Current and Alternative NAAQS", 04/15/2022.
[16] Princeton Student Climate Initiative, "Racial Disparities and Climate Change", 8/15/23.
[17] Zeger, S., et. al., "Mortality in the Medicare Population and Chronic Exposure to Fine Particulate Air Pollution in Urban Centers", Environmental Health Perspectives, 8/12/08. ; Liu, J., et. al., "Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990-2010", Environmental Health Perspectives, 12/15/21.

experience with prolonged exposure to a specific level of outdoor air pollution[18] with six color-coded categories that correspond to different levels of health concern. OLO notes the AQI does not account for the racial inequities in exposure to air pollution, nor the fact that BIPOC experience higher rates of illness and death caused by air pollution, compared to their White counterparts. This means BIPOC are more likely to be impacted by air pollution exposure at lower levels of exposure (I.e., "yellow" and "orange" days on the AQI) compared to White people. The chart below illustrates the AQI.

Daily AQI Color	Level of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable although there may be a risk for some people, particularly those who are sensitive to air pollution.
Orange	Unhealthy for Sensitive[19] Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	The general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Source: U.S. Air Quality Index

There is a separate AQI for five major air pollutants regulated by the Clean Air Act:[20]

- Ground-level Ozone;
- Particle Pollution (also known as particulate matter, including PM2.5 and PM10);
- Carbon Monoxide;
- Sulfur Dioxide; and
- Nitrogen Dioxide.

[18] AirNow.gov, "Air Quality Index Basics", Accessed 10/16/23.

[19] In this context, sensitive groups refers to anyone with pre-existing health conditions, people who work outdoors, older adults, and children. The AQI does not account for racial inequities in exposure to air pollution, nor racial inequities in health and how due to disproportionate and majorly exposure to air pollution, BIPOC are more likely to be impacted by air quality levels. Based on racial inequities in exposure to air pollution and with those who have preexisting conditions, it is reasonable to estimate BIPOC would likely be impacted differently than their White counterparts in the various "level of concern" categories the AQI currently identifies.

[20] AirNow.gov, "Using the Air Quality Index", Accessed 10/16/23.

These five pollutants can negatively impact human health and their health impacts are discussed in detail in the following sections.[21] The AQI formula is based on the health-based national ambient air quality standard for each pollutant measured. The pollutant with the highest daily levels are highlighted in the reporting, which is available through the Airnow.gov website.[22] Ground-level ozone and particulate matter are discussed in further detail below because the data in this report focus primarily on levels of local ozone and particulate matter.

Ground-level Ozone (O3). Ozone is a colorless, odorless gas made up of three oxygen molecules (oxygen that we breath is made up of two oxygen molecules). Ozone occurs in both the Earth's upper atmosphere and at ground level and can be good or bad for human health and the environment depending on where it is found. Ground-level ozone is a harmful air pollutant for both human and environmental health and is the main ingredient in smog. Ground-level ozone is created by chemical reactions when oxides of nitrogen (NOx) and volatile organic compounds (VOC) emitted by cars, power and chemical plants, refineries, and other sources that chemically react with sunlight.[23] Ozone is most likely to reach unhealthy levels on hot sunny days in urban environments, although ozone levels can be high in the winter as well. Like other air pollutants, it can be transported long distances by wind.[24]

Ground-level ozone can cause the following health effects:

- Coughing and sore throats;
- Difficulty of breath;
- Inflammation in the airways;
- Susceptibility of lung infections;
- Aggravation of lung diseases such as asthma, emphysema, and chronic bronchitis; and
- Increased frequency of asthma attacks.[25]

Long-term exposure to ozone is linked to both the development of asthma and aggravation of existing asthma. People most susceptible to ground-level ozone exposure include people with asthma, children, older adults, and people who are active and/or work outdoors.[26] BIPOC, especially Black and Latino men, are systematically overrepresented in jobs that require working outdoors,[27] such as grounds

[21] Lane, H., et. al., "Historical Redlining is Associated with Present-Day Air Pollution Disparities in U.S. Cities", Environmental Science & Technology Letters, 3/9/22.
[22] AirNow.gov, "Technical Assistance Document for the Reporting of Daily Air Quality", September 2018.
[23] United States Environmental Protection Agency, "Ground Level Ozone Basics", Accessed 10/18/23.
[24] United States Environmental Protection Agency, "Ground Level Ozone Basics", Accessed 10/18/23.
[25] United States Environmental Protection Agency, "Health Effects of Ozone Pollution", Accessed 10/18/23.
[26] Ibid.
[27] Racial job segregation is a term coined by racial equity expert Marlysa D. Gamblin and variations of the term have been used by economists to describe how different races are overrepresented or underrepresented in various occupations. This is due to the history of BIPOC, namely Black communities, being segregated into the ten lowest paying occupations post-slavery. BIPOC are disproportionately overrepresented in low paying jobs which often lack job protections due to the legacy of historical racial discrimination. In this context, it is important to note that BIPOC workers are overrepresented in jobs that require working outdoors, which furthers their exposure to air pollution and can increase racial inequities in health effects associated with air pollution. From: Bread for the World Institute, Gamblin, M. D. and King, K., "Racially Equitable Responses to Hunger During COVID-19 and Beyond", 1/19/2021.

work/maintenance, construction, and farm work.[28] Data show more than 40% of outdoor workers are either Black or Latino despite comprising about 32% of the U.S. population.[29] This contributes to further racial inequities in air pollution exposure and health inequities associated with air pollution exposure, particularly for Black and Latino communities.

Negative environmental effects of ozone exposure include harm to sensitive vegetation during the growing season and changes to water and nutrient cycles in affected ecosystems.[30]

The EPA sets standards for pollutants, including ground-level ozone, through the National Ambient Air Quality Standards (NAAQS). The current standard is .070 parts per million (ppm) and is monitored on an 8-hour interval daily.[31]

Particulate Matter (PM). Particulate matter consists of solid particles and liquid droplets that can be found in air. Particles such as dust, dirt, soot, or smoke, can be seen with the naked eye while other types of particles can only be detected via microscope.[32] Two common particulate pollutants that are monitored due to their negative impacts on humans and environmental effects are PM10, which are inhalable particles with diameters that are 10 micrometers and smaller and PM2.5 with diameters that are 2.5 micrometers and smaller.[33] Particulate pollution can be emitted directly from smokestacks, fires, and construction sites although most particles form in the atmosphere via chemical reactions (I.e., chemicals emitted from power plants, industries, and automobiles).[34]

PM2.5 and PM10, due to their microscopic nature, can get deep into lungs and bloodstream, and cause harmful health effects. PM2.5 poses the greatest risk to health. Impacts from exposure to PM10 and PM2.5 includes:

- Premature death in people with heart or lung disease;
- Heart attacks (nonfatal);
- Irregular heartbeat;
- Aggravated asthma;
- Decreased lung function; and
- Increased respiratory symptoms, such as coughing or difficulty breathing.[35]

[28] Union of Concerned Scientists, "Too Hot to Work", August 2021.
[29] Ibid.
[30] United States Environmental Protection Agency, "Ecosystem Effects of Ozone Pollution", Accessed 10/18/23.
[31] Federal Register, "Environmental Protection Agency National Ambient Air Quality Standards for Ozone", 10/26/2015.
[32] United States Environmental Protection Agency, "Particulate Matter Basics", Accessed 10/18/23.
[33] For reference, the average single human hair is about 70 micrometers in diameter, which is 30 times larger than the largest fine particle.
[34] United States Environmental Protection Agency, "Particulate Matter Basics", Accessed 10/18/23.
[35] United States Environmental Protection Agency, "Health and Environmental Effects of Particulate Matter", Accessed 10/18/23.

PM2.5 and PM10 can also cause environmental damage including:

- Acidification of lakes and streams;
- Changing the nutrient balance in coastal waters and large river basins;
- Depletion of nutrients in soil;
- Damaging sensitive forests and crops;
- Affecting the diversity of ecosystems; and
- Contributing to acid rain effects.[36]

In early 2023, the EPA proposed a decision to lower the primary annual PM2.5 standard to 9.0 to 10.0 micrograms per cubic liter (µg/m$^{3)}$, from 12.0 -15.0 µg/m^3.[37] The 24-hour standard for PM2.5 is 35 µg/m^3.[38] PM10 does not have an annual standard but has a 24-hours standard of 150 µg/m^3.

Other Pollutants. The next table describes the other three major pollutants monitored by the AQI, including source(s), health and environmental impacts, and the National Ambient Air Quality Standard (NAAQS). These pollutants are referred to as Traffic-Related Air Pollution (TRAP), which comes from emissions from motor vehicles due to fossil fuel combustion. These pollutants are a mixture of gases and particles, such as various forms of carbon and nitrogen and sulfur oxides. TRAP also includes ground-level ozone and particulate matter. TRAP contributes significantly to ambient air pollution, especially in cities and higher density areas, and has been established as a risk factor for hypertension and cardiovascular disease in adults.[39]

[36] United States Environmental Protection Agency, "Health and Environmental Effects of Particulate Matter", Accessed 10/18/23.
[37] United States Environmental Protection Agency, "National Ambient Air Quality Standards for PM", Accessed 10/18/23.
[38] Ibid.
[39] U.S. Department of Health and Human Services, "National Toxicology Program Monograph on the Systematic Review of Traffic-Related Air Pollution and Hypertensive Disorders of Pregnancy", December 2019.

