

# Investigating the spatial variation of PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in residential indoor environments in Mexico City

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Thirty years of control policies have achieved a downward trend in most air pollutants in Mexico City, once known as the most polluted city in the world. Although outdoor air quality is regulated, no guidelines exist for indoor pollution. When air pollution exceeds thresholds considered harmful for sensitive population subgroups, health and environmental authorities recommend staying indoors, where concentrations can be higher than outdoors.

During the COVID-19 lockdown restrictions, Mexicans spent 90% of their time indoors, potentially having significant exposure, among other pollutants, to PM<sub>2.5</sub> and PM<sub>10</sub>, which are frequently above the Mexican air quality standards and the WHO guideline. The results show the differences between the particulate concentrations inside and outside selected homes in Mexico City.

Two Particle Plus monitors, equipped with laser particle counter sensors, were simultaneously placed indoors and outdoors in 38 homes for 7 days. During the follow-up, each participant completed a diary with information such as cooking and cleaning activities, lighting candles, or burning incense. Participants also completed an online questionnaire to capture broader details, such as the number of occupants in the home, the type of building construction, and proximity to industry and heavy traffic.

Indoor PM<sub>2.5</sub> concentrations averaged 22.4 µg/m<sup>3</sup>, with a maximum of 1372.6 µg/m<sup>3</sup>, while these values for PM<sub>10</sub> concentrations were 71.7 and 12457.3 µg/m<sup>3</sup>, respectively. Outdoor PM<sub>2.5</sub> concentrations averaged 20.9 µg/m<sup>3</sup>, with a maximum of 1046.7 µg/m<sup>3</sup>, while PM<sub>10</sub> concentrations were 75.2 and 10664.4 µg/m<sup>3</sup>, respectively. The PM<sub>2.5</sub>/PM<sub>10</sub> ratio was on average 0.3, both indoors and outdoors indicating the presence of larger particles resuspended by movement of vehicles and people. 21% of the analyzed homes were observed to have a higher maximum PM<sub>2.5</sub> concentration outdoor than indoor (with a maximum of 3.6 times the indoor concentration), in 18% these concentrations were similar (proportions of 0.8 to 1.2) and in

60% of the cases, the maximum PM<sub>2.5</sub> concentration was higher indoors (up to 9 times the maximum outdoor concentration). Higher indoor PM<sub>2.5</sub> concentrations were found to be primarily related to cooking and, to a lesser extent, cleaning activities; PM<sub>2.5</sub> peaks can take 4 to 8 hours to decrease to baseline levels.