MKE FreshAir Collective

DATA YOU CAN USE

MILWAUKEE AIR QUALITY 2024 REPORT

MKE FreshAir Collective

Prepared by Data You Can Use

ACKNOWLEDGEMENTS

MKE FreshAir Collective thrives because of the dedication and expertise of an incredible network of environmental and community health advocates. Each of these businesses and individuals has played an essential role in advancing our mission, including securing the placement of one or more of our neighborhood-based air quality sensors. Their commitment to environmental justice and public health in Milwaukee continues to drive our efforts forward.

We are deeply grateful to the Wisconsin Department of Health Services for supporting this work through the Minority Health Program's Community Grant. This funding made it possible to clean, analyze, and report MKE FreshAir Collective's air quality data — turning local insights into meaningful action for healthier, more equitable communities.

We also extend our sincere thanks to the Wisconsin Asthma Program within the Wisconsin Department of Health Services for their assistance in providing crucial data on asthma-related healthcare utilization, which has been vital to our analysis.

Finally, we want to express our heartfelt appreciation to IQAir for their years of partnership and support. Their generosity and commitment to making air quality monitoring accessible to communities across the country — especially those most impacted by environmental injustices — have been instrumental in helping us build and expand Milwaukee's neighborhood-based air quality monitoring network. We're proud to be part of the broader community they've helped empower. By developing consumer-grade air sensors and the AirVisual platform, they've made data collection and sharing accessible to community organizations like ours. We're proud to be part of the broader network they've supported in making air quality data local, actionable, and community-owned

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INTRODUCTION

MKE FreshAir Collective, Inc. is a 501(c)(3) nonprofit air quality monitoring organization based in Milwaukee, Wisconsin. We are a collective of environmental advocates and concerned residents passionate about creating a healthier, more equitable environment for all who live, work, and play in our city. Our mission is to collect accurate air quality data, foster meaningful community engagement, and drive action to improve indoor and outdoor air quality in Milwaukee with a steadfast focus on health equity and dismantling systemic racism.

At the heart of our mission is a belief that everyone deserves to know the quality of the air they breathe. We are dedicated to providing accurate, clear, and accessible information that helps people understand the impact of air quality on their health — and what they can do to reduce their exposure. Today, we operate over 20 neighborhood-based sensors, with plans to expand by 10 additional locations in the next year.

Beyond data collection, we are committed to education, advocacy, and community engagement. Our work empowers historically marginalized communities by offering critical, hyperlocal insights into air quality disparities. Through collaborative, data-driven, and community-rooted initiatives, MKE FreshAir Collective is working toward a healthier, more just, and sustainable future for Milwaukee.

Thank you for being part of this important conversation. We invite you to explore our resources, engage with our work, and reach out with any questions or concerns about air quality in our community.

Danika & Langston
Co-Executive Directors
MKE FreshAir Collective

ABOUT THE DATA

Using state-of-the-art, accessible technology and the latest scientific methods, our sensors measure three sizes of particulate matter (PM_1, $PM_{2.5}$, and PM_{10}), and CO2. We work closely with local and state agencies, community-based organizations, and public health advocates to ensure our data informs policies and decisions that protect community health.

In this report, we focus our analysis on particulate matter ($PM_{2.5}$) and the Air Quality Index (AQI):

US AQI Level		PM2.5 (µg/m³)	Health Recommendation (for 24 hour exposure)
WHO PM2.5 (µg/m³) Recommended Guidelines as of 2024: **0-5.0**			
Good	0-50	0-9.0	Air quality is satisfactory and poses little or no risk.
Moderate	51-100	9.1-35.4	Sensitive individuals should avoid outdoor activity as they may experience respiratory symptoms.
Unhealthy for Sensitive Groups	101-150	35.5-55.4	General public and sensitive individuals in particular are at risk to experience irritation and respiratory problems.
Unhealthy	151-200	55.5-125.4	Increased likelihood of adverse effects and aggravation to the heart and lungs among general public.
Very Unhealthy	201-300	125.5-225.4	General public will be noticeably affected. Sensitive groups should restrict outdoor activities.
Hazardous	301+	225.5+	General public at high risk of experiencing strong irritations and adverse health effects. Should avoid outdoor activities.

