

Southeast-Rio Vista YMCA

AirAware Air Quality Monitoring Quarterly Report (05/2025 – 07/2025)



Photo of the Southeast-Rio Vista YMCA

**Prepared by the
AirAware Team**

Southeast-Rio Vista YMCA

AirAware Air Quality Monitoring Quarterly Report - # 3

May 2025 - July 2025

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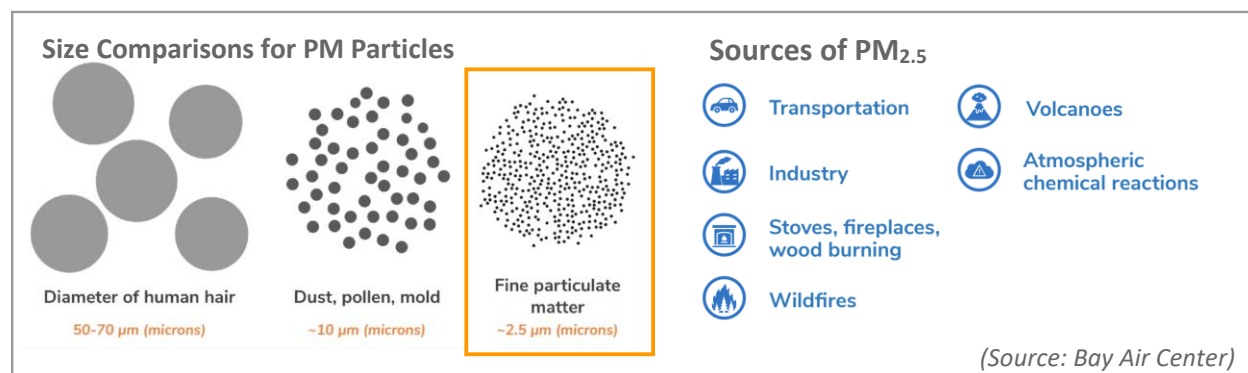
This report summarizes the recent air quality trends observed at the Southeast-Rio Vista YMCA, focusing on the differences between indoor and outdoor fine particulate matter (PM_{2.5}).

Key Takeaways

- PM_{2.5} levels varied across time and largely stayed within the Good and Moderate AQI range for outdoor and indoor conditions.
- Smoke from Fourth of July fireworks impacted indoor and outdoor air quality the most in this period and caused similar short-term levels of PM_{2.5} as during wildfires earlier in the year, highlighting the importance of non-wildfire sources of PM_{2.5} on air quality-related health impacts.
- Gym 2 had the highest indoor average during higher pollution days than other indoor spaces. The room also frequently experienced spikes in PM_{2.5} higher than outdoor levels. This may require further investigation by the YMCA.

Background

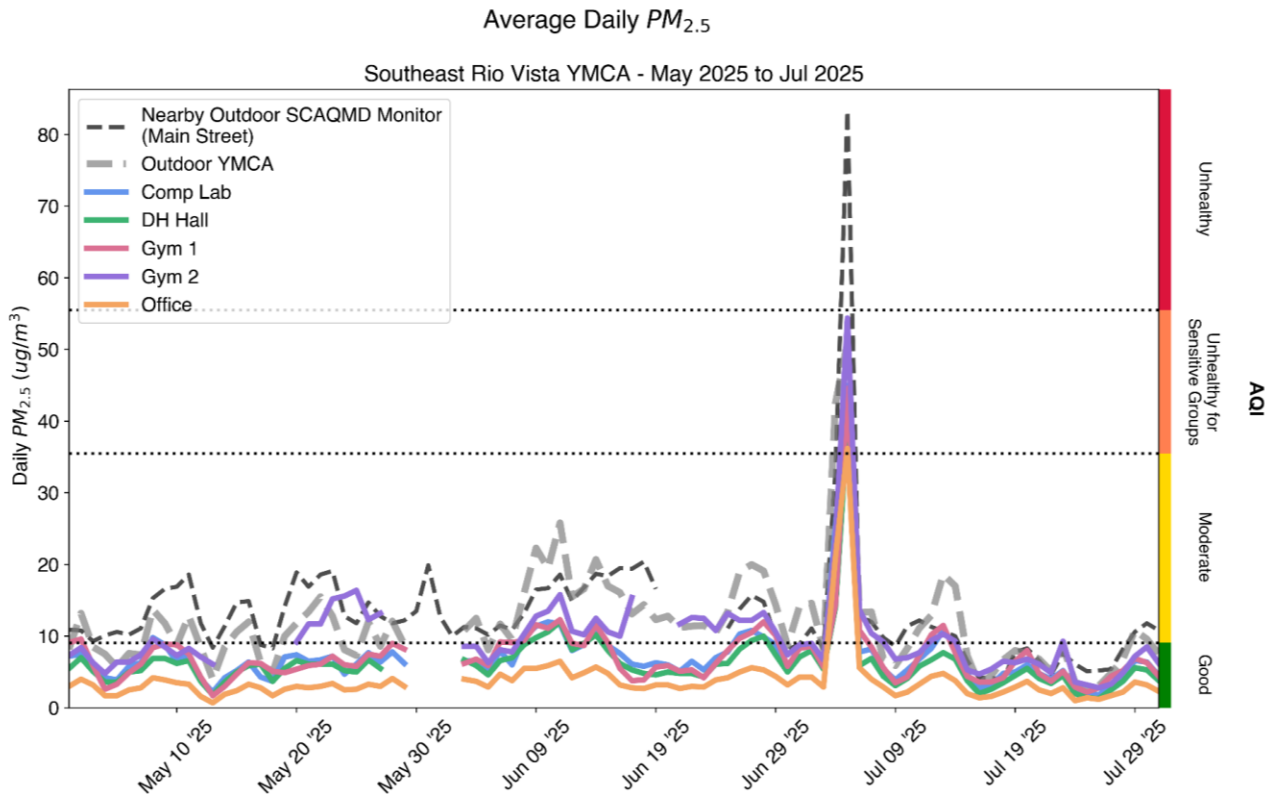
Particulate matter is an air pollutant made of tiny liquid and solid airborne particles that vary in size. Fine particulate matter (PM_{2.5}), which is the focus of the AirAware project, describes an important subset of particulate matter that is 2.5 microns and smaller in size (~30x smaller than the 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 or 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 during late spring and early summer of 2025 (May-July).