Table 1. Description of Pollutants

Pollutant	Sources	Health Impacts	Environmental Impacts	National Ambient Air Quality Standard
Carbon Monoxide (CO)	Burning of fossil fuels, particularly emissions from cars, trucks, buses, and power plants	For people with some types of heart disease, exposure can result in reduced oxygen to the heart and chest pain	• CO can react with other air pollutants, forming harmful ground-level ozone (known as smog)	9 parts per million (measured on an 8-hour interval)
Sulfur Dioxide (SO2)	Burning of fossil fuels, particularly in power plants and other industrial facilities	Negatively impacts the respiratory system and cause difficulty breathing, especially for those with asthma	• Damages foliage and decreases growth of trees and plants • Contributes to acid rain	75 parts per billion (measured on an hourly basis)
Nitrogen Dioxide (NO2)	Burning of fossil fuels, particularly emissions from cars, trucks, buses, and power plants	Can irritate airways in the respiratory system and aggravate respiratory diseases like asthma	• Contributes to nutrient pollution in coastal waters • Contributes to acid rain • Causes haze/low visibility	100 parts per billion (measured on an hourly basis)

Source: U.S. EPA Air Pollutants

Section II. Racial Inequities in Air Pollution Exposure

In the United States, communities of color at every income level are exposed to higher levels of air pollution. In other words, race and ethnicity, independent of income, drives disparities in exposure to air pollution.[40] Due to historical racial discrimination, Black, Indigenous, and People of Color are more likely to live in areas with heavy pollution and more likely to die prematurely due to environmental causes.[41]

Due to a legacy of racist and discriminatory policies and land-use planning, the current spatial distribution of pollution sources, such as factories, landfills, and highways, is inequitable and are overwhelmingly located in more BIPOC neighborhoods compared to White neighborhoods.[42] This has contributed to higher levels of air pollution in BIPOC neighborhoods.[43] A National Association for the Advancement of Colored People (NAACP) report from 2012 found that of the six million Americans that live within three miles of a coal plant, 39% are people of color, 3% higher than the population of people of color in the United States population (36%). The report also found that 78% of all Black Americans live within 30 miles of a coal fired power plant.[44]

Racial inequities in exposure to air pollution have led to increased health disparities by race and ethnicity.[45] For example, exposure to poor air quality causes health problems such as asthma. Data show that approximately 13.4% of Black children are diagnosed with asthma compared to 7.3% of White children.[46] Further, studies looking at mortality rates in the Medicaid population found that those who live in predominately Black communities face higher rates of premature death from particle pollution than those who live in predominately White communities.[47] An additional study found that Asian, Black, and Latino people are susceptible to higher rates of premature death from particle pollution compared to White people, and that income did not drive these differences.[48]

[40] United States Environmental Protection Agency, "Study Finds Exposure to Air Pollution Higher for People of Color Regardless of Region or Income", 11/20/21.; Liu, J., et. al., "Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990-2010", Environmental Health Perspectives, 12/15/21.; Josey, K., et. al., "Air Pollution and Mortality at the Intersection of Race and Social Class", The New England Journal of Medicine, 4/13/23. ; Tessum, C., "PM2.5 Polluters Disproportionately and Systemically Affect People of Color in the United States", Science Advances, 4/28/21.
[41] Princeton Student Climate Initiative, "Racial Disparities and Climate Change", 8/15/23.
[42] See page 12 for a historical analysis of racial inequities in exposure to air pollution.
[43] United States Environmental Protection Agency, "Carbon Monoxide Pollution in Outdoor Air", Accessed 10/20/23.
[44] National Association for the Advancement of Colored People, "Coal Blooded: Putting Profits Before People", 2016.
[45] American Lung Association, "Disparities in the Impact of Air Pollution", 11/2/23.
[46] Princeton Student Climate Initiative, "Racial Disparities and Climate Change", 8/15/23.
[47] Zeger, S., et. al., "Mortality in the Medicare Population and Chronic Exposure to Fine Particulate Air Pollution in Urban Centers", Environmental Health Perspectives, 8/12/08.
[48] United States Environmental Protection Agency, "Study Finds Exposure to Air Pollution Higher for People of Color Regardless of Region or Income", 11/20/21.

Racial Inequities in Exposure to Air Pollution and the Racial Wealth Divide

The racial wealth divide refers to the wealth inequities across racial and ethnic groups in the U.S. The wealth divide between Black and White families is especially large – the average White family holds nearly thirteen times the wealth of the average Black family.[49] This divide was created and reinforced by historical policies that were racially discriminatory and blocked generations of Black families from building wealth, including racial segregation laws, redlining, and the racially discriminatory implementation of the New Deal.[50]

Air pollution exposure can further exacerbate the racial wealth divide. BIPOC, especially Black individuals, experience higher rates of respiratory diseases and illnesses from air pollution exposure compared to their White counterparts, and this furthers the disproportionate economic burden for racial health inequities.[51] There are higher rates of medical debt for Black individuals (56% of Black adults) compared to White individuals (37% of White Adults).[52] This medical debt can impact the ability of Black individuals to build wealth. Further, research shows wealth is consistently correlated with health outcomes. Net worth and assets such as savings, stocks, or homeownership, are found to be positively correlated with better health outcomes while debts, including medical debt, are found to be negatively correlated with worse health outcomes.[53] Overall, the disproportionate economic burden for racial health inequities is exacerbated by disproportionate exposure to air pollution and leads to both worse health outcomes and the widening of the racial wealth divide.

Historical Analysis of Racial Inequities in Exposure. Research has shown that past federal, state, and local government decisions have led to racial inequities in air pollution exposure today. Decisions and policies have shaped the current and inequitable spatial distribution of pollution sources and the location of communities, which has led to BIPOC experiencing disproportionate amounts of air pollution compared to White people. In particular:

Redlining was an explicitly racist policy that denied entire neighborhoods access to home loans in the United States based on the presence of Black and immigrant people living in communities[54], even if the

[49] Bread for the World Institute, Gamblin, M. D., "Racial Wealth Gap Learning Simulation", Accessed 11/15/2023.
[50] Ibid.
[51] JAMA Network, LaVeist, T. A., et. al., "The Economic Burden of Racial, Ethnic, and Educational Health Inequities in the US", 05/16/2023.
[52] NPR, "Why Black Americans are more likely to be saddled with medical debt", 10/2/2022.
[53] J Health Soc Behav, Boen, C. E., Keister, L. A., and Aronson, B., "Beyond Net Worth: Racial Differences in Wealth Portfolios and Black-White Health Inequality across the Life Course", 05/23/2020.
[54] Redlining policy explicitly targeted Black residents, but also impacted other communities of color, including communities of color who immigrated to the U.S.

residents would personally qualify for loans.[55] Beginning in the 1930s, redlining led to significantly lower home ownership by BIPOC residents, which continues to this day.[56]

Redlining resulted in racially discriminatory investment pattens, which subsequently shaped government land use decision-making and urban development.[57] Data from a 2010 study showed that Black Americans were about twice as likely to live in areas where PM2.5 concentrations exceeded the 90th percentile nationwide, compared to White and Latino Americans.[58] A recent study shows that historical redlining is associated with present-day air pollution disparities in U.S. cities, lack of greenspace, fewer tree canopies, urban-heat exposure disparities, and increased health effects including asthma, cancer, and adverse birth outcomes.[59] The same study also found that redlining is associated with substantial air pollution disparities for NO2 and PM2.5.

The design of the Federal Highway system also contributed to higher levels of air pollution in communities of color, especially Black communities. Historical studies show all levels of government deliberately targeted predominantly Black neighborhoods in the construction of interstate highways during the 1960s, resulting in the destruction of communities and displacement of its residents.[60] According to the U.S. Transportation Department, more than 475,000 households in predominantly Black neighborhoods were displaced by construction of the federal highway system, with some highways built right through city centers in majority Black neighborhoods.[61]

These decisions have led to current racial inequities, as a higher concentration of Black communities, as well as other BIPOC households, live near interstates and other major roadways compared to White people.[62] Traffic-related air pollution (TRAP) is a main pollution source leading to unhealthy outdoor air quality, especially in urban areas with high traffic volume. Traffic is a major source of local fluctuation in air pollution, with generally higher concentrations and risk of exposure near busy roads and highways. This proximity has led to disproportionately higher adverse health effects among BIPOC residents, such as higher levels of asthma, cardiovascular disease, and death.[63] Studies also show a casual association between exposure to TRAP and asthma severity and evidence of causing childhood asthma and cardiovascular mortality.[64]

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[55] Lane, H., et. al., "Historical Redlining is Associated with Present-Day Air Pollution Disparities in U.S. Cities", Environmental Science & Technology Letters, 3/9/22.
[56] American Lung Association, "Air Pollution and Health Equity: A Closer Look at How Redlining and E-Commerce Affect the Air We Breathe", 6/14/22.
[57] Ibid.
[58] Columbia University Irving Medical Center, "Racial Disparities in Air Pollution Where Most Americans Live Worse Than Previously Understood", 7/7/22.
[59] Lane, H., et. al., "Historical Redlining is Associated with Present-Day Air Pollution Disparities in U.S. Cities", Environmental Science & Technology Letters, 3/9/22.
[60] Mahajan, A., "Highways and Segregation", Journal of Urban Economics, 6/26/23.
[61] U.S. Department of Transportation, "Beyond Traffic 2045", 2017. ; Washington Post, "Interstate Highways Were Touted as Modern Marvels. Racial Injustice was Part of the Plan.", 8/17/21.
[62] U.S. Department of Transportation, "Beyond Traffic 2045", 2017.
[63] Boehmer, T., et. al., "Residential Proximity to Major Highways - United States", National Center for Environmental Health, 11/22/13.
[64] Ibid.

