

# Risky Businesses: Carbon Dioxide Monitoring to Assess Ventilation in Grocery Stores as an Indicator of Risk for Respiratory Virus Transmission

Maria Torres-Teran MD<sup>1</sup>, Jennifer L. Cadnum BS<sup>1</sup>, Curtis J. Donskey MD<sup>2-3</sup>

<sup>1</sup> Research Service, Louis Stokes Cleveland Veterans Affairs Medical Center, Cleveland OH, <sup>2</sup>Cleveland VA Geriatric Research, Education, and Clinical Center, Cleveland, OH, <sup>3</sup> Case Western Reserve University School of Medicine



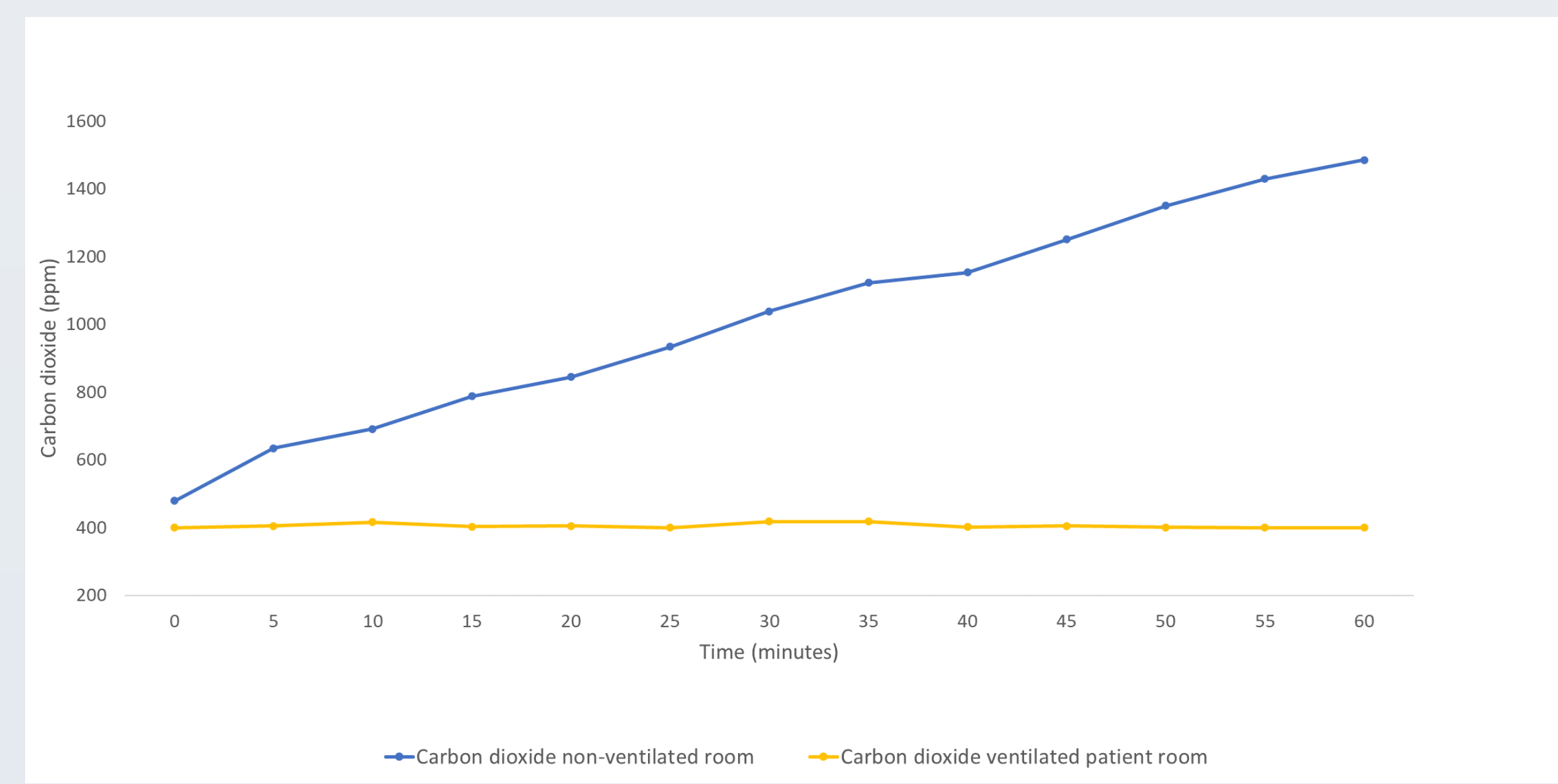
Follow The CLEAn Team @CLE\_Cleans

Poster # 1926

Contact: Maria.torresteran@va.gov

## Background

- Poorly ventilated indoor settings pose a risk for transmission of SARS-CoV-2 and other respiratory viruses
- Transmission often occurs in the community, but limited information is available on the quality of ventilation in community settings
- Carbon dioxide monitoring has been recommended as a practical tool to assess ventilation in occupied spaces (Figure 1) (carbon dioxide levels: outdoor air ~400 parts per million (ppm); exhaled breath ~40,000 ppm)



