

Hoskin Z, Siegel JA, Haines S. 2024. Estimating indoor airborne concentrations of SARS-CoV-2 RNA using quantitative filter forensics. *Building and Environment*, **259**, 111632. DOI: 10.1016/j.buildenv.2024.111632

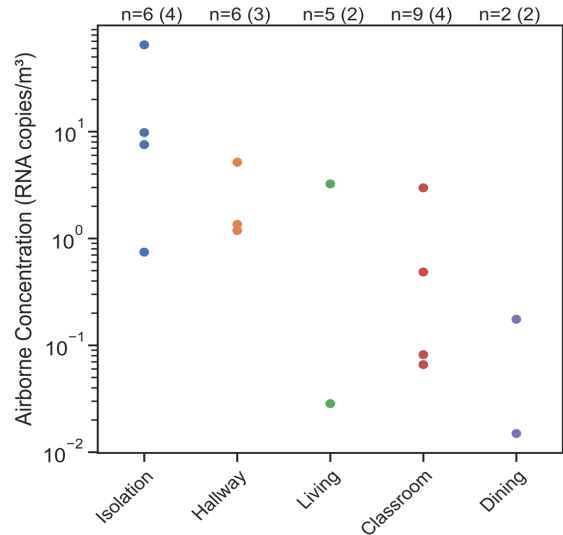
### Abstract

This investigation used portable air cleaners (PACs) and quantitative filter forensics (QFF) to assess week-long average airborne concentrations of SARS-CoV-2 RNA in homes occupied with COVID-symptomatic individuals, classrooms, and dining locations throughout Toronto, Canada. PACs were deployed for one week each, and dust from filters was collected via vacuuming. SARS-CoV-2 RNA from filter dust was quantified using reverse transcription-polymerase chain reaction (RT-PCR). RNA quantities and PAC metadata were used to estimate airborne concentrations of SARS-CoV-2 RNA. The highest concentrations of RNA were found in isolation rooms (median concentration=8.68 RNA copies/m<sup>3</sup>). Classrooms had lower concentrations during summer than in fall and winter (median concentration of sampling weeks when RNA was present = 0.02 RNA copies/m<sup>3</sup> and 0.11 RNA copies/m<sup>3</sup>, respectively), which may be attributed to differences in classroom occupancy among other factors. Limitations include unknown recovery efficiency of RNA from filters and the dynamics of concentrations due to the temporal averaging provided by QFF. Our results are consistent with previous research highlighting the effectiveness of isolation in preventing distribution of high concentrations of SARS-CoV-2 RNA throughout a home. Overall, QFF is a beneficial tool for environmental sampling of respiratory airborne virus RNA such as SARS-CoV-2 RNA, that can be implemented for long-term sampling in mixed-occupancy environments.

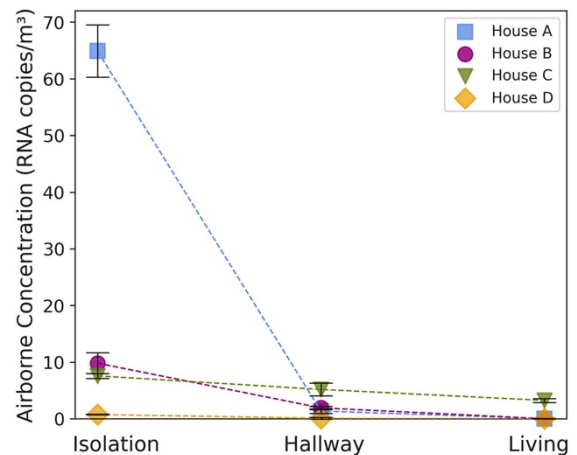
### Main findings

1. Quantitative filter forensics provides week-long estimates of airborne SARS-CoV-2 RNA
2. Isolation rooms have the highest SARS-CoV-2 RNA concentrations in homes
3. Classrooms have seasonal differences in concentrations of SARS-CoV-2 RNA
4. No significant difference in RNA quantification between RT-dPCR and RT-qPCR

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**Fig. 1.** Average airborne concentrations of SARS-CoV-2 RNA above the limit of quantification (LoQ) in isolation rooms, hallway, living room, classrooms, and dining locations.



**Fig. 2.** Estimated airborne concentrations of SARS-CoV-2 RNA above the limit of quantification (LoQ), quantified with RT-qPCR in houses with a symptomatic person.

