

Testimony of Donald K. Milton, MD, DrPH in favor of HB686. I am Professor of Environmental and Occupational Health at the University of Maryland School of Public Health, College Park, MD and was named MPowering Maryland Professor for my contributions to understanding airborne infection transmission and collaborations uniting the Baltimore and College Park campuses. Having graduated from Baltimore City Public Schools, UMBC (a classmate of the Speaker), and the Johns Hopkins School of Medicine, I've lived in Maryland most of my life.

Safer, cleaner, indoor air in Maryland schools resulting from enactment of this bill will make major contributions to the health of our children and communities. Ventilation, bringing outdoor air into classrooms, was repeatedly shown to reduce illness absence from school and work – before the pandemic. For example, in 2013 researchers from the Lawrence Berkeley National Laboratory showed that simply increasing school ventilation sufficiently to keep indoor carbon dioxide (CO<sub>2</sub>) levels under about 1000 to 1200 ppm would reduce illness absence rates in California schools by 3.4% <sup>1</sup>. A review and summary of research on ventilation in schools (a total of 28 peer-reviewed reports published in 2017) found that the average and median classroom peak-CO<sub>2</sub> levels were frequently more than 2000 ppm and the maximum concentrations were as high as 6000 ppm <sup>2</sup>. Consider what that means. Because indoor CO<sub>2</sub> comes from the exhaled breath of people, if indoor air contains 6000 ppm of CO<sub>2</sub>, then 15% of each breath that a child takes is air that someone else just exhaled. Lowering the CO<sub>2</sub> to 1000 ppm reduces the amount of re-breathed air 10-fold to 1.5% <sup>3</sup>.

Re-breathing, sharing exhaled air from other people, inhaling virus floating in the air, is how the virus that causes COVID-19 passes from person-to-person. The US Centers for Disease Control and Prevention (CDC) and the World Health Organization both now recognize that airborne transmission is the main way that the coronavirus spreads <sup>4,5</sup>. Ventilation makes a difference. The CDC did an extensive analysis of COVID-19 incidence in November-December 2020 among students and staff in Georgia elementary schools. Schools with improved ventilation had 39% lower rates of COVID-19 than schools that had not improved ventilation <sup>6</sup>. Consider that the effect of ventilation was at least as large as the effect of mask mandates for staff (37%) – without requiring individual behavior changes. Therefore, ventilation is a key component of strategies to control COVID-19, including future variants <sup>7</sup>.

And, this isn't just a problem with COVID-19. It is now increasingly well recognized that influenza and many other respiratory infections are also airborne infections <sup>8-10</sup>. Therefore, improving ventilation will not only reduce risk of passing COVID-19 around in the classroom, it will also reduce risk of transmitting influenza and other respiratory viral infections. What's more, school-associated respiratory viral infections have been the major cause of childhood hospitalizations over many years because they trigger acute asthma attacks. Canadian and British investigators showed the annual September epidemic of asthma hospitalizations reliably occurs 18 days after the opening of public schools for the fall semester and were due to respiratory viral infections <sup>11,12</sup>.

Consider that the Pandemic Preparedness Plans, for the last 20 years, included closing schools during an influenza pandemic <sup>13,14</sup> – largely because they are well known hotspots for influenza transmission due to notoriously poor ventilation. Consider what the costs of school closures has been and will be again in future pandemics. Pandemics aren't going away, but poor ventilation is a problem we can solve.

The benefits of improved ventilation are not limited to reduced illness absence and hospitalization. Student intellectual functioning and academic performance also benefit from improved ventilation. Every intervention study that has tested whether increased ventilation impacted student performance has shown significant improvements <sup>2</sup>.

The costs of increased ventilation, which might be as much as \$5 to \$10/student per year, pale in comparison with the benefits of reduced illness absence, pediatric hospitalizations, and improved student performance and learning. Avoiding school closures during severe influenza epidemic and future pandemics is priceless.

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