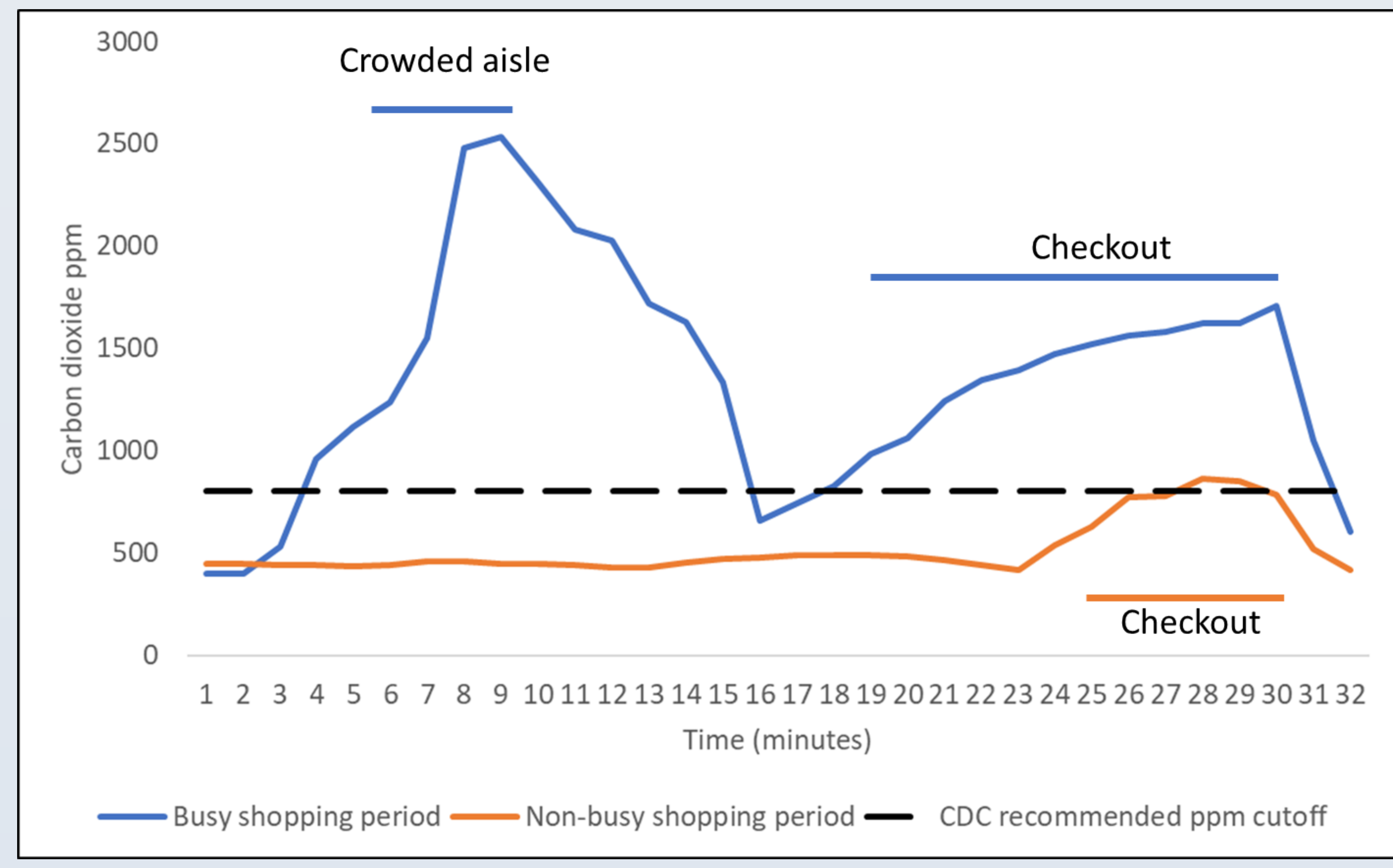
**Figure 1.** Carbon dioxide levels increase in a non-ventilated room with 2 occupants but not in a well-ventilated patient room

## Methods

- Carbon dioxide levels were monitored continuously in 10 grocery stores using a handheld carbon dioxide monitor (Figure 2) during busy and non-busy shopping periods
- Carbon dioxide readings above 800 ppm were considered an indicator of suboptimal ventilation for the number of people present
- During shopping trips, locations in the store and the approximate number of people present in each location were recorded

## Results

- Of 10 grocery stores studied, 3 (30%) were classified as large supermarkets, 6 (60%) were classified as medium-sized grocery stores, and 1 (10%) was a smaller convenience store that sold groceries
- During non-busy shopping periods, carbon dioxide levels remained below 800 ppm in all 10 stores
- During busy shopping periods, carbon dioxide only rose above 800 ppm in 2 (20%) stores, both of which were medium-sized supermarkets
- For the 2 stores with carbon dioxide levels above 800 ppm, the levels were elevated in busy checkout areas and in one store in crowded, relatively narrow aisles
- Figure 3 shows carbon dioxide levels in one store with elevated levels during busy and non-busy shopping periods



**Figure 3.** Increase in carbon dioxide levels in parts per million (ppm) in a grocery store during busy and non-busy shopping trips

**Figure 2.** Handheld carbon dioxide monitor



## Conclusions

- Ventilation in most grocery stores may be adequate to minimize the risk for transmission of airborne pathogens
- Some stores may have sub-optimal ventilation for crowded locations and during busy shopping times
- Portable air cleaners with high efficiency particulate air (HEPA) filters could be used in areas such as the checkout counter
- Carbon dioxide monitoring could potentially be a useful tool to assess ventilation in community settings

## Acknowledgements

We thank William Rutala, PhD for helpful discussions.



ID week link