Photo of the Corona-Norco Family YMCA

Corona-Norco Family YMCA

AirAware Air Quality Monitoring Quarterly Report

(11/2024 – 01/2025)

Prepared by the **AirAware Team**

Corona-Norco Family YMCA

AirAware Air Quality Monitoring Quarterly Report - #1

November 2024 - January 2025

Prepared by the AirAware team

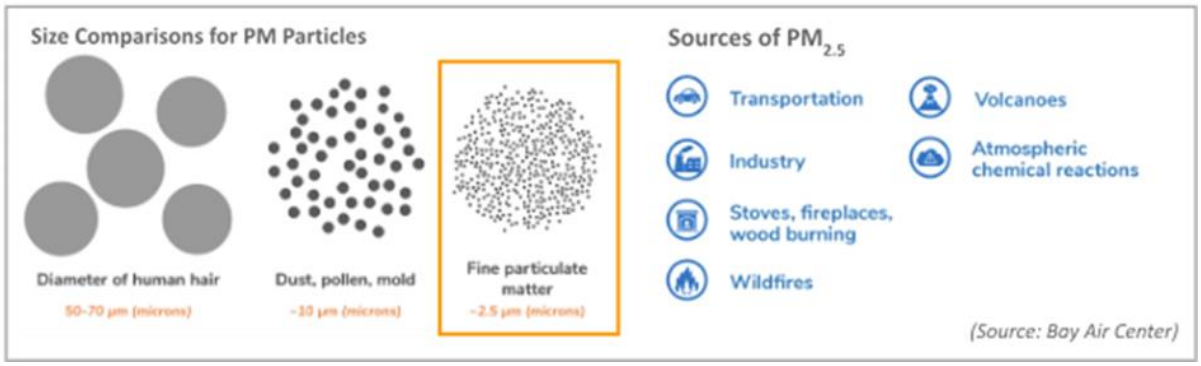
This report summarizes the recent air quality trends observed at your YMCA, focusing on the differences between indoor and outdoor fine particulate matter ($PM_{2.5}$).

Key Takeaways

- $PM_{2.5}$ levels varied across time with the majority of indoor levels in the Moderate and Good AQI range, while outdoor levels rose into Unhealthy AQI levels.
- Indoor levels during higher outdoor pollution days were 66% lower than outdoor levels. With the future HVAC upgrade, we'd expect indoor levels to be at least 80% lower than outdoor levels.
- A pattern in high overnight indoor $PM_{2.5}$ in the Break Room requires investigation and explanation from the YMCA on associated cleaning activities.

Background

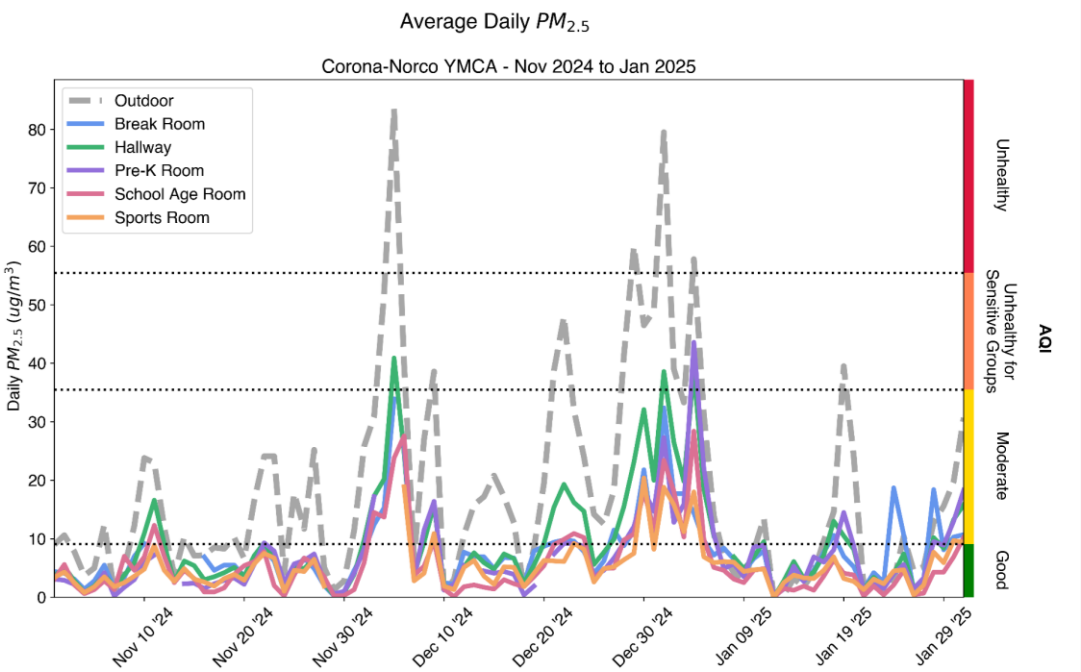
Particulate matter is an air pollutant made of tiny liquid and solid airborne particles that vary in size. Fine particulate matter ($PM_{2.5}$), which is the focus of the AirAware project, describes an important subset of particulate matter that is 2.5 microns and smaller in size (~30x smaller than the diameter of a human hair) and predominantly comes from sources of combustion (burning of fuels), such as wildfires, residential wood burning, transportation, and industry.



