



# **COVID-19, HVAC & Healthy Buildings**

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**Washington, DC**

**March, 2021**

## BACKGROUND & CONTEXT

### **Our current operational approach conflates community spread with front-line exposure**

- Evidence supports that community spread is aerosol-driven<sup>1-3</sup>
- Effective strategies to mitigate community spread by aerosol transmission are not comprehensively discussed<sup>4</sup>

### **Continuing along this path will serve to prolong the pandemic**

- Change of approach is imperative, with a focus on mitigating transmission rather than attempting to annihilate it<sup>5,6</sup>
- Many states' opening strategies problematically rely on the implementation of cloth face coverings and ultra-hygiene measures, despite their ineffectiveness<sup>7-10</sup>

**Good lessons to be learned from Japan & Sweden<sup>11-12</sup>**

## THE PROBLEM

Aerosol-driven transmission has been excluded from our operational approach, and this will greatly hinder our ability to open all facets of society, safely.

- Scientific information pertaining to COVID-19 that may implicate policy is uncoordinated and often unattainable, as well as highly technical and largely incomprehensible to decision makers
- Policies predicated on wrong or incomplete information have dire consequences for a public that is currently vacillating between inexorable anguish and abject apathy

## THE SOLUTION

### **HVAC can solve this problem.**

High volume air exchange can remove lingering aerosol contaminants from indoor spaces<sup>13</sup>.

- Prioritize schools & universities, hospitality & retail
- Extend to housing complexes/nursing homes
- Generalize to larger venues

**CDC absolutely needs to compile a working group of ASTM/NIOSH and a slew of HVAC industry heads to establish air quality standards for aerosol contaminants in public spaces.<sup>4,14</sup>**

## STRATEGY & IMPLEMENTATION

**Multi-pronged approach to coordinate information and insights from science, industry, government, & consumers**

- Each arena has knowledge to which others are not privy
- Comprehensively patching the holes in understanding between each arena is imperative for operation

### Science-Industry

- Perform basic research to establish upper limits on air handlers/exchangers to remove molecular contaminants from various indoor spaces
- Further R&D and product development to increase capabilities for consumer products
- Amend current protocols and provide clear operational guidance for consumers to implement protocols

### Industry-Government

- Provide funding for research
- Provide incentives for consumers to purchase new systems or retrofitted solutions to their current