Image source: https://www.iqair.com/us/newsroom/what-is-aqi

- $PM_{2.5}$ refers to fine inhalable particles with diameters that are 2.5 micrometers or smaller — about 30 times smaller than the width of a human hair. These particles are especially harmful because they can penetrate deep into the lungs and even enter the bloodstream, contributing to respiratory and cardiovascular problems. $PM_{2.5}$ was selected for this analysis because it has strong links to health disparities and is a key pollutant of concern in Milwaukee, particularly in historically marginalized neighborhoods with high rates of asthma and heart disease.
- AQI is a standardized tool used to communicate how clean or polluted the air is on a given day, and what associated health concerns might be. It incorporates multiple pollutants, including $PM_{2.5}$, and converts pollutant concentrations into a simple scale from 0 to 500, with higher values indicating worse air quality and greater health risks.

Although each sensor measures temperature, barometric pressure, and relative humidity, they were not installed with the intent of capturing accurate readings for these variables (i.e., some are placed in direct sunlight against a brick wall and some are placed in constant shade). As a result, no analysis of temperature, barometric pressure, relative humidity, PM_1 and PM_{10} data was conducted for this report.

This report presents data from 21 neighborhood air quality sensors across Milwaukee between January and December of 2024. Each sensor began collecting data at different points in time, with the longest running sensor installed in 2020, and the most recent added in September 2024. As a result, some air quality sensors have a full year of data, while others reflect a shorter monitoring period. To account for these differences, comparative analysis between sensor locations was conducted using monthly averages rather than annual averages. This approach ensures a fair and consistent comparison across all monitoring sites, regardless of how long each sensor has been active.

Each sensor is paired with a dedicated analysis section, where local demographic data from the U.S. Census Bureau's American Community Survey (ACS) is presented alongside air quality measurements. To provide relevant context for each location, the surrounding demographic area was defined by identifying census tracts within a half-mile radius of the sensor. The Data You Can Use team carefully reviewed and adjusted these boundaries, using their professional judgment to include or exclude specific census tracts based on size, geography, and neighborhood characteristics. This method aims to create an accurate and meaningful demographic snapshot of the community immediately surrounding each sensor site.

QUICK FACTS: 2024 AIR QUALITY IN MILWAUKEE

- **Average AQI across all 21 sensors:** 35.34
- **Worst air quality month across all 21 sensors:** August (Average AQI: 46.30)
- **Best air quality month across all 21 sensors:** April (Average AQI: 22.55)
- **Highest daily average AQI level recorded:** 154.46 in Havenwoods on December 26th
- **Lowest daily average AQI level recorded:** 0.71 in Harambee on January 16th
- The **King Park** neighborhood sensor had **the lowest average AQI** in 2024 (29.04)
- The **Near Westside** neighborhood sensor had **the highest average AQI** in 2024 (41.79)
- **Days with at least one sensor's daily average AQI classified as 'Unhealthy for Sensitive Groups' or worse** (over 100): 10
- **Number of sensors that experienced at least one 'Unhealthy for Sensitive Groups' AQI day** (AQI range: 101 - 150): 20
- Statistical testing revealed that the **Silver Spring** neighborhood sensor and the **King Park** neighborhood sensor had the most **statistically different air quality** from the rest of the group.

Monitor Location (Launch Date)

1. Washington Heights (2/2020)
2. Harambee (5/2021)
3. Riverwest (11/2022)
4. Silver Spring (12/2022)
5. Near Westside (12/2022)
6. Grasslyn Manor (3/2023)
7. Clarke Square (5/2023)
8. Franklin Heights (5/2023)
9. Lindsay Heights (6/2023)
10. Menomonee S (6/2023)
11. Bayview (6/2023)
12. Amani (12/2023)
13. Metcalfe Park (1/2024)
14. Burnham Park (2/2024)
15. Rufus King (3/2024)
16. Silver City (3/2024)
17. Havenwoods (4/2024)
18. Walker Square (5/2024)
19. King Park (8/2024)
20. Lower Eastside (8/2024)
21. Menomonee N (10/2024)