Land use and zoning decisions across the United States have led to disproportionate exposure of BIPOC households to environmental hazards that still persist today, such as proximity to factories and other pollutants.[65] Zoning laws, which determine how land can be used in an area, date back to the nineteenth century and studies show these laws were often used to enforce segregation or the exclusion of people of color. In 1917, explicit racial zoning, which kept people of color out of particular parts of cities deemed "more valuable and whiter," was deemed unconstitutional.[66] However, after 1917, city planners continued to use zoning to segregate people via indirect methods, such as changing an area's zoning designation from residential to industrial or commercial in majority BIPOC neighborhoods.[67] These practices had far reaching impacts on BIPOC communities, impacting things like access to schools, transportation, jobs, and healthcare and proximity to pollutants.[68]

[65] Pacific Standard, "How to Use Zoning Laws to Reduce Pollution in Low-Income Communities", 5/20/19.
[66] Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019. ; White House Council of Economic Advisors, "Exclusionary Zoning: Its Effect on Racial Discrimination in the Housing Market", 6/17/21.
[67] White House Council of Economic Advisors, "Exclusionary Zoning: Its Effect on Racial Discrimination in the Housing Market", 6/17/21.; Washington Post, "'Snob zoning' is racial housing segregation by another name", 9/25/17.
[68] Economic Policy Institute, "The Color of Law: A Forgotten History of How Our Government Segregated America", 2017.

Section III. County Data of Air Pollution

This section summarizes several types of air quality data. The two primary groups of data measure Environmental Protection Agency (EPA) air quality data on ozone and particulate matter 2.5 pollution ("PM2.5," inhalable particles 2.5 micrometers or smaller).[69] Also included in the data on Ozone and PM2.5 are EPA Environmental Justice (EJ) Index data, a combination of environmental and socioeconomic data that highlights areas where BIPOC and low-income residents may be disproportionately impacted by pollution. The section also summarizes other EPA air quality data and air quality data from the National Lung Association. Note that the data in this section are approximations and cannot precisely measure local exposure to all types of air pollution that pose risks to human health and the environment.

Overview of EPA's EJScreen Data and Limitations. The sections on ozone and PM2.5 include data from the EPA's EJScreen website. EJScreen is a GIS tool for mapping national environmental justice concerns and the EPA designed it as a starting point for considerations of environmental justice. It combines national environmental and socioeconomic data to highlight areas where BIPOC and low-income populations may be disproportionately impacted by pollution. The data may help reveal patterns and show areas that should be considered for further study for racial inequities in distribution of and exposure to air pollution and the drivers of inequities.

This report includes two types of data from EJScreen. The first type of data summarize the absolute levels of ozone and PM2.5 measured in the County by block group. The second type of data – called the Environmental Justice (EJ) Index – combines environmental and demographic data to identify areas that may have higher pollution burdens *and* BIPOC and low-income populations present.[70]

The EJ index for ozone pollution is a combination of the following in a specific block group:

- The pollution indicator;
- BIPOC population; and
- Low-income population;

Both types of data are presented in percentiles by County block group and there are 663 block groups in the County. The percentiles show the percent of the U.S. population with less potential for exposure/proximity to certain pollutants. For example, a block group in the 80th percentile for a pollutant means that 80% of block groups in the U.S., on average, are exposed to lower levels of the pollutant and only 20% of block groups in the U.S., on average, are exposed to higher levels of that pollutant.[71] The EPA identifies any block group that is at or above the 80th percentile for any indicator (e.g., ozone pollution) as a candidate for further review.

[69] Detailed data on other pollutants also regulated by the Clean Air Act, such as nitrogen and sulfur dioxide, are not available.
[70] OLO notes that while the EPA uses low-income populations in their EJ index, research shows race and ethnicity, independent of income, drives disparities in exposure to air pollution.
[71] United States Environmental Protection Agency, "How to Interpret EJScreen Data", Accessed 10/21/2023.

EJScreen is annually updated with environmental and demographics data and uses the highest resolution data available for the analysis EJScreen provides.[72]

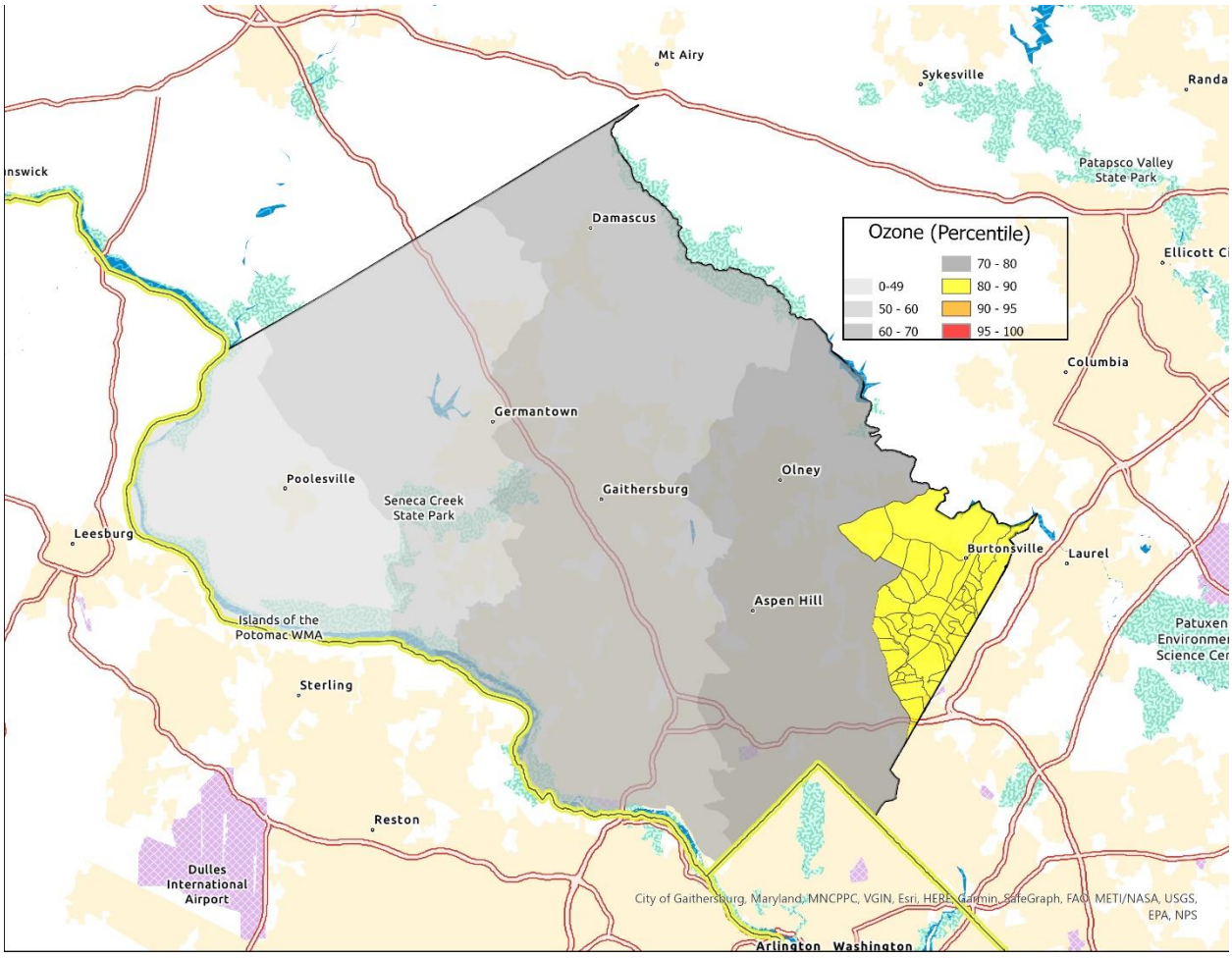
Data limitations include:

- Data for indicators are collected from various years (data in this report are from 2019);
- Census data has limitations and may obscure small communities; and
- EPA cautions that EJScreen is not a designation tool and should not be used to label "EJ communities;" rather, it can be used as a starting point for identifying EJ communities.

