

PM_{2.5} Concentrations at a Cannabis Smoking Lounge

Schick SF¹, Huang A^{1*}, and Murphy M^{1*}.

¹University of California, San Francisco, Department of Medicine, San Francisco, CA, U.S.

Supported by TRDRP grant # 28IR0049

BACKGROUND

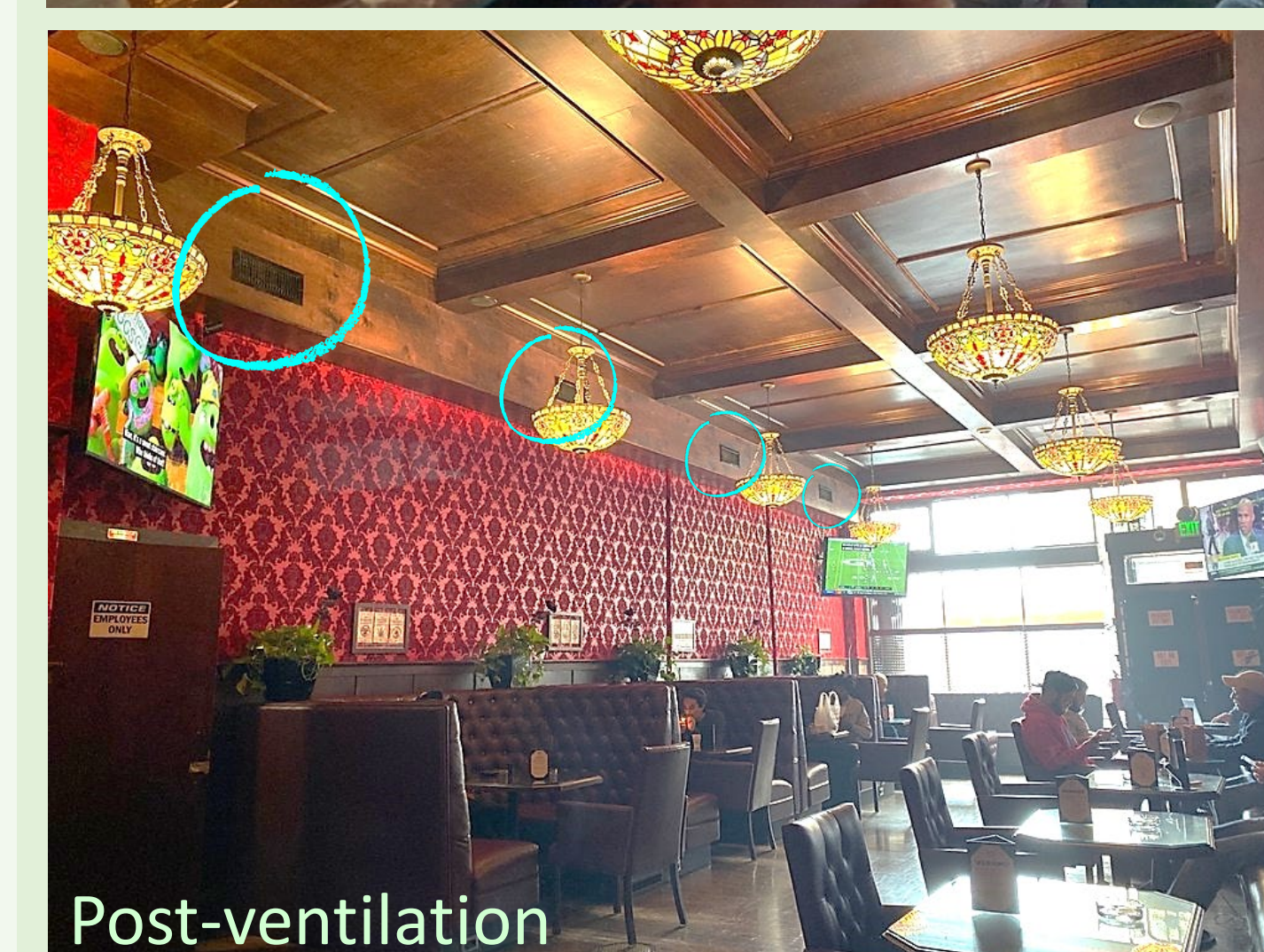
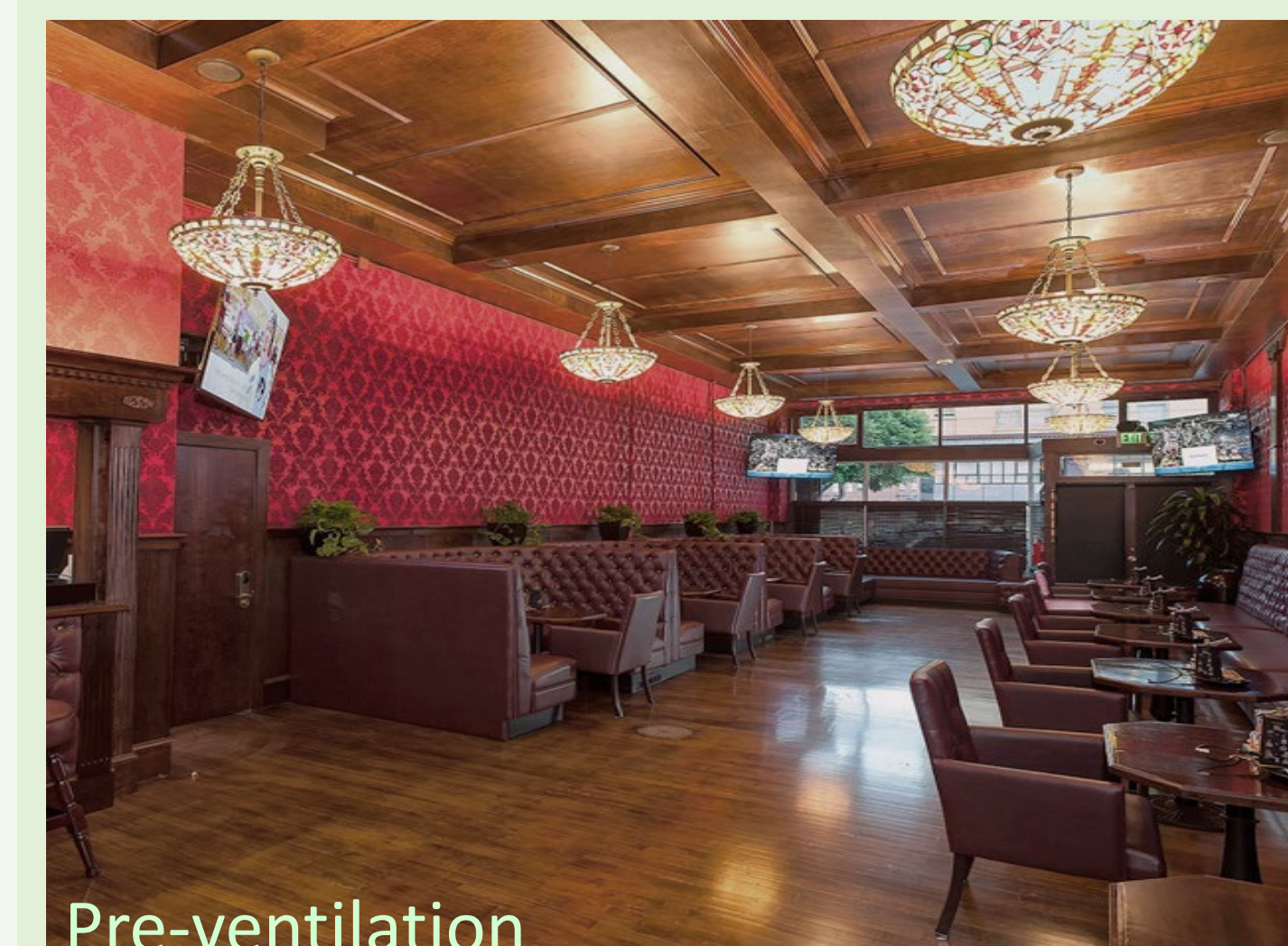
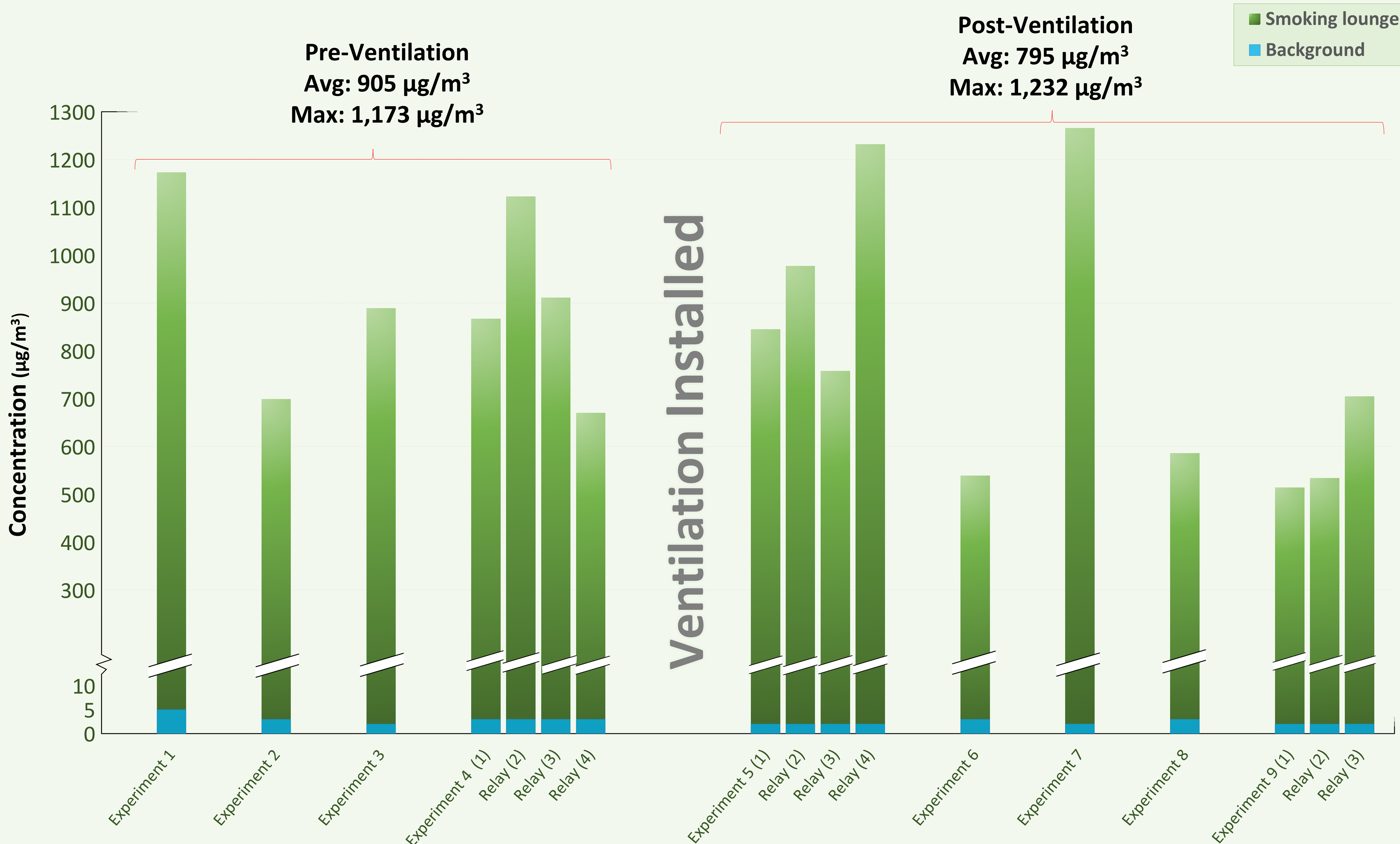
Smoking cannabis in most public places remains illegal in California. State law allows local government to issue permits for cannabis consumption in licensed cannabis stores. Consumption activity can include smoking, vaping, dabbing, and ingesting cannabis products. Secondhand cannabis smoke is the smoke emitted by burning cannabis between puffs and exhaled smoke. Due to the scarcity of research to date on secondhand cannabis smoke, we collected air samples at a smoking lounge in a cannabis store in San Francisco to measure the potential exposures to fine particulate material 2.5 micrometers in diameter and smaller (PM_{2.5}). PM_{2.5} exposure causes cardiopulmonary disease.