Map created April 2025

AIR QUALITY AND HEALTH

The link between poor air quality and adverse health outcomes is not only well-established but also profoundly concerning. Extensive scientific research has shown that exposure to air pollution significantly increases the risk of numerous health problems, ranging from acute respiratory symptoms like asthma attacks and bronchitis to long-term chronic conditions including heart disease, stroke, lung cancer, and premature death.[1] The World Health Organization classifies air pollution as a carcinogen, recognizing its role in causing cancer as well as contributing to both short-term respiratory issues and long-term chronic diseases.[2,3]

Moreover, the burden of air pollution is not shared equally across society. Due to decades of historical inequities, systemic racism, and discriminatory policies such as redlining and industrial zoning, communities of color disproportionately live in neighborhoods exposed to higher concentrations of harmful pollutants.[4] As a result, these communities face elevated risks of suffering from the health consequences of poor air quality, exacerbating existing health disparities.[5] This environmental injustice means that the legacy of racism continues to impact the air people breathe, contributing to a cycle of inequity in health outcomes that demands urgent attention and action.

MKE FreshAir Collective is deeply aware of this environmental injustice and intentionally locates its air quality sensors in communities most likely to experience environmental and social inequities. We aim to capture these environmental disparities through our data collection so that we can begin advocating for better protections in communities exposed to the highest levels of air pollution.

In partnership with Data You Can Use, we analyzed data from the Wisconsin Department of Health Services on asthma-related healthcare utilization alongside our outdoor air quality sensor data. This geographic and statistical analysis helps deepen our understanding of the relationship between air quality and health outcomes across Milwaukee neighborhoods.

1 Pope CA 3rd, Dockery DW. (2006). Health effects of fine particulate air pollution: lines that connect. Journal of the Air & Waste Management Association, 56(6), 709-742. https://doi.org/10.1080/10473289.2006.10464485

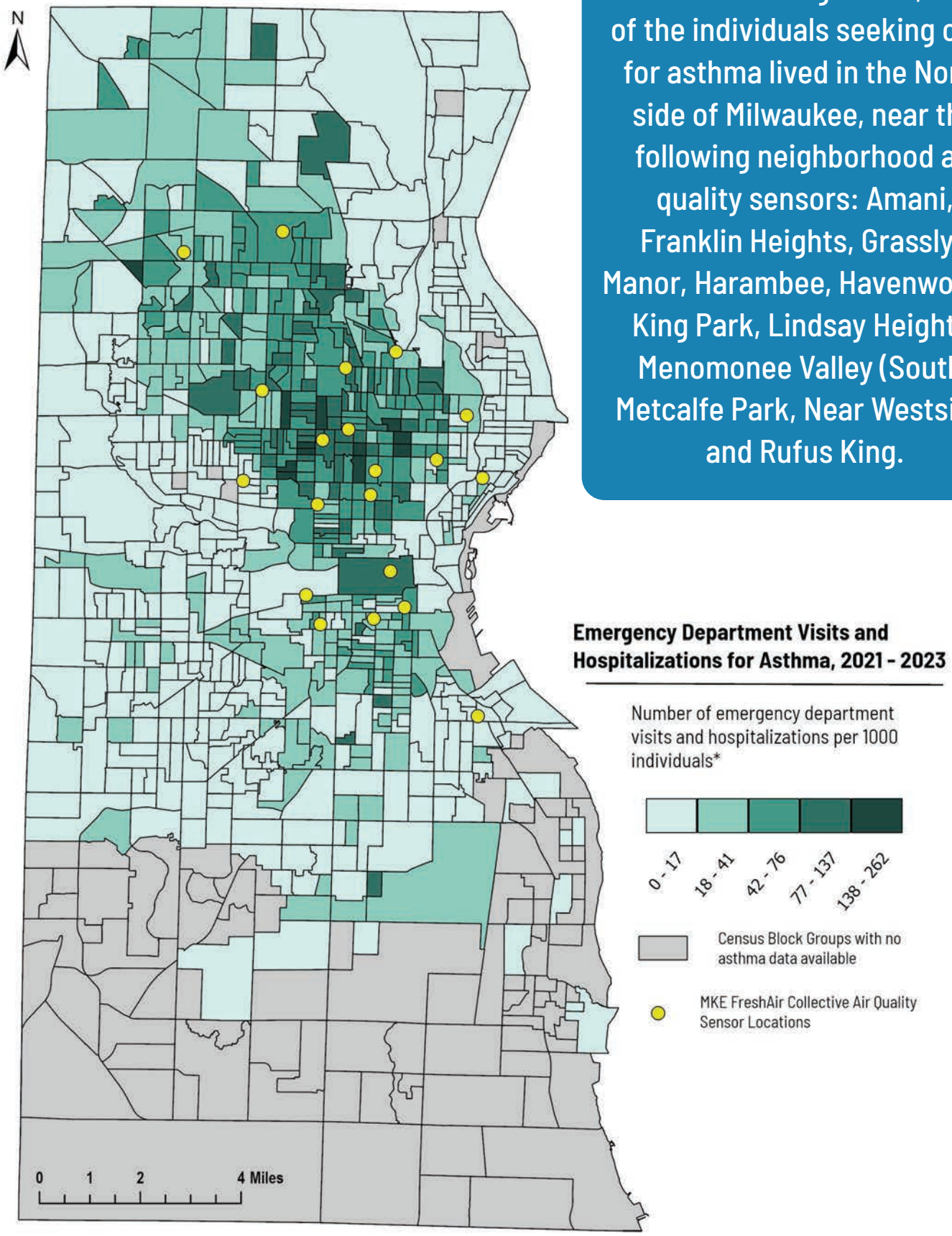
2 National Institute of Environmental Health Sciences, "Air Pollution and Your Health."