A. Ozone

The data in this map show the comparison of annual average ozone level in the County in 2019 compared to the U.S. average.

Map 1. Ozone Percentiles in Montgomery County



Source: OLO Analysis of EPA EJScreen Data

[72] United States Environmental Protection Agency, "Updates to EPA's Environmental Justice Screening Tool", Accessed 10/22/2023.

Air Quality and Hotspots in Montgomery County

In the County, 51.7% of block groups are at or above the 70th national percentile range for ozone exposure. Overall, the western and upcounty area has lower ozone levels compared to the east downcounty area. In particular, areas north of Silver Spring and Burtonsville have the highest ozone levels, in the 80th - 90th national percentile range. The next table shows the distribution of block groups in each percentile range. It presents a count and overall percentage of block groups in the County within each group.

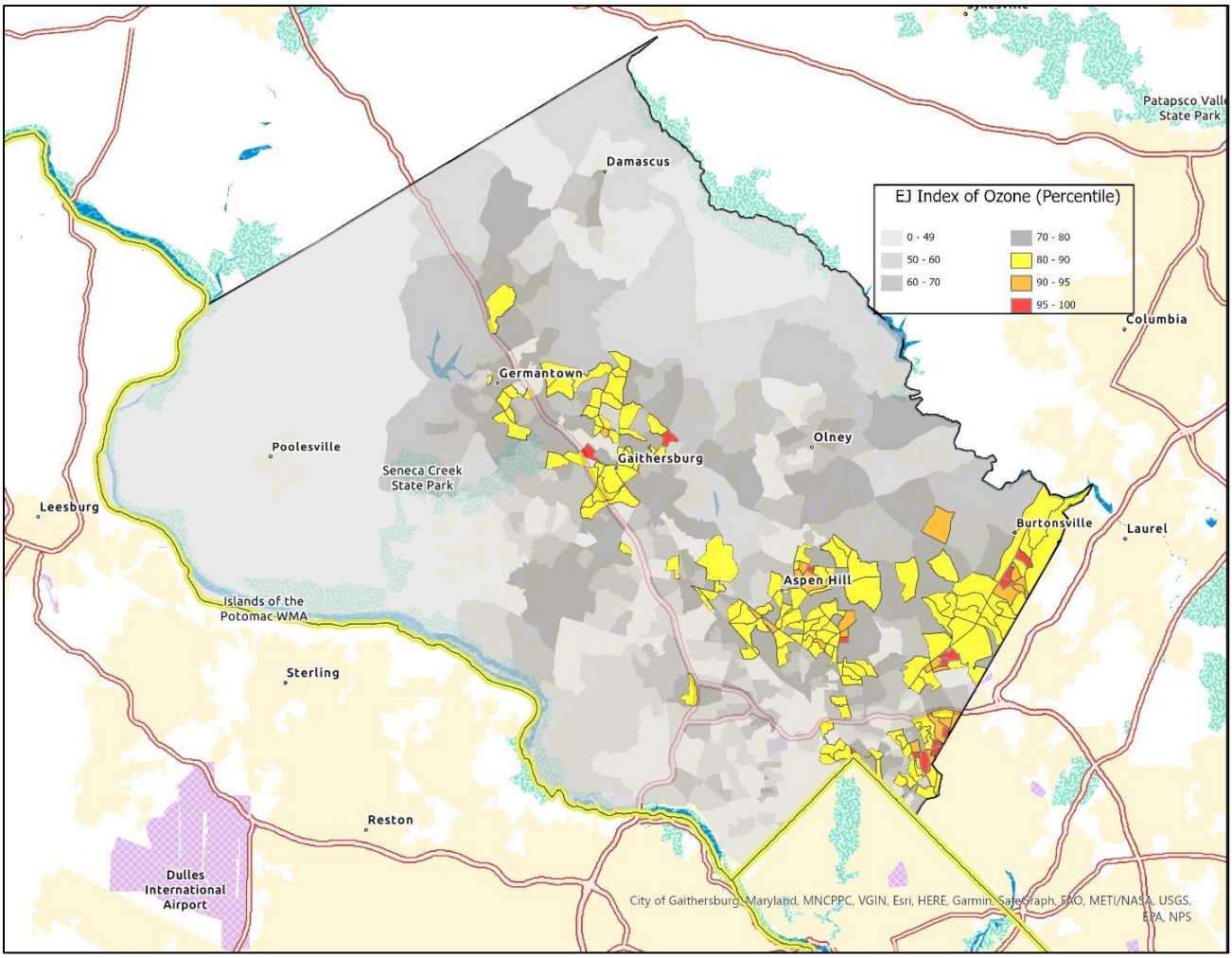
Table 2. County Distribution of Percentile Categories for Ozone

National Percentile Range	# of Block Groups	# of Block Groups
0 – 49th Percentile	3	0.5%
50 – 60th Percentile	45	6.8%
60 – 70th Percentile	272	41%
70 – 80th Percentile	295	44.5%
80 – 90th Percentile	48	7.2%
90 – 95th Percentile	0	--
95 – 100th Percentile	0	--

The data in the next map are from the EPA's EJ Index – and can show racial inequities in who is experiencing more air pollution in the County. The map shows the EJ index, which is the product of the environmental indicator (in this case ozone pollution) and the demographic index.

The data show that 173 block groups (26.1%) in the County are at or above the 80th national percentile of ozone pollution on the EJ index. The areas that are above the 80th national percentile are mostly concentrated in the eastern part of the County and along the Interstate 270 corridor.

Map 2. Ozone Percentiles In Montgomery County (With EJ Index)



Source: OLO Analysis of EPA EJScreen Data

The data in the next table show the number of County block groups in each percentile range on the EJ Index.

Table 3. County Distribution of Percentile Categories for Ozone (EJ Index)

Percentile Range	# of Block Groups	% of Block Groups
0 – 49th Percentile	119	17.9%
50 – 60th Percentile	100	15.1%
60 – 70th Percentile	124	18.7%
70 – 80th Percentile	147	22.2%
80 – 90th Percentile	136	20.5%
90 – 95th Percentile	22	3.3%
95 – 100th Percentile	15	2.3%

Air Quality and Hotspots in Montgomery County

The block group in the highest percentile in the County on the EJ Index is the 98th national percentile and is located in White Oak. Only 2% of block groups, on average, in the U.S. fare worse on the EJ Index. The data below show summary statistics for the residents who live in this block group (240317015094). The data in the following table summarize the number and percentage of block groups in each percentile range.

- **Per Capita Income** - $15,631
- **Number of Households** – 797
- **Low income** – 75%
- **People of color** – 98%
  - **Asian** – 5%
  - **Black** – 55%
  - **Latino** – 38%

County Block Groups with Highest Ozone Pollutions. The data in the next table summarize data from EJScreen for the 15 block groups in the County with the highest ozone pollution on the EJ index.[73] All 15 block groups are in the 95th to 100th percentile for ozone pollution on the EJ index. However, OLO notes that 173 block groups in the County are at or above the 80th percentile on the EJ index for ozone pollution – the threshold above which EPA recommends further review of racial and socioeconomic inequities in exposure to ozone and air pollution in general.

The data show that racial inequities of air pollution exposure in the County reflect national racial inequities. Residents in these block groups are overwhelmingly BIPOC. The trend persists for block groups where fewer than half the residents are identified as low-income. This aligns with national research showing the main determinant for higher exposure to air pollution is race and ethnicity.

Table 4. Top 15 Block Groups in the County for Highest Ozone Pollution (EJ Index)

Block Group	Area	EJ Index (Percentile)	# of House holds	Low Income	Non-White*	Asian	Black	Latino	Other	Two or More	White
7015094	White Oak	98th %ile	797	75%	99%	5%	55%	38%	0%	0%	1%
7026022	Silver Spring	97th %ile	406	77%	97%	22%	61%	10%	0%	5%	3%
7020001	Silver Spring	97th %ile	544	68%	100%	2%	39%	59%	0%	0%	0%
7016022	Silver Spring	97th %ile	688	65%	100%	1%	13%	86%	0%	0%	0%
7032072	Wheaton	97th %ile	444	71%	100%	6%	11%	83%	0%	0%	0%
7014221	Fairland	96th %ile	1,103	51%	97%	5%	73%	14%	1%	4%	3%
7032142	Aspen Hill	95th %ile	565	63%	96%	2%	33%	48%	11%	2%	4%
7014232	Fairland	95th %ile	811	41%	95%	10%	74%	10%	0%	0%	5%
7014261	Fairland	95th %ile	629	40%	95%	6%	62%	26%	0%	2%	5%
7007233	Gaithersburg	95th %ile	41	81%	100%	0%	81%	19%	0%	0%	0%
7007104	Redland	95th %ile	288	76%	98%	8%	3%	85%	0%	0%	2%

[73] Block group numbers generally start with a state and county FIPs code. For the table, the FIPS code is dropped. For Montgomery County, it starts with 24031

7019001	Silver Spring	95th %ile	378	69%	82%	6%	7%	69%	0%	0%	18%
7020003	Silver Spring	95th %ile	733	58%	92%	4%	13%	71%	0%	5%	8%
7021013	Silver Spring	95th %ile	417	55%	97%	2%	14%	79%	0%	3%	3%
7015083	White Oak	95th %ile	836	52%	94%	5%	75%	7%	2%	6%	6%

Source: 2019 Census Data obtained from EPA EJScreen
*The census data for the nonwhite category do not always add up due to missing data. The Census Bureau calculated the data by subtracting the % of reported White residents from 100%.