RESULTS

The average PM_{2.5} concentration measured over the course of nine visits and 10 hours of measurements in the dispensary was **840 µg/m³**. The business installed a ventilation system halfway through our study. Before the ventilation system was installed, the average PM_{2.5} was **905 µg/m³**, afterwards it was **795 µg/m³**; a 12.2% decrease. We measured cannabinoids in the two longest experiments and the average concentrations in the lounge for THC, CBD, and CBN were **79.0 µg/m³**, **0.71 µg/m³**, and **7.2 µg/m³** respectively.

METHODS

We measured airborne PM_{2.5} within a cannabis smoking lounge in the Bay Area. We carried the sampling equipment in backpacks, relaying them between researchers for some experiments to collect multiple readings in a single visit. Visits lasted 32 to 152 minutes. PM_{2.5} concentrations were measured in real time using laser photometers (Sidepak model AM510, and DustTrak model 8532, TSI Inc., Shoreview MN) fitted with 2.5 µm impactors to exclude larger particles. For gravimetric aerosol particle and cannabinoid measurement, air pumps (model 800485, Sensidyne L.P., St. Petersburg, FL, model 1003002K, SKC Inc., Eighty Four, PA) were fitted with 37 or 47 mm filters (Pallflex Emfab, Pall Corporation, Cortland, NY, and 1851-037 or 1822-037, Whatman, GE Healthcare Life Sciences, Chicago, IL). The filters were pre- and post-weighted on a Mettler Toledo XP26 analytical microbalance. The air pumps and photometers were calibrated with a soap bubble spirometer (Gilibrator-1, Sensidyne, LP, St Petersburg, FL).



U.S. EPA AQI Thresholds for PM_{2.5}

| AQI | "Level of Concern" | PM _{2.5} µg/m ³ |
|---------|--------------------------------|-------------------------------------|
| 0-50 | Healthy | 0-12 |
| 51-100 | Moderate | 12.1-35.4 |
| 101-150 | Unhealthy for Sensitive Groups | 35.5-55.4 |
| 151-200 | Unhealthy | 55.5-150.4 |
| 201-300 | Very Unhealthy | 150.5-250.4 |
| 301-500 | Hazardous | 250.5-500.4 |
| | Beyond the Scale | >500.5 |

CONCLUSIONS

The PM_{2.5} concentrations we observed are similar to the highest published concentrations measured in public places where people were smoking tobacco (1) and similar to the maximum PM_{2.5} concentrations observed after smoking a single joint in a small, unventilated bedroom (2). Because the sampled nicotine concentrations in the dispensary were below 0.10 µg/m³, the cannabinoid concentrations were high, and the background particle concentrations outdoors and in a nearby business were low, we believe that nearly all the particulate matter measured in the dispensary derived from cannabis consumption. Particulate air pollution exposure is known to cause cardiovascular and respiratory disease (3). Cannabis smoke is chemically similar to tobacco, containing many of the same carcinogens and toxins (4). It is important to recognize that secondhand cannabis emissions can pose a hazard to human health, whether it be the employees working long hours daily or the average visitor settling in the lounge.

REFERENCES

- California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Office of Air Resources Board. Proposed identification of environmental tobacco smoke as a toxic air contaminant. Oakland California: California Environmental Protection Agency; 2005 June 24, 2005.
- Ott WR, Zhao T, Cheng KC, Wallace LA, Hildemann LM. Measuring indoor fine particle concentrations, emission rates, and decay rates from cannabis use in a residence. Atmos Environ. 2021;10.
- Li MH, Fan LC, Mao B, Yang JW, Choi AMK, Cao WJ, et al. Short-term Exposure to Ambient Fine Particulate Matter Increases Hospitalizations and Mortality in COPD: A Systematic Review and Meta-analysis. PLoS One 2015; 10(9):e0138146.
- Moir D, Rickert WS, Leveseur G, Larose Y, Maertens R, White P, et al. A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions. Chem Res Toxicol. 2008;21(2):494-502.