3 World Health Organization. "Ambient (outdoor) air pollution." Fact sheet, 2021.

4 American Lung Association, 2022, "Air Pollution and Health Equity."

5 Clark LP, Millet DB, Marshall JD. "National Patterns in Environmental Injustice and Inequality: Outdoor NO2 Air Pollution in the United States." Environmental Health Perspectives. 2014 Mar;122(5):439-45.

From 2021 through 2023, most of the individuals seeking care for asthma lived in the North side of Milwaukee, near the following neighborhood air quality sensors: Amani, Franklin Heights, Grasslyn Manor, Harambee, Havenwoods, King Park, Lindsay Heights, Menomonee Valley (South) Metcalfe Park, Near Westside, and Rufus King.



HOW DOES AIR QUALITY DIFFER ACROSS MILWAUKEE?

ANALYSIS METHODS

To determine how the air quality differed across Milwaukee neighborhoods, the Wilcoxon Signed Rank Test was used to understand differences between neighborhood sensor data. The Wilcoxon test is used to test for significant differences between one subset of a population to the whole. For example, when looking at math test scores, this test could be employed to see if Class A's math scores differ significantly from the entire school's test scores. This test determines if the subset is significantly different from the whole, but does not indicate the direction of that difference.

Data You Can Use received hourly data from the 21 neighborhood air quality sensors. Te data was cleaned and aggregated to calculate daily AQI medians for each sensor. Because each sensor began collecting data at different points in time, with the most recent only added in September 2024, the Wilcoxon test was run for every month of 2024 to ensure the most accurate analysis. For a sensor location to be included in a month's test, the sensor needed to have recorded data for 70% of that month, or roughly 20 days.

Once the test statistic was calculated, the critical values of the Wilcoxon Signed Rank Test were used to determine if the specified sensor carries a significantly different value from the median. The analysis values are based on the 99% (0.01) confidence level.

RESULTS

After determining significance for each month for each sensor, a significance rate was calculated, highlighting the proportion of analyzed months that were found to be significantly different from the entire group. Two sensors - Silver Spring and King Park - are significantly different for every month that the test could be run (the King Park sensor was only launched in September, so only four months were analyzed). This means, overall, these sensor locations tended to have air quality that differed significantly from the group. While the test can not determine direction of the difference, the monthly AQI averages of the Silver Spring sensor were lower than the group 11/12 months, and the King Park sensor's monthly AQI averages were lower than the group 4/4 months. This could indicate that these sensor locations have substantially better air quality than the rest of the sensor locations.