County Specific Inequities. The Montgomery County Planning Department developed a tool to identify "Equity Focus Areas" in the County to examine and assess potential racial and social inequities. The tool identified 56 census tracts in the County as Equity Focus Areas by analyzing three variables – household income, race and ethnicity, and the ability to speak English – "to identify areas of the county that may experience the highest inequities in access to transportation, job opportunities and other resources supporting a high quality of life."[74]

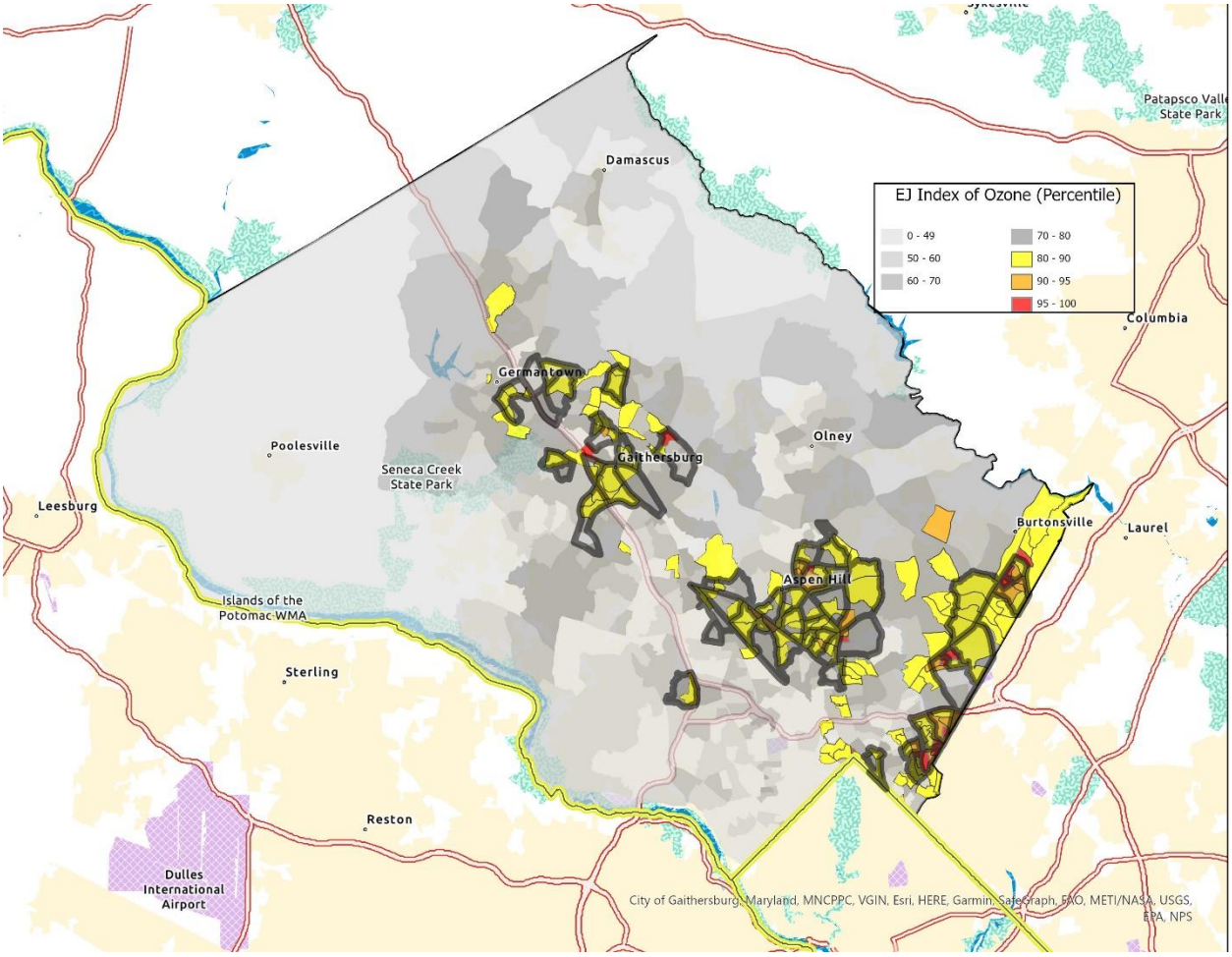
OLO overlaid the equity focus areas with County data on ozone pollution to analyze the overlap of areas in the County with higher pollution compared to the equity focus areas. OLO obtained ozone data shown in the next map from the EPA's EJ Index.

The areas outlined in dark gray on the next map show the Planning Department's equity focus areas. The data show that more than half of County block groups with ozone pollution at or above the 80th national percentile are contained within the census tracts identified as Equity Focus Areas.

Noticeably, several block groups around and west of Burtonsville are in the 90th to 95th national percentile category on the EJ Index but are not located in Equity Focus Areas.

[74] Montgomery Planning, "The Equity Focus Areas Analysis", Accessed 10/21/23.

Map 3. County Equity Focus Areas and Ozone Pollution Exposure by Block Group



Source: OLO Analysis of EPA EJScreen Data and Montgomery County Planning Data

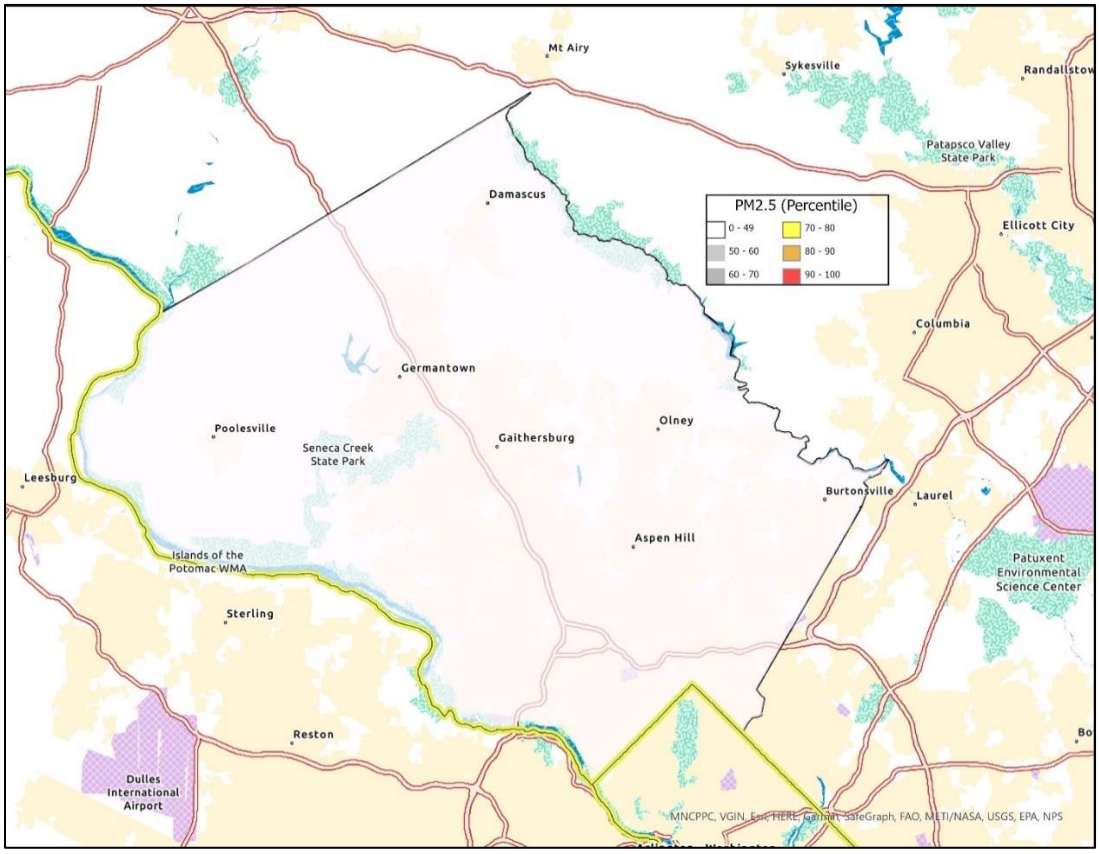
The Planning Department is also undertaking a project to develop publicly available maps to show historical racial restrictive covenant areas in the County. Racial restrictive covenants are private contractual agreements that prohibit the sale, rent, lease, or occupation of property to particular groups of people and primarily targeted BIPOC individuals. The U.S. Supreme Court ruled that racially restrictive covenants were unconstitutional in 1948, however enforcement of covenants continued across the U.S. Congress officially outlawed use of racially restrictive covenants in the 1968 Fair Housing Act. Impacts, nonetheless, are still seen today in details such as majority White neighborhoods having more parks and tree coverage and communities of color having more environmental hazards such as landfills and highways.[75]

[75] Mapping Segregation Project - Montgomery Planning

B. Particulate Matter

Particulate Matter 2.5 pollution levels are lower in the County compared to ozone levels. PM2.5 levels in the County are all below the 50th percentile of PM2.5 pollution nationwide. The median percentile for PM2.5 in the County overall is in the 40th percentile. The following map and table show these data.

