

Southeast-Rio Vista YMCA

AirAware Air Quality Monitoring Quarterly Report (02/2025 – 04/2025)



Photo of the Southeast-Rio Vista YMCA

**Prepared by the
AirAware Team**

Southeast-Rio Vista YMCA

AirAware Air Quality Monitoring Quarterly Report - # 2

February 2025 - April 2025

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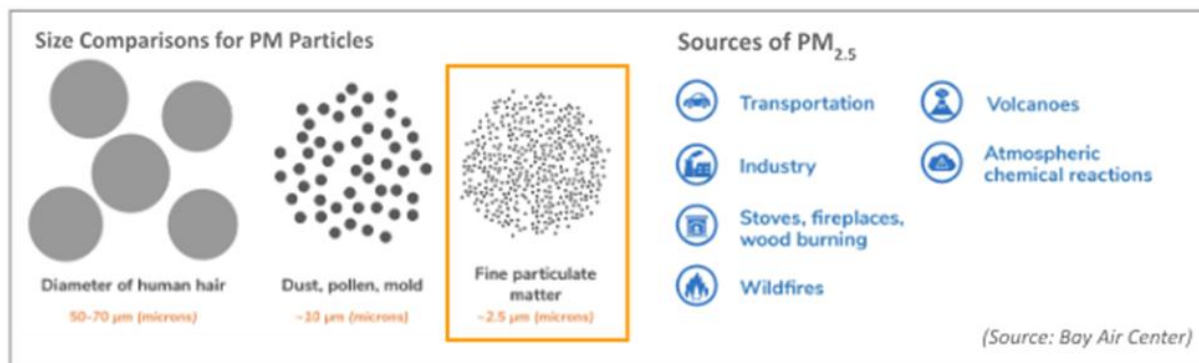
This report summarizes the recent air quality trends observed at your YMCA, focusing on the differences between indoor and outdoor fine particulate matter (PM_{2.5}).

Key Takeaways

- PM_{2.5} levels varied across time and largely stayed within the Good and Moderate AQI range for outdoor and indoor conditions.
- Gym 2 had the highest indoor average during higher pollution days than other indoor spaces. Additionally, the room experienced very high PM_{2.5} across Feb 5 - Feb 10th, during a period when outdoor air quality was in the Good AQI. This may require further investigation by the YMCA.

Background

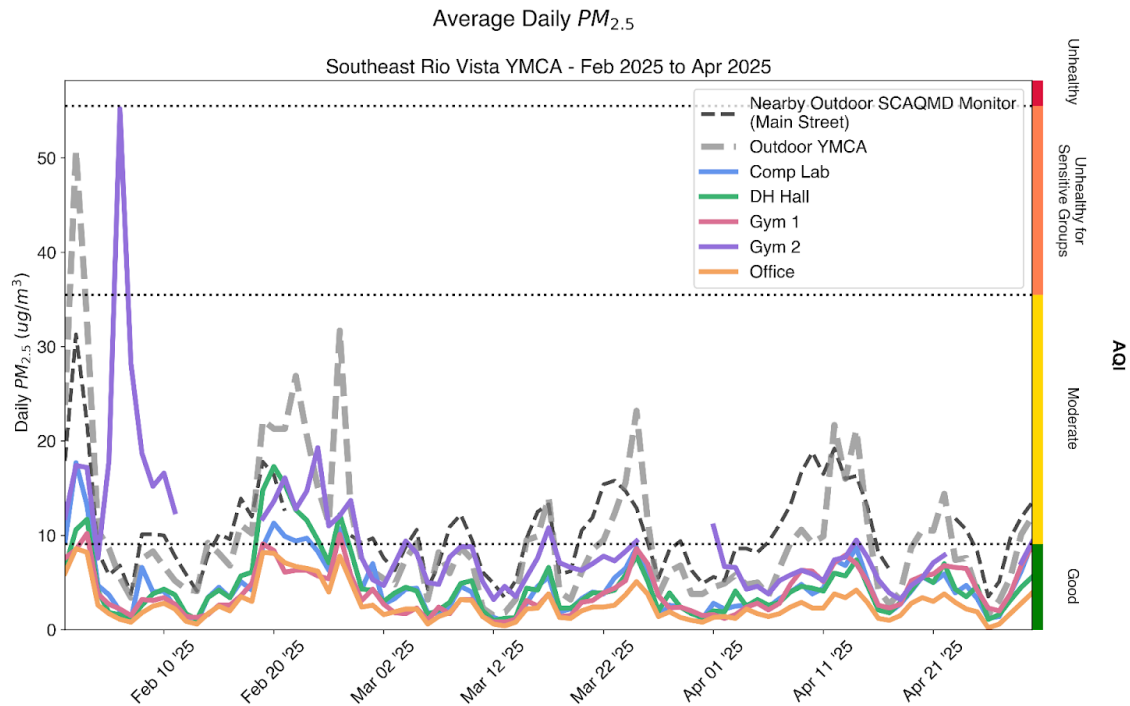
Particulate matter is an air pollutant made of tiny liquid and solid airborne particles that vary in size. Fine particulate matter (PM_{2.5}), which is the focus of the AirAware project, describes an important subset of particulate matter that is 2.5 microns and smaller in size (~30x smaller than the diameter of a human hair) and predominantly come 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 Southeast Rio Vista YMCA has been underway since late Fall 2024. This section explores the trends across time and space in Spring 2025.