Other sensors that had several months found to be statistically significant were Havenwoods, Menomonee Valley South, Burnham Park, and Clarke Square. For the months that were statistically different, Havenwoods and Burnham Park generally had a lower average AQI levels (better air quality) than the group while Menomonee Valley South and Clarke Square generally had higher average AQI levels (worse air quality) than the group. See Table 1 on the following page for the full results.

Table 1: Wilcoxon Statistical Test Results

Sensor	J	F	M	A	M	J	J	A	S	O	N	D	%
Silver Spring	X	X	X	X	X	X	X	X	X	X	X	X	100
King Park	-	-	-	-	-	-	-	-	X	X	X	X	100
Havenwoods	-	-	-	-	X	X	X	X	X	X	X		88
Menomonee (South)	X	X	X	X			X	X	X	X	X	X	83
Burnham Park	-	X	X	X	X	X	X	X	X	X			82
Clarke Square	X		X	X	X	X	X		X	X	X		75
Rufus King	-	-			X	X	X	X	X		X	X	70
Riverwest	X			X	X	X	X	X	X	X			67
Amani	X	X	X			X	X		X		X		58
Harambee	X	X	X			X		X			X	X	58
Washington Heights		X	X					X	X	X	X	X	58
Lower Eastside	-	-	-	-	-	-	-	-			X	X	50
Metcalfe Park	-			X		X	X		X	X			45
Lindsay Heights				X		X			X	X		X	42
Menomonee (North)	-	-	-	-	-	-	-	-	-			X	33
Near Westside	X					X	X		X				33
Franklin Heights	X								X	X	-	-	30
Walker's Square	-	-	-	-	X	X							25
Silver City	-	-	-					X	X				22
Bayview					X	-	-			X			20
Grasslyn Manor						-	-	-	-		X		13

X = Significant Difference - = Not Enough Observations Blank = No Significant Difference

% Column shows the significance rate, or the proportionate of months found to be significantly different divided by the total number of months that test was run (test could only be run for sensors with 20 or more days of observation in the month).

On the next page, Table 2 breaks down the monthly group average AQI per month, in comparison to the highest sensor average and the lowest sensor average.

Looking at monthly averages, the Menomonee Valley (South), Near Westside, and Franklin Heights sensors had the worst air quality most frequently and the Harambee, Silver Spring, and King Park sensors had the best air quality most often.

Table 2: Monthly AQI Averages

Month	Group Average AQI	Highest Average AQI	Lowest Average AQI
January	42.39	49.13 (Menomonee South)	37.51 (Harambee)
February	46.24	53.09 (Menomonee South)	38.53 (Harambee)
March	26.13	32.17 (Near Westside)	21.29 (Harambee)
April	**22.55**	26.35 (Near Westside)	18.57 (Silver Spring)
May	29.12	35.43 (Near Westside)	24.14 (Silver Spring)
June	29.35	35.53 (Near Westside)	24.19 (Silver Spring)
July	43.76	55.53 (Near Westside)	37.81 (Burnham Park)
August	**46.30**	56.73 (Near Westside)	41.66 (Riverwest)
September	33.63	41.96 (Franklin Heights)	28.39 (Silver Spring)
October	29.07	38.82 (Franklin Heights)	23.10 (King Park)
November	33.02	39.40 (Near Westside)	23.45 (King Park)
December	45.75	52.66 (Menomonee South)	36.25 (King Park)