Map 4. Percentiles for Particulate Matter 2.5 in Montgomery County



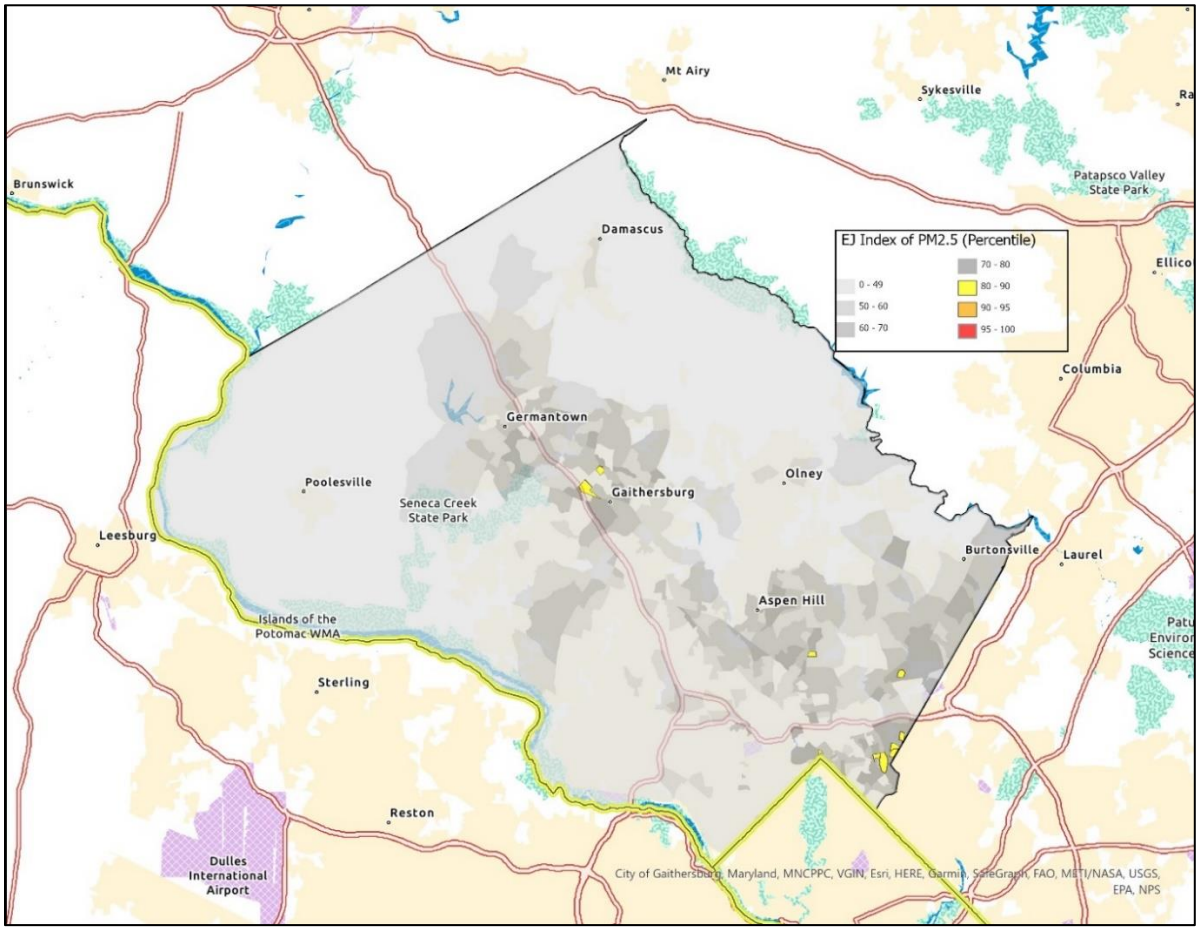
Source: OLO Analysis of EPA EJ Screen Data

Table 5. County Distribution of Percentile Categories for PM2.5

National Percentile Range	# of Block Groups	% of Block Groups
0 – 49th Percentile	663 (100%)	100%
50 – 60th Percentile	0	
60 – 70th Percentile	0	
70 – 80th Percentile	0	
80 – 90th Percentile	0	
90 – 95th Percentile	0	
95 – 100th Percentile	0	

The next map shows PM2.5 pollution on the EJ index. There is less severe PM2.5 pollution in the County compared to Ozone pollution. Ten block groups in the County, primarily in the Gaithersburg and Silver Spring area, are in the 80th – 90th percentile range nationally.

Map 5. EJ Index of Particulate Matter 2.5.



Source: OLO Analysis of EPA EJ Screen Data

Table 6. County Distribution of Percentile Categories for PM2.5 (EJ Index)

Percentile Range	# of Block Groups	% of Block Groups
0 – 49th Percentile	290	43.7%
50 – 60th Percentile	148	22.3%
60 – 70th Percentile	144	21.7%
70 – 80th Percentile	71	10.7%
80 – 90th Percentile	10	1.6%
90 – 95th Percentile	0	--
95 – 100th Percentile	0	--

I. EPA Outdoor Air Quality Data

The EPA's air quality monitoring network was primarily designed to measure specific pollutants or sources for regional, not local, air quality.[76] Data from air monitoring sites are not necessarily representative of the air quality for an entire county or urban area. Further, air quality is dependent on weather and pollution from multiple sources, which creates inherent difficulties when analyzing air quality monitoring data.[77] The EPA has monitors around the country that collect data on air quality with 17 monitors currently in Montgomery County.[78]

The next table summarizes data on the amount of "unhealthy days" in the County from 2010 to 2023 from the EPA's air quality index (AQI). Unhealthy days are classified as days at or above the orange level on the AQI for any pollutant, such as ozone or particulate matter. The data show only a few days classified as unhealthy for those with asthma or other lung diseases for the majority of years in this period.[79] Note the EPA will not finalize 2023 data until May 2024 and should not be analyzed as complete data.

[76] Georgetown Climate Center, "Issue Brief: How Community-Based Air Quality Monitoring Can Make Climate Policy More Equitable", 6/1/2023.
[77] Georgetown Climate Center, "Issue Brief: How Community-Based Air Quality Monitoring Can Make Climate Policy More Equitable", 6/1/2023.
[78] 4 of the 17 monitors collect data on ozone and 7 of the 17 monitors collect data on PM2.5. The other monitors collect data such as wind speed, temperature, and barometric pressure.
[79] AirNow.gov, "AirCompare Basic Info", Accessed 10/21/2023.

Table 7. County Annual Air Quality Index (AQI) Data (2010-2023)

		# of Days							
Year	# Days Monitored	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Hazardous	Max AQI	AQI Median
2023	179	145	29	**2**	**3**	0	0	161	42
2022	355	293	61	**1**	0	0	0	119	40
2021	361	296	62	**3**	0	0	0	119	39
2020	355	333	22	0	0	0	0	77	33
2019	361	313	48	0	0	0	0	86	39
2018	347	265	81	**1**	0	0	0	112	42
2017	359	305	52	**2**	0	0	0	105	38
2016	345	279	66	0	0	0	0	100	38
2015	345	229	111	**5**	0	0	0	143	45
2014	355	261	94	0	0	0	0	90	42
2013	354	275	78	**1**	0	0	0	105	40
2012	360	216	137	**6**	**1**	0	0	154	45
2011	335	195	126	**13**	**1**	0	0	156	47
2010	362	208	130	**24**	0	0	0	136	47

Source: EPA Outdoor Air Quality Data[80]

In 2010, 24 days were classified as unhealthy for sensitive groups, the highest number among the years reported. Since 2010, the annual count of "unhealthy" days (both for sensitive[81] groups and the general public) did not go above 14 days and has generally decreased over time. In the data shown, before 2023 "red" days last occurred in 2011 and 2012. However, 2023 has had three "red" days due to smoke from wildfires in Canada. During a red day, everyone may begin to experience health effects from outdoor air quality, with members of sensitive groups experiencing more serious health effects.[82]

[80] United States Environmental Protection Agency, "Air Data: Air Quality Data Collected at Outdoor Monitors Across the US", Accessed 10/21/2023.

[81] In this context, sensitive groups refers to anyone with pre-existing health conditions, people who work outdoors, older adults, and children. The AQI does not account for racial inequities in exposure to air pollution, nor racial inequities in health and how due to disproportionate exposure to air pollution, BIPOC are more likely to be impacted by air quality levels.