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 May 2025 to the end of July 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. The YMCA-wide data gap in late May/early June was due to routine project maintenance (6-month collocation). Any additional gaps in the data are due to issues in power or WiFi/cellular connectivity.

What does this plot tell us?

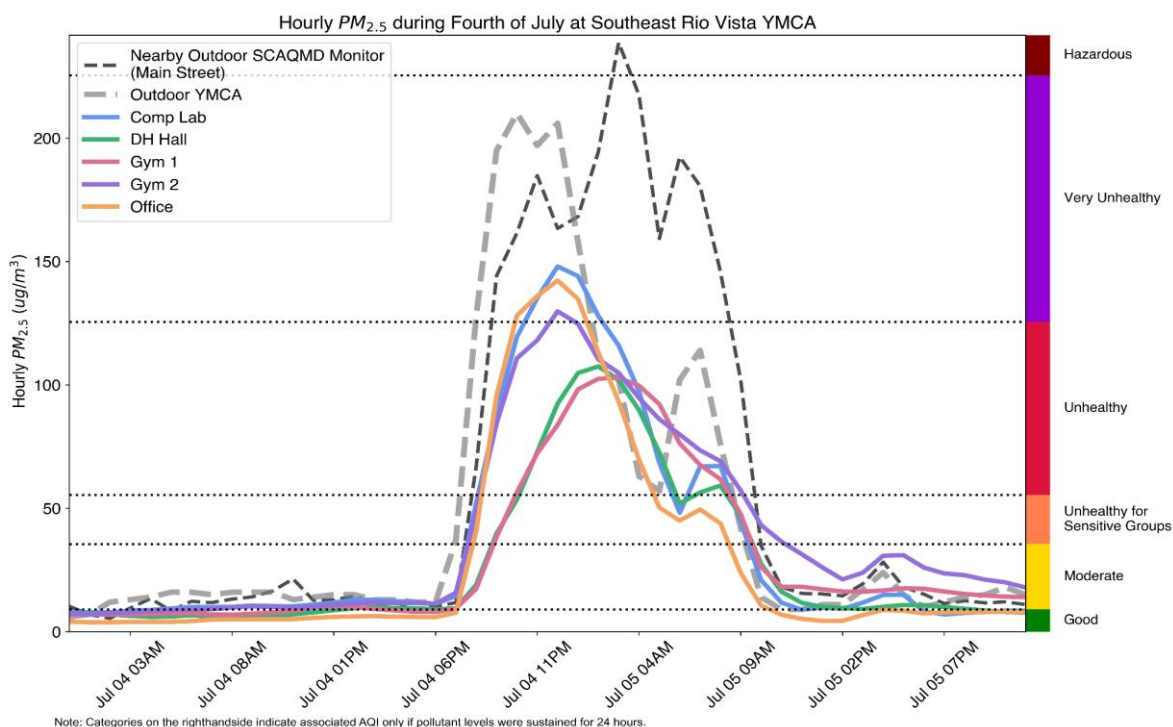
- From May 2025 to July 2025, PM_{2.5} levels varied across time, and largely stayed within the Good and Moderate AQI range. Indoor levels followed the rise and fall in outdoor air pollution, but at lower concentrations. The early July peak from Fourth of July Fireworks caused levels to reach Unhealthy for Sensitive groups both outside and inside of the YMCA, with the daily average in Gym 2 exceeding the outdoor level on July 5th. This event is discussed in more detail below.
- Gym 2 continues to show levels in the Moderate AQI more frequently than other indoor areas (earlier data also showed this trend). This is explored further on page 5.