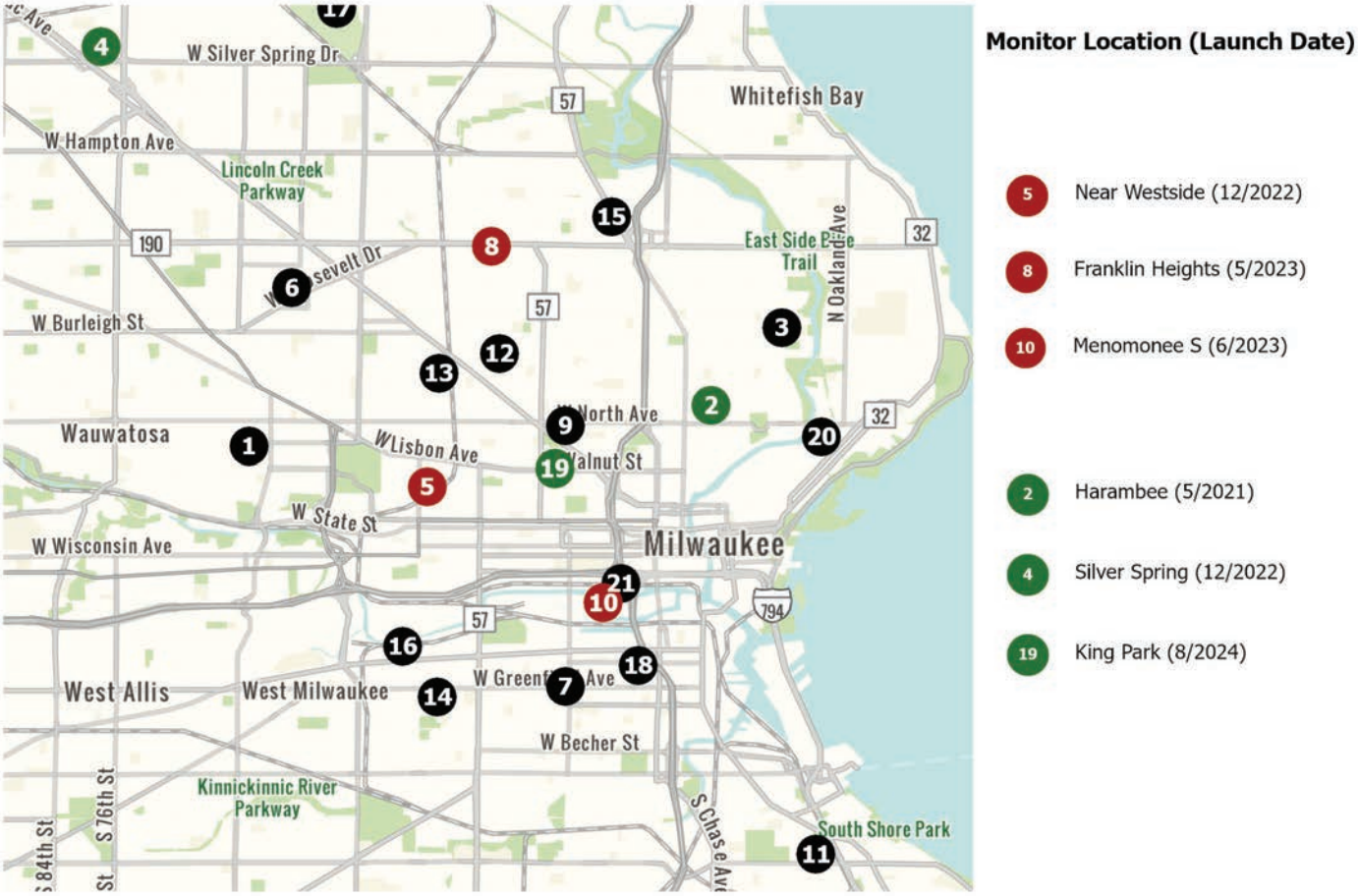
Across all the 21 sensors, April had the best air quality with an average daily AQI of 22.55.

August had the worst air quality across the group, with an average daily AQI of 46.30.

The **Menomonee Valley South**, **Near Westside**, and **Franklin Heights'** sensor locations most often had the **worst air quality**, looking at monthly averages.

Harambee, **Silver Spring**, and **King Park**'s sensor locations most often had the **best air quality**, looking at monthly averages.

Notably, the King Park sensor location had the best monthly average AQI for 3 out of the 4 months the sensor was active.



CONCLUSION AND NEXT STEPS

This 2024 MKE FreshAir Collective Air Quality Report highlights the importance of neighborhood-level environmental data in identifying and addressing health inequities in Milwaukee. Our findings reinforce long standing research on the connections between poor air quality and adverse health outcomes — particularly in communities historically overburdened by environmental hazards. Through this work, we aim to ensure that residents have access to timely, actionable data to help protect their health and advocate for cleaner, safer environments.