[82] United States Environmental Protection Agency, "About Air Data Reports", Accessed 10/21/2023.

II. Data from The National Lung Association

The National Lung Association has analyzed and presented national air quality data since 1999, known as the "State of the Air." The report investigates ozone and particle pollution data, obtained from the EPA's Air Quality System (AQS), and calculates the average annual pollution concentration for each. Scores range from "A" to "F" and are taken from the average monitoring data for a three-year period. From 2019–2021, Montgomery County received a "C" for ozone levels and an "A" for average particle pollution levels in a 24-hour period.

During the 2019-2021 monitoring period, the County had three orange days on the Air Quality Index (AQI) and no days above the orange level on the AQI.[83] At the orange level, members of sensitive groups may experience health effects from exposure to outdoor air pollution, however the general public is less likely to be affected.[84]

[83] See page 5 for a chart of the Air Quality Index (AQI) and an explanation of how it's calculated.
[84] American Lung Association, "Report Card: Maryland - State of the Air", Accessed 10/22/2023

Section IV. Local Solutions for Air Quality

While air pollution can travel across jurisdictions and vary dramatically based on events such as wildfires, there are many ways for local government to improve air quality through land-use, zoning, and planning. Local governments especially are primed to center environmental justice because they can directly address racial inequities in the siting of pollution burdens, such as landfills and factories.[85]

This section provides examples of state and local legislation approaches to improving air quality, especially policies centering environmental justice.

Environmental Justice

The environmental justice movement began in the 1980s in response to racially discriminatory environmental practices that included toxic dumping and waste facility siting in predominantly BIPOC communities.[86] Environmental justice seeks to correct racial inequities in the distribution of environmental hazards that disproportionately burden Black, Indigenous, and People of color (BIPOC) communities.[87] In sum, environmental justice stands for the fair treatment and meaningful involvement of all people, regardless of race, national origin, or income. Everyone has the right to the same environmental protections and benefits and meaningful involvement in the development, implementation, and enforcement of environmental laws.[88]

State legislation. In the United States, each state has authority to develop and implement its own environmental regulations. Most federal statutes allow states to set environmental standards that are more stringent than federal requirements and some state governments have adopted additional environmental laws.[89] Overall, state governments are in a position to develop pollution standards, reviews, and laws to improve state and local air quality problems and center environmental justice. Examples include:

- The state of California adopted the Global Warming Solutions Act in 2006, implementing a suite of policies to reduce in-state greenhouse gas emissions and develop low carbon solutions that can be deployed elsewhere. The Act intends to improve local air quality problems and includes several provisions to address environmental justice concerns, including an environmental justice (EJ) advisory committee with seats for community advocates and a requirement to hold policy planning workshops in communities with populations of BIPOC and low-income residents.[90]

[85] Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019.
[86] Congressional Black Caucus Foundation, "History » Environmental Justice", Accessed 11/17/2023.
[87] Journal of the American Planning Association, Brinkley, C. and Wagner J., "Who Is Planning for Environmental Justice—and How?", 11/21/2022.
[88] Environmental Impact Assessment Review, Ulibarri, N., Figueroa, O. P., and Grant, A., "Barriers and opportunities to incorporating environmental justice in the National Environmental Policy Act", 11/2022.
[89] United States Environmental Protection Agency, "Other Regulators: Response to Environmental Compliance Violations at Federal Facilities", Accessed 10/22/2023.
[90] Brookings Economic Studies, "Climate Policy, Environmental Justice, and Local Air Pollution", October 2020.

- In 2020, the state of New Jersey passed the Environmental Justice Law which is "an act concerning the disproportionate environmental and public health impacts of pollution on overburdened communities."[91] The law requires the state's Department of Environmental Protection (NJDEP) to reject applications for development permits (including gas-fired power plants, sewage plants, and recycling facilities) if the project has potential to have a disproportionate negative impact on "overburdened communities" (defined as communities that are majority low-income and/or predominantly BIPOC). Further, developers must include residents of affected communities in decision making and must consider issues such as the cumulative impacts of multiple sources of pollution and water quality issues. Permit applicants are also required to prepare an environmental justice impact statement and host a public hearing on their plan.[92]

Maryland Enviromental Justice Laws. The Maryland General Assembly recently passed three bills intended to strengthen environmental justice efforts within the state:

- **HB1200 Environmental Justice Screening**, effective October 2022, requires applicants for permits that require public notice to develop an EJ Score via the Maryland EJ Tool. The Maryland Department of the Environment (MDE) will review the EJ Score for all applicants.
- **SB0528 Climate Solutions Now Act of 2022** included a requirement that MDE consult with the Commission on Environmental Justice and Sustainable Communities (CEJSC) "to adopt a methodology for identifying communities disproportionately affected by climate impacts and develop specific strategies to address geographical impact concerns," including reducing greenhouse gas emissions and building climate equity in disproportionately impacted communities.
- **SB0090 Supplemental Environmental Projects Database** requires MDE to maintain a database of potential environmental projects to be considered as part of settlements or enforcement actions for violations of environmental regulations and will solicit input from "communities in the State that are overburdened, underserved, or otherwise disadvantaged by environmental stressors. Projects in the same geographic area as alleged environmental regulations violations will be prioritized.[93]

Local legislation. Local governments have a large influence over land use and planning and can develop policies to improve air quality at the local level and more equitably distribute pollution burdens in the community.[94] Policy tools include:

[91] New Jersey Code, C.13:1D-157.
[92] New Jersey Monitor, "New 'environmental justice' rules now in place to protect pollution-choked communities", 4/17/2023.
[93] Maryland Department of the Environment, "EJ Maryland Legislation", Accessed 10/23/2023.
[94] National Association of Counties, "Air Quality Improvement: Guide for Local Governments", July 2007.

- Bans on specific types of polluting facilities often sited in communities that have historically borne the brunt of pollution (e.g., in 2018, the City of Baltimore banned new or expanded crude oil terminals in the city);[95]
- Broad environmental justice policies that incorporate environmental justice goals and considerations into a range of municipal activities, such as public health initiatives;
- Environmental justice review processes applied to new developments;
- Targeted land use measures that address existing sources of pollution, and
- Enhanced public health codes that reach both existing and new sources of pollution that impact public health.[96]

Local governments have also used proactive land use and planning approaches that emphasize environmental justice. Examples include:

- Master plans that center environmental justice in land use planning and development;
- Addressing existing land uses through mechanisms such as use restrictions, phase outs of incompatible uses like industrial zoning near residential areas, and targeted investments in "green" infrastructure in BIPOC neighborhoods with higher rates of exposure to pollution; and
- Urban planning that prioritizes walking and biking infrastructure and public transportation to lower emissions from vehicles in residential areas.[97]

For all local policies centering environmental justice, it is essential to develop strong mechanisms for sustained and consistent public engagement in the development of legislation and subsequent actions. The communities most impacted by environmental burdens should drive solutions and resources should be focused on these communities.[98]

Federal Funding for Local and State Projects. Several federal programs help fund state and local level projects to improve environmental resilience and air quality. For example, through the Inflation Reduction Act (IRA), Congress recently authorized the Environmental and Climate Justice Block Grant and the Neighborhood Access and Equity Grant Program to support environmental justice projects, such as community-led air pollution monitoring.[99]

[95] Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019.
[96] National Equity Atlas, "Air Pollution: Healthy Neighborhoods are Free of Pollution and Toxins that Undermine Safety, Health, and Well-being", 2020. ; Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019.
[97] Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019.
[98] Natural Resources Defense Council, "Local Policies for Environmental Justice: A National Scan", 02/2019.; WasteDive, "Community engagement is critical to environmental justice progress: NERC Conference", 10/21/2021.; RAND Corporation, "What Does Environmental Justice Look Like?", Accessed 10/23/2023.
[99] United States Environmental Protection Agency, "Advancing Environmental Justice", Accessed 10/23/2023.

V. Findings and Discussion Items

This section presents OLO's findings and discussion items for Council consideration.

Findings

Finding #1. Exposure to outdoor air pollution is associated with multiple negative health impacts and diseases.

Exposure to outdoor air pollution has a detrimental effect on human health and air pollution is classified as a human carcinogen by the World Health Organization (WHO). Outdoor air pollution is estimated to cause 4.2 million premature deaths per year as result of stroke, heart disease, respiratory disease, and lung cancer. Further, exposure to outdoor air pollution is associated with dementia, low birthweight, and type 2 diabetes. Increases in asthma cases, both in count and severity, are linked to outdoor air pollution, particularly for children exposed to ozone and particulate matter pollution.

Older adults, children, and people with respiratory issues are especially susceptible to air pollution exposure. Levels of air pollution that may not be harmful to the general public could cause health effects for those in these groups.

Finding #2. Decades of research show there are racial inequities in the spatial distribution of air pollution, which has exacerbated racial health inequities. Research further shows race and ethnicity, independent of income, drives inequities in exposure to air pollution.

Due to a legacy of racist and discriminatory policies and land-use planning, such as redlining and the deliberate siting of pollution sources (which includes factories, landfills, and highways) near and in BIPOC neighborhoods, there are significant racial inequities in exposure to air pollution.