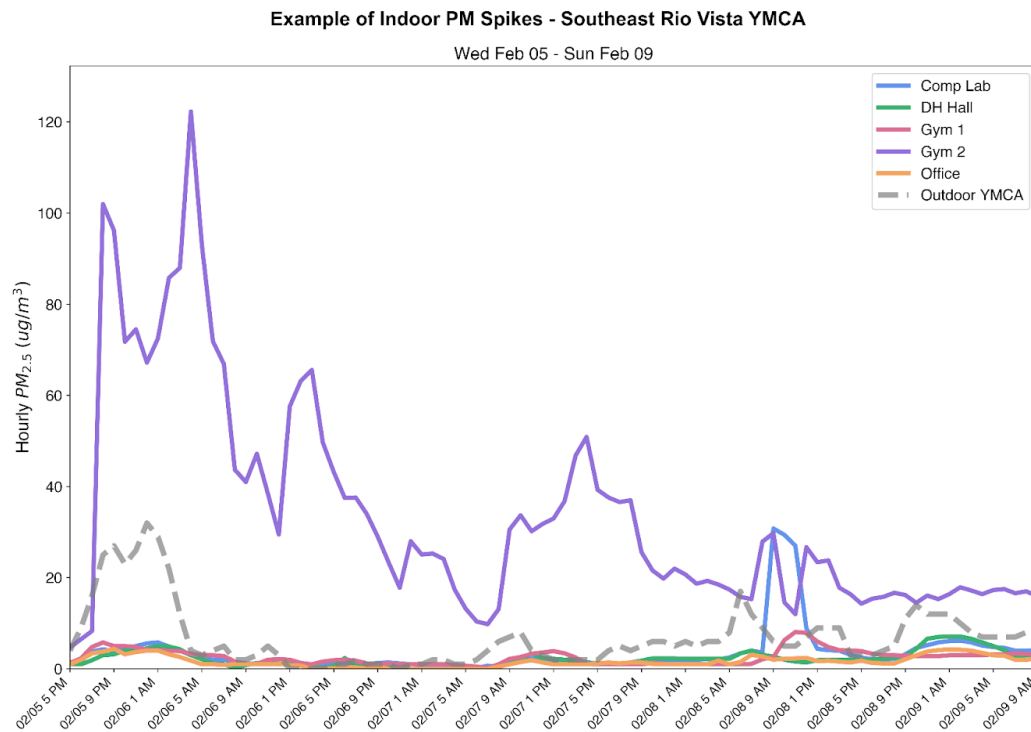


This plot shows average daily PM_{2.5} levels across time for both the indoor (solid color lines) and outdoor (dashed grey line) AirAware monitors from the beginning of February 2025 to the end of April 2025. Data from a nearby regulatory monitor from the South Coast Air Quality Management District (SCAQMD) is also included (dashed black line). 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 February 2025 to April 2025, PM_{2.5} levels varied across time, and largely stayed within the Good and Moderate AQI range. Indoor levels followed the rise and fall in outdoor air pollution, but often at lower concentrations.
- The highest outdoor PM_{2.5} levels occurred in early February, with levels rising into the Unhealthy for Sensitive Groups AQI. Indoor levels remained in the Moderate AQI during this time. These outdoor February measurements are consistent with winter trends in Southern California, where PM_{2.5} levels are higher due to atmospheric conditions and lower winds compared with other seasons.
- The outdoor YMCA monitor often showed higher levels than the nearest regulatory monitor from the South Coast Air Quality Management District (SCAQMD). The

regulatory monitor is 6 miles Northwest from the YMCA. This may be due to real differences in $PM_{2.5}$ across space, but also could be due to the performance of the AirAware monitors. These monitors have not been directly evaluated against the SCAQMD monitor, so we cannot draw conclusions about any differences between the two.