- The outdoor YMCA monitor often showed fairly similar to or slightly higher $PM_{2.5}$ levels than the nearest regulatory monitor from the South Coast Air Quality Management District (SCAQMD) 6 miles Northwest from the YMCA, except in early July.¹

Impacts of Fourth of July Fireworks

- The highest $PM_{2.5}$ levels both indoors and outdoors occurred in early July due to Fourth of July firework-related emissions.

The plot below zooms in on the hourly data and further shows how fireworks impacted air quality both outdoors and indoors.



This plot shows average hourly $PM_{2.5}$ levels across time for both the indoor (solid color lines) and outdoor (dashed grey line) AirAware monitors from July 4th to July 5th 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, to provide health context, with the caveat that levels would need to be sustained for 24 hours to translate to the shown AQI. Times are shown in Standard Time (i.e. one hour behind Daylight Savings Time).

- These higher short-term hourly outdoor levels are similar to what was observed during the Eaton and Palisade wildfires in early January, highlighting the air quality-related health concerns of smoke from fireworks².

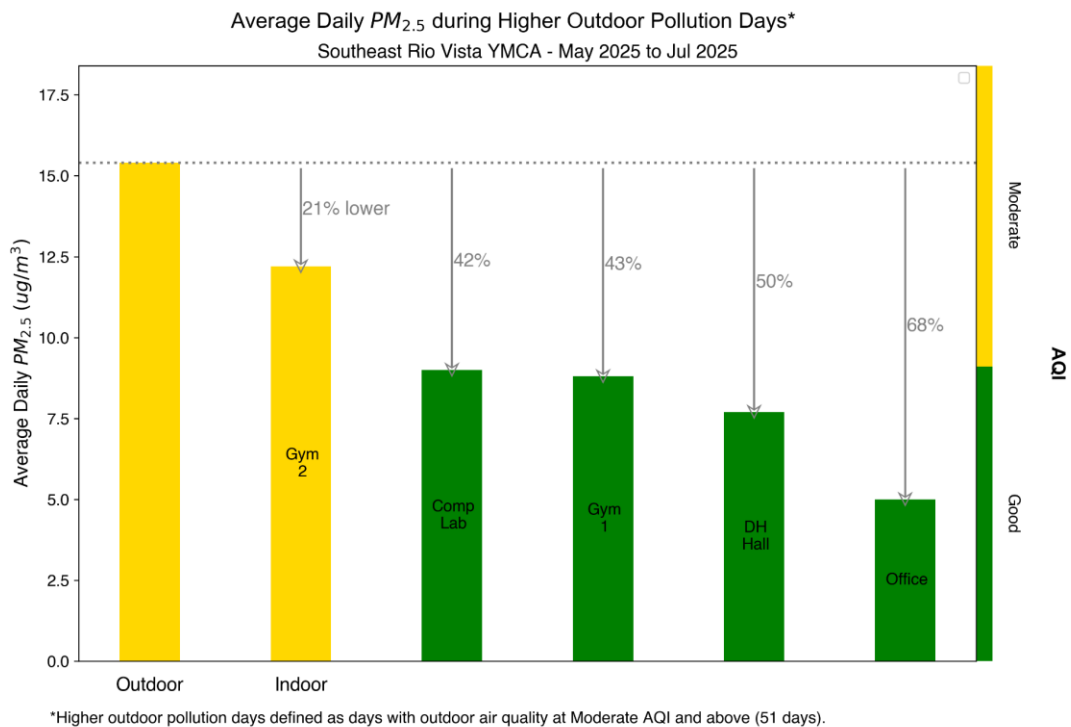
¹ The outdoor YMCA monitor has not been directly evaluated against the SCAQMD monitor, so we cannot draw conclusions about differences between the two.

² This is just one piece of the health impact puzzle. Health impacts from PM are also informed by the chemical composition of the particles, which AirAware does not measure, but which will vary for wildfire and firework-related PM emissions.