In the United States, communities of color are exposed to higher levels of air pollution at every income level. In other words, race and ethnicity, independent of income, drives inequities in exposure to air pollution. Black, Indigenous, and People of Color are more likely to live in areas with heavy pollution and more likely to die prematurely due to environmental causes.

Racial inequities in exposure to air pollution has also increased health inequities by race and ethnicity. Exposure to poor air quality can cause health problems such as asthma, and approximately 13.4% of Black children have asthma compared to 7.3% of White children. Further, studies looking at mortality rates in the Medicaid population found that those who live in predominately Black communities face higher rates of premature death from particle pollution than those who live in predominately White communities. Another study found that Asian, Black, and Latino people had a higher risk of premature death from particle pollution compared to White people, and that income did not drive these differences.

Finding #3. The Environmental Protection Agency's (EPA) 17 air monitors in Montgomery County measure ozone levels and particulate matter, two of the major air pollutants regulated by the federal Clean Air Act.

Ozone is a colorless, odorless gas made up of three oxygen molecules. Ground-level ozone is a harmful air pollutant for both human and environmental health and is the main ingredient in smog. Ground-level ozone is created by chemical reactions when oxides of nitrogen (NOx) and volatile organic compounds (VOC) emitted by cars, power and chemical plants, refineries, and other sources chemically react with sunlight.

Particulate matter consists of solid particles or liquid droplets that can be found in air. Particulate pollution can be emitted directly from smokestacks, fires, and construction sites although most particles form in the atmosphere via chemical reactions (I.e., chemicals emitted from power plants, industries, and automobiles). The data on particulate matter in this report is called "particulate matter 2.5 pollution" or PM2.5 and consist of particles with diameters that are 2.5 micrometers and smaller.[100]

Finding #4. In Montgomery County, ozone pollution is higher than particulate matter pollution, compared to national averages.

EPA data on ozone and PM2.5 are presented in percentiles by County block group[101] (there are 663 block groups in the County). The percentiles show the percent of the U.S. population with less potential for exposure/proximity to certain pollutants. For example, a block group in the 80th percentile for a pollutant means that 80% of block groups in the U.S., on average, are exposed to lower levels of the pollutant and only 20% of block groups, on average, are exposed to higher levels of that pollutant. The EPA identifies any block group that is at or above the 80th percentile for any indicator (e.g., ozone pollution) as a candidate for further review.

EPA data from 2019 show that **over 51%** of block groups in Montgomery County fall within the 70th-80th national percentile range of ozone pollution. This means these block groups have ozone pollution higher than 70 – 80% of the rest of the country, on average. By comparison, **all 663** block groups in Montgomery County fall within the 0 – 49th national percentile range for PM2.5 pollution.

[100] For reference, the average single human hair is about 70 micrometers in diameter, which is 30 times larger than the largest fine particle.

[101] A block group is the smallest unit for which the U.S. Census Bureau reports a full range of demographic statistics. A block group is a subdivision of a census tract with about 700 residents, on average, per block group.

Montgomery County Ozone and Particulate Matter 2.5 Pollution, 2019 (by National Percentile)

National Percentile Range	# of Block Groups - Ozone	# of Block Groups – PM2.5
0 – 49th Percentile	3	663
50 – 60th Percentile	45	0
60 – 70th Percentile	272	0
70 – 80th Percentile	295	0
80 – 90th Percentile	48	0
90 – 95th Percentile	0	0
95 – 100th Percentile	0	0

Finding #5. Demographic data overlayed with ozone pollution data show apparent racial inequities in the distribution of pollution in the County.

EJScreen is an EPA GIS tool for mapping national environmental justice (EJ) concerns and was designed as a starting point for considerations of environmental justice. It combines national environmental and socioeconomic data to highlight areas where BIPOC and low-income populations may be disproportionately impacted by pollution. The data may help reveal patterns and show areas that should be considered for further study for racial inequities in distribution of and exposure to air pollution and the drivers of inequities.

EJScreen reports an Environmental Justice (EJ) Index, which combines both environmental and demographic data to identify areas that may have higher pollution burdens ***and*** BIPOC and low-income populations present. The EJ index for ozone pollution is a combination of the following in a specific block group:

- The pollution indicator;
- BIPOC population; and
- Low-income population;

The 15 block groups with the highest ozone pollution on the EJ Index are in the 95th to 100th percentile. However, 173 block groups in the County are at or above the 80th percentile on the EJ index for ozone pollution – the threshold above which EPA recommends further review of racial and socioeconomic inequities in exposure to ozone and air pollution in general.

County Distribution of Percentile Categories for Ozone (EJ Index)

Percentile Range	Count of Block Groups
0 – 49th Percentile	119 (17.9%)
50 – 60th Percentile	100 (15.1%)
60 – 70th Percentile	124 (18.7%)
70 – 80th Percentile	147 (22.2%)
80 – 90th Percentile	136 (20.5%)
90 – 95th Percentile	22 (3.3%)
95 – 100th Percentile	15 (2.3%)

The data show that racial inequities of air pollution exposure in the County reflect national racial inequities. Residents in these block groups are overwhelmingly BIPOC. The trend persists for block groups where fewer than half the residents are identified as low-income. This aligns with national research showing the **main** determinant for higher exposure to air pollution is race and ethnicity.

Finding #6. According to data, the County's overall "unhealthy days" have decreased over time, according to a review of data from 2010 - 2023.

The EPA classifies unhealthy days on its air quality index (AQI) as days at or above the orange level on the AQI for any pollutant, such as ozone or particulate matter. Data from 2010-2023 show only a few days classified as unhealthy for those with asthma or other lung diseases for the majority of years in this period.

Year	# Days Monitored	# Days Good	# Days Moderate	# Days Unhealthy for Sensitive Groups	# Days Unhealthy
2023	179	145	29	**2**	**3**
2022	355	293	61	**1**	0
2021	361	296	62	**3**	0
2020	355	333	22	0	0
2019	361	313	48	0	0
2018	347	265	81	**1**	0
2017	359	305	52	**2**	0
2016	345	279	66	0	0
2015	345	229	111	**5**	0
2014	355	261	94	0	0
2013	354	275	78	**1**	0
2012	360	216	137	**6**	**1**
2011	335	195	126	**13**	**1**
2010	362	208	130	**24**	0

Source: EPA Outdoor Air Quality Data

In 2010, 24 days were classified as unhealthy for sensitive groups, the highest number among the years reported. Since 2010, the annual count of "unhealthy" days (both for sensitive groups and the general public) did not go above 14 days and has generally decreased over time. In the data shown, before 2023 "red" days last occurred in 2011 and 2012. However, 2023 has had three "red" days due to smoke from wildfires in Canada. During a red day, everyone may begin to experience health effects from outdoor air quality, with members of sensitive groups experiencing more serious health effects.

Discussion Items

The following discussion items are aimed at collecting more data on air pollution and investigating policy tools to improve air quality in the County.

Discussion Item #1. Consider partnering with relevant stakeholders and agencies to collect and analyze local air pollution data to determine what is driving hot spots in the County.

The Environmental Protection Agency (EPA) data in this report identified hot spots in air quality in the County and racial inequities in the distribution of air quality hot spots in the County. The 2019 data, however, do not identify the cause of air quality hot spots in the County (e.g., traffic, emissions from facilities, etc.). EPA data can be used to reveal patterns of air pollution and show likely racial inequities for those experiencing air pollution, identifying areas of the County that warrant further study.

OLO recommends that the County Council consider the benefits of partnering with relevant agencies and stakeholders to develop a more robust air pollution monitoring system, particularly in block groups identified in this report as experiencing higher exposure to air pollution. Stakeholders may include the County's Department of Environmental Protection, Maryland Department of the Environment, local colleges, and residents of affected neighborhoods. Examining pollution sources and drivers of air quality hot spots in the County can aid in the development of targeted solutions to decrease local pollution and reduce racial inequities in the distribution of air quality hot spots.

Discussion Item #2. Explore local level policy tools and funding opportunities to reduce outdoor air pollution and racial inequities in the distribution of air pollution in the County.

At the local level, there are many opportunities to reduce the burden of air pollution on BIPOC neighborhoods and households. Several jurisdictions around the country developed air pollution reduction strategies that prioritize environmental justice, such as requiring developers to undergo an environmental justice review prior to approval of permits (i.e., Cincinnati, OH, Camden, NJ). Other jurisdictions have developed land use and planning processes that emphasize environmental justice. Examples include:

- Master plans that center environmental justice in land use planning and development;
- Addressing existing land uses through mechanisms such as use restrictions, phase outs of incompatible uses like industrial zoning near residential areas, and targeted investments in "green" infrastructure in BIPOC neighborhoods with higher rates of exposure to pollution; and
- Urban planning that prioritizes walking and biking infrastructure and public transportation

Several federal programs, including Environmental and Climate Justice Block Grants and Neighborhood Access and Equity Grants, are available to help fund environmental justice projects and improve environmental resilience and air quality, such as community-led air pollution monitoring.