Exposure to $PM_{2.5}$ has various detrimental health effects, such as aggravated asthma, decrease in lung function, increase in respiratory symptoms, and nonfatal heart attacks and premature deaths in people with heart and lung disease. It also impacts the environment through reduced visibility, damaged vegetation, and reduced soil nutrients, among many other impacts.

Trends in Fine Particulate Matter ($PM_{2.5}$)

Indoor and outdoor air quality monitoring at the Corona-Norco Family YMCA has been underway since late Fall 2024. This section explores the trends across time and space over these first three months of monitoring.



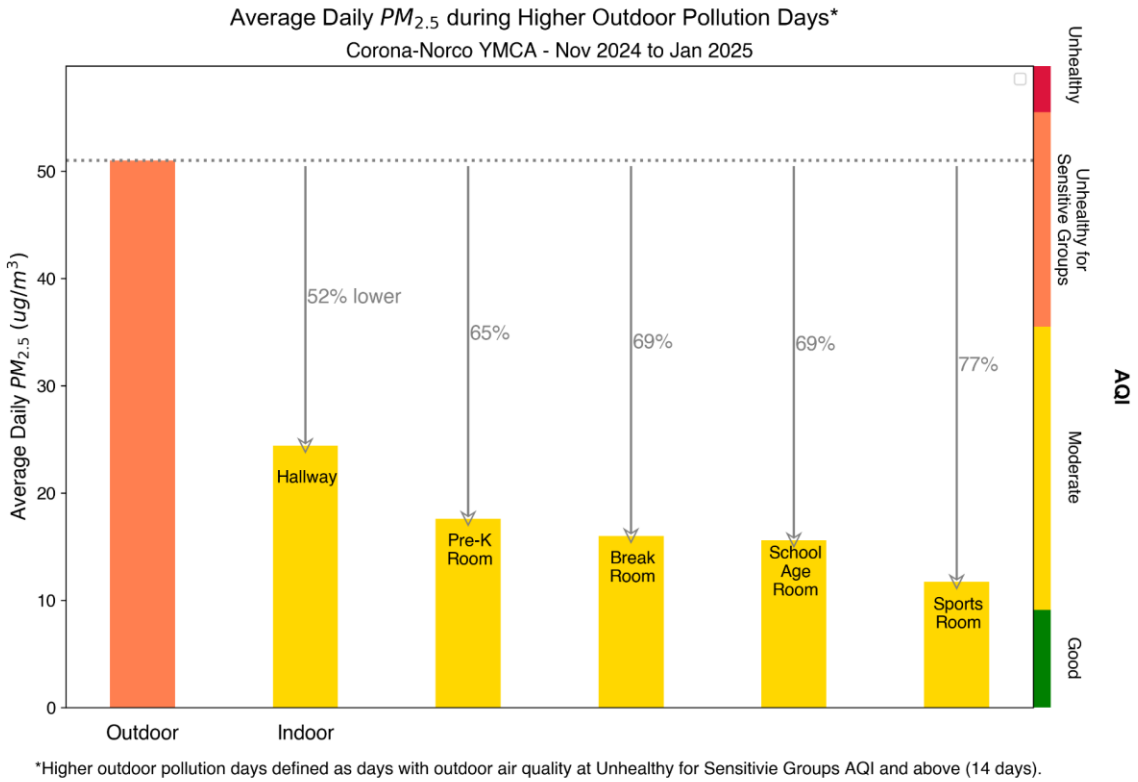
This plot shows average daily $PM_{2.5}$ levels across time for both the indoor (solid color lines) and outdoor (dashed grey lines) monitors from the beginning of November 2024 to the end of January 2025. The Air Quality Index (AQI) categories coinciding with $PM_{2.5}$ concentrations are shown on the right with bounds shown across the plot in dashed black lines, helping to provide health context. Any gaps in the data are due to issues in power or WiFi/cellular connectivity.

What does this plot tell us?

- From November 2024 to January 2025, $PM_{2.5}$ levels varied across time. Indoor levels followed the rise and fall in outdoor air pollution, but at lower concentrations, with the majority of $PM_{2.5}$ indoors in the Good and Moderate AQI range.
- Higher indoor $PM_{2.5}$ levels in the Unhealthy for Sensitive Groups AQI occurred briefly in early and late December 2024, when outdoor levels rose into the Unhealthy AQI. These poor outdoor air quality days were likely due to pollution from stagnant winter weather, not wildfires, and highlight the importance of sustained and effective air filtration in maintaining healthy indoor air quality conditions year round.
- While indoor levels were most influenced by outdoor conditions during this period, the data also indicate the presence of indoor sources of $PM_{2.5}$, which can sometimes cause indoor levels to be higher than outdoors. This occurred on January 24 and January 25, 2025 in the Break Room (further discussed in the “Questions about Indoor $PM_{2.5}$” section at the end of this report).