Looking ahead to 2025, we have several exciting iniatives planned:

- Expanding our sensor network with additional neighborhood air quality sensors, with a focus on schools, parks, near highways, and other key spaces.
- Deploying our first near-reference grade sensor, which will allow us to capture even more precise air quality data, including measurements of nitrogen dioxide (NO_2) and ozone (O_3), alongside particulate matter. This will provide valuable insights into pollutants that have significant health impacts but are often under-monitored at the community level.
- Introducing more CO_2-capable sensors to better understand the relationship between carbon dioxide levels, air quality, and respiratory health in dense urban areas.
- Grow our indoor air monitoring initiatives in homes, community gathering spaces, child-care centers, and public facilities to address the often-overlooked issue of indoor air quality.
- Advocating for stronger, equity-centered environmental health policies informed by our growing network of hyper-local data.

HOW CAN YOU CHECK YOUR LOCAL AIR QUALITY?

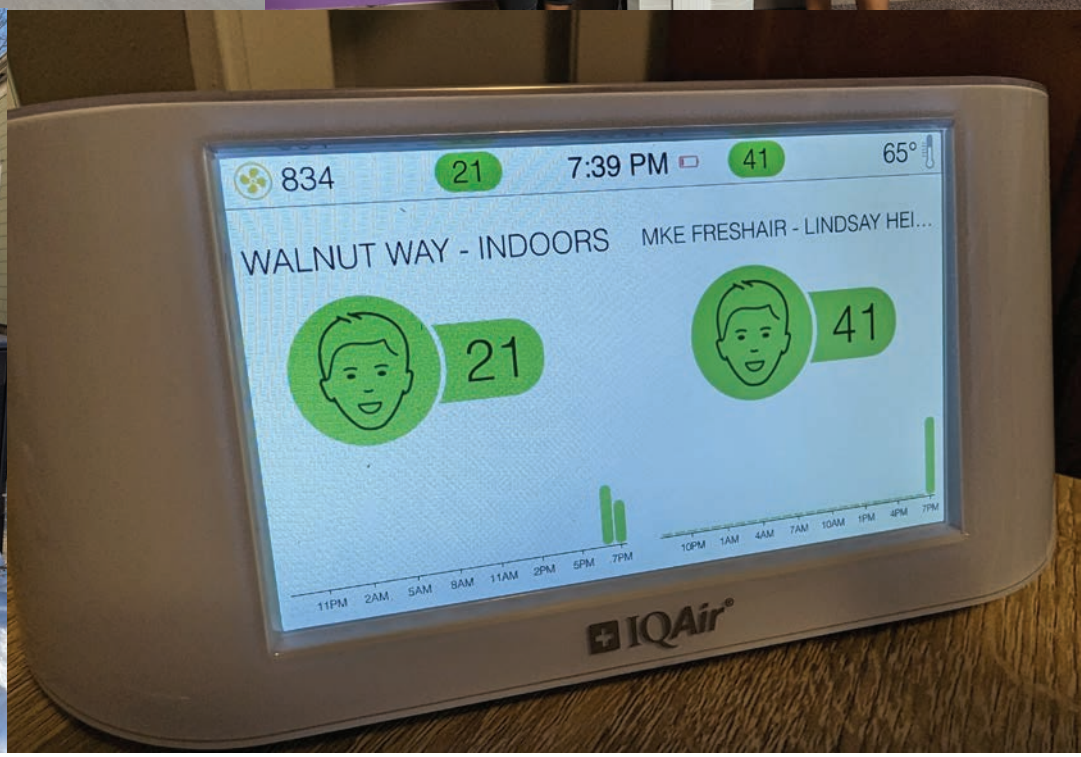
1) Download the AirVisual app by IQAir on your phone to access the real-time air quality data

2) Follow your neighborhood sensors directly through the app, to track the air quality wherever you live, work, and play

3) Get notifications when air quality gets unhealthy or worse

See your air quality right now: bit.ly/MKE-AQI


WE
ARE IN THIS
TOGETHER
FRED KARMS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