- Outdoor and indoor air quality were impacted by firework-related emissions for a prolonged period (~17 hours). PM levels began to rise in the evening on July 4th, peaked between 9PM and 1AM of the following day, remained high until the morning of July 5th, and returned to cleaner air quality by noon.
- Indoor spaces were impacted differently by the firework emissions, with the Comp Lab, Office, and Gym 2 showing higher hourly PM_{2.5} levels than the DH Hall and Gym 1, which also peaked a couple of hours later.
- While the YMCA was likely closed during most of these hours, the impacts to indoor air quality apply to other indoor environments and highlight the importance of filtration during these events as well. **Was your YMCA open during these hours?**

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's HVAC system is currently 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.

For this quarter, we are considering "higher" pollution days to be anything above Good AQI. This let us draw conclusions about indoor and outdoor PM_{2.5} comparisons from more data.

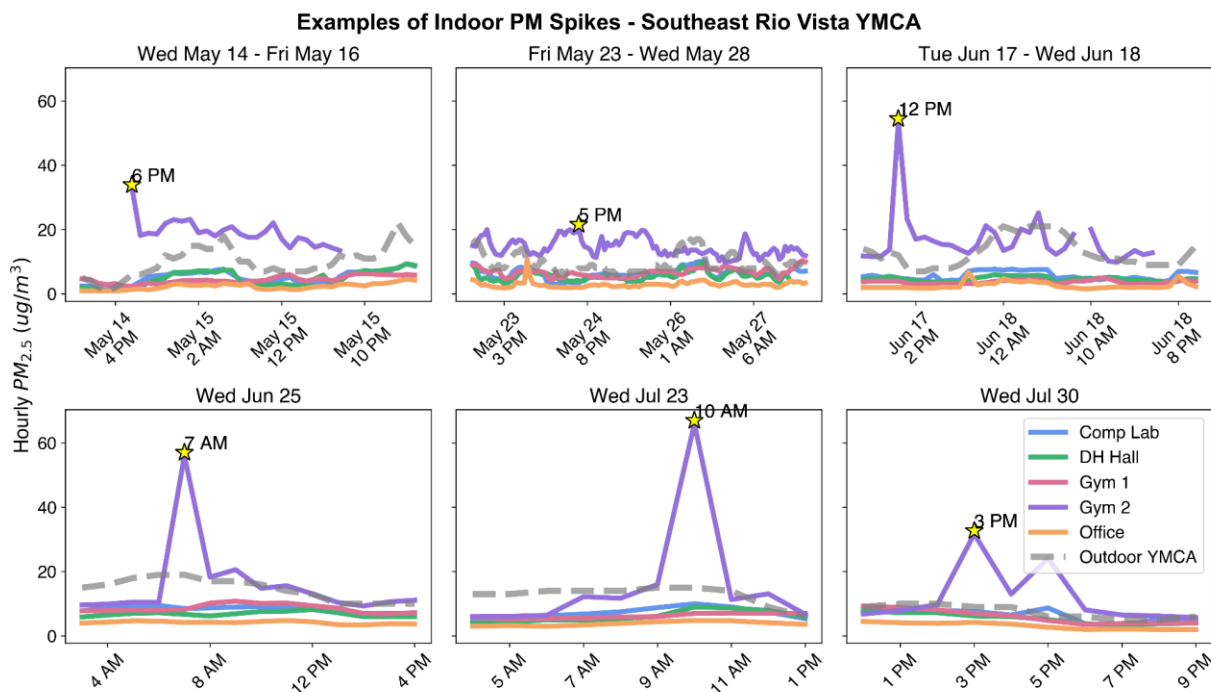
However, air pollution was acceptable during this time, and only one day saw outdoor levels in Unhealthy for Sensitive Groups or above.

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, except in Gym 2. This means the HVAC filtration system is generally working as expected.
- Gym 2 had the highest indoor averages during higher pollution days, and was largely the only indoor site 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. **What could be causing these elevated indoor levels?**
- The Office continues to measure the cleanest on average air (68% 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.

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 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. All times are shown in Standard Time (i.e. one hour behind Daylight Savings Time).

What does this chart tell us?

- PM_{2.5} levels in Gym 2 frequently rose above outdoor levels, sometimes at double the outdoor concentration. The plot above shows examples of hourly indoor spikes in Gym 2 from May through July.
- For most of May and June, levels in Gym 2 were consistently similar to or higher than outdoor levels, with a few peaks, seen in the top three panels of the chart. From the end of June to July, we observed more isolated spikes in PM_{2.5} in Gym 2, all occurring on Wednesdays, but at different times. **What could be causing these patterns of elevated PM_{2.5} in Gym 2?**