Comparison of Indoor and Outdoor $PM_{2.5}$

The relationship between indoor and outdoor $PM_{2.5}$ is important to explore as it can tell us how effective your YMCA is at filtering out particulate matter from outdoor sources and can help highlight indoor air quality concerns and any needs for HVAC improvement.



The bar chart above compares average daily outdoor (left) and indoor (right) $PM_{2.5}$ levels during higher outdoor pollution days. The color of each bar chart coincides with an AQI category, and the arrows from the grey dashed line and coinciding percentages indicate how much lower average indoor levels are per room compared to outdoor. The indoor spaces are ordered from most to least similar to outdoor levels.

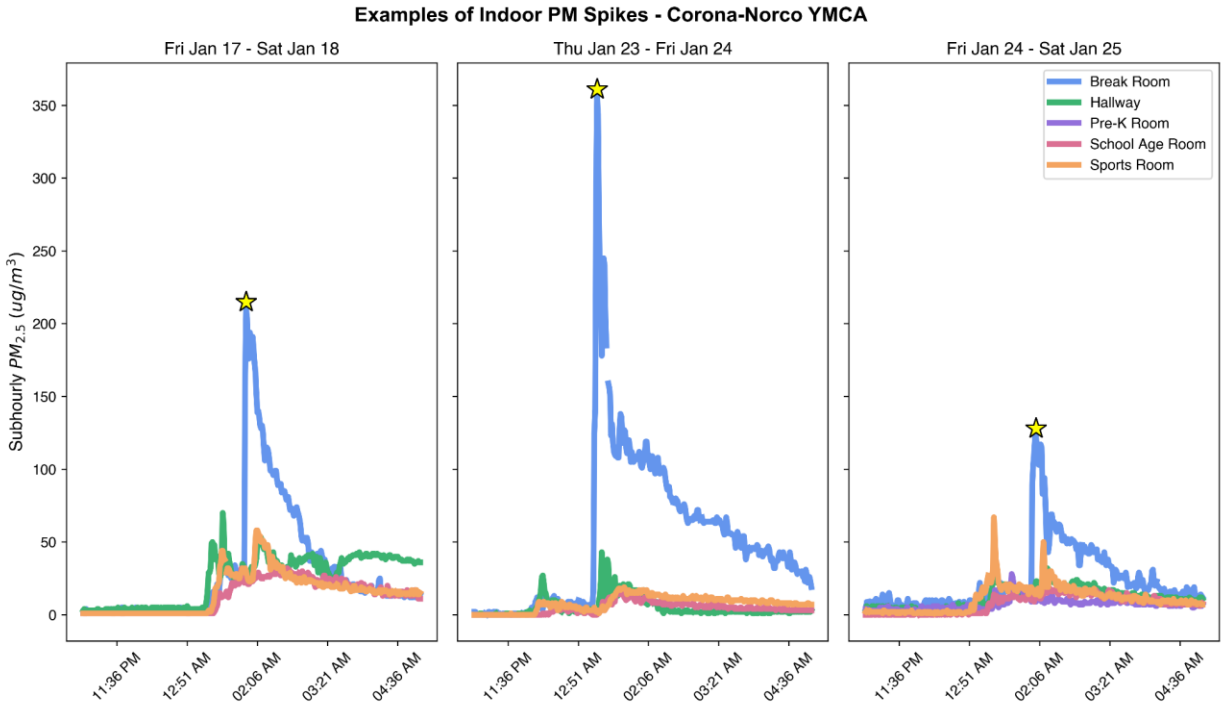
What does this chart tell us?

- We expect indoor $PM_{2.5}$ levels to be between 30% and 80% lower than outdoor levels on average, depending on currently installed HVAC filtration. For this first quarter, all average indoor levels during higher pollution days were within the expected range, but levels did vary across the different monitored rooms and spaces (between 52% and 77%).

- The Sports room measured the cleanest on average air (77% lower than outdoors), though still in the Moderate AQI, and was statistically lower than the Hallway. Statistical analysis showed that averages across the Hallway, Pre-K, Break, and School Age rooms were similar.

Questions about Indoor $PM_{2.5}$

Indoor sources and activities can also contribute to higher indoor air quality levels, and exploring these trends can help identify contributing indoor activities or behaviors and provide insight on possible changes to improve indoor air quality.



This plot shows examples of sub-hourly (1-min) indoor $PM_{2.5}$ levels that are characteristic of indoor sources or activities that contribute to higher indoor air quality.

- Some trends have emerged in overnight indoor $PM_{2.5}$ at Corona-Norco YMCA that don't coincide with outdoor levels. During some nights after the YMCA had closed for the day, sharp spikes in sub-hourly $PM_{2.5}$ occurred in the Break Room, and sometimes rose to above 300 ug/m^3, taking multiple hours to reach cleaner levels again.
- These larger Break Room spikes were often preceded by small increases in $PM_{2.5}$ in the Hallway and Sports Room an hour or so earlier.
- During an earlier discussion, we learned that these times often coincide with nighttime cleaning at the YMCA. Due to the repetitive nature and high levels, these levels could be concerning for exposure. **Could you provide more details on the nighttime cleaning activities occurring at the YMCA, particularly in the Break Room?**