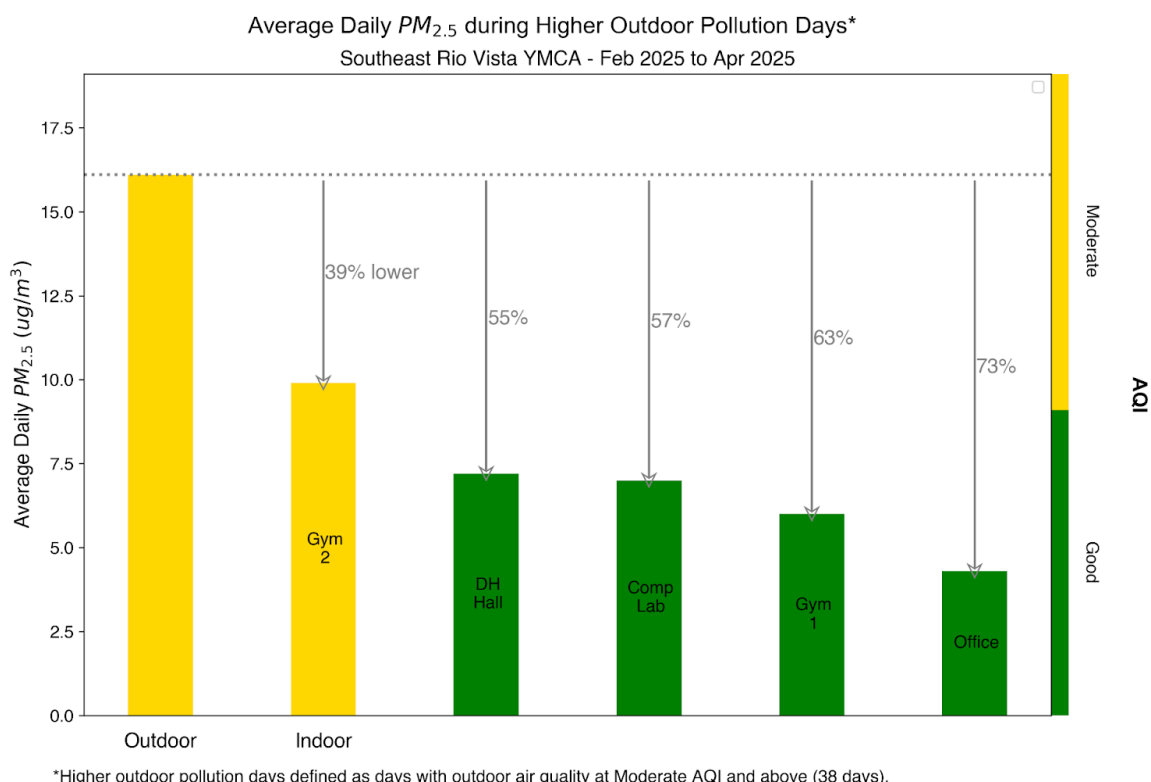


This plot shows examples of hourly indoor (solid color lines) and outdoor (dashed grey lines) $PM_{2.5}$ levels at the YMCA that are characteristic of indoor sources or activities that contribute to higher indoor air quality.

- 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 outdoor levels. This occurred between February 5th and February 10th in Gym 2 when outdoor levels were in the Good AQI. Further analysis, shown in the plot above, illustrated that these daily averages were most impacted by high hourly peaks starting the evening of February 5th and additional peaks on February 6th and February 7th, which took multiple days to lower back down. **What could have caused these higher levels in Gym 2?**

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 currently 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.

For this quarter, we are considering "higher" pollution days to be anything above Good AQI. However, air pollution was acceptable during this time, and only one day saw outdoor levels above Unhealthy for Sensitive Groups. This let us draw conclusions about indoor and outdoor PM_{2.5} comparisons from more data.

What does this chart tell us?

- On average, we would expect indoor levels to be between 30% and 80% lower than outdoor levels, depending on currently installed HVAC filtration. For this first quarter, all average indoor levels during higher pollution days were within this expected range, but levels did vary across some of the different monitored rooms and spaces. This means the HVAC filtration system is working as expected.

- Gym 2 had the highest indoor averages during higher pollution days, and were the only indoor sites that reported averages within the same Moderate AQI category as outdoor, importantly highlighting that when outdoor air was polluted, so was indoor air in Gym 2. This was due to regularly higher levels in the room across the quarter, and was not impacted by the high Gym 2 levels across February 5 - 10th, as outdoor levels were below the Moderate AQI during that period. **What could be causing these elevated indoor levels?**
- The Office measured the cleanest on average air (73% lower than outdoors). Many factors may be causing these differences, such as building and HVAC design. Statistical analysis showed that the DH hall, the Comp Lab, and Gym 1 averages were likely similar.
- In future reports, if outdoor levels rise above the Moderate AQI more frequently, we will compare data before and after the YMCA's HVAC filters were updated on January 21, 2025 to assess whether this change has had an impact on indoor levels.

