Ontario School Safety
School Buses

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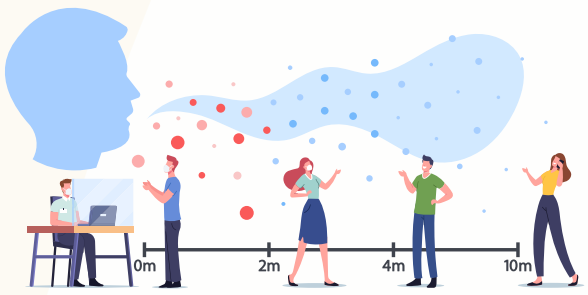
Ventilation on a School Bus

Due to their design, many school buses have poor ventilation, causing high levels of carbon dioxide (CO_2) on the bus. They have low ceilings and not enough fans or filters to move the air. Classrooms aim for 6+ air exchanges per hour (ACH) using ventilation and filtration but school buses may only get 0.13-1.9 ACH with fresh air [1, 2]. Opening the windows on a bus can help improve the air quality [2], but this may be challenging when outdoor air quality is poor, like on wildfire smoke days.

Airborne Viruses & Health Impacts



High CO_2 levels mean you are breathing other people's exhaled air—including whatever illnesses they have. Measles, Strep A, Influenza, RSV, SARS-CoV-2 (the virus that causes COVID-19), the Common Cold, and even Norovirus can float and spread in the air like smoke [3-9]. SARS-CoV-2 can infect someone within 6-37 minutes in air that is not moving [10]. Each COVID-19 infection increases the risk of experiencing long-term symptoms like fatigue, shortness of breath, and "brain fog" [11]. Approximately 1 in 9 Canadians have long-term COVID-19 symptoms, and some have yet to fully recover [11]. **Kids can suffer with long-COVID, too** [12].

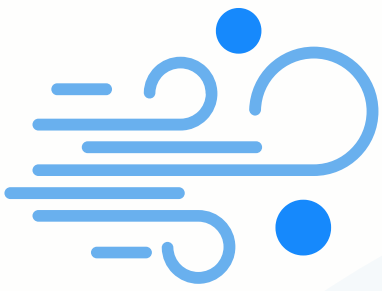
Crowding & Time on a School Bus

The design of school buses, combined with how we load and unload them, increases the risk of exposure to high levels of CO_2 and inhaling rebreathed air. Students often sit shoulder-to-shoulder for 20-30 minutes to and from school in a space with low ceilings and little to no fresh air supplied. Each seat acts like a small compartment where kids talk, shout, laugh and sing while sharing air. Crowding also occurs in the aisles when boarding or leaving the bus. [13]

Monitoring CO_2 & Ventilation Quality

Humans are the main source of the CO_2 that contributes to poor indoor air quality. Exhaling especially increases the CO_2 concentration in poorly-ventilated spaces. Measuring CO_2 levels can indicate how well our exhaled air is replaced with fresh air. Outdoor air ranges from 300-500 parts per million (ppm) of CO_2. **Community members have measured 3000 ppm on fully occupied school buses**. These levels are 3x higher than Canada's long-term exposure limit of 1000 ppm, which aims to limit health risks. For example, as CO_2 increases, humans are at a higher risk of tiredness, headaches, dizziness, and concentration difficulties. No one wants to be behind the wheel when feeling tired, dizzy, or having difficulty concentrating—especially when transporting students. [14]

Improving Air Quality on School Buses



Reducing CO_2 and the risk of spreading preventable diseases on school buses is important for keeping drivers healthy and working and students safe on their way to and from school. We have tools—let's use them!

- Opening windows and any available roof hatches to improve ventilation when the bus moves
- Maximizing the fresh air defroster fan speed to bring more outdoor air into the bus
- Investing in portable air filtering units with high clean air delivery rates for the driver and the entire bus
- Wearing high-quality, tight-fitting, high-filtration masks like (K)N95 respirators to filter rebreathed air
- … and more! [2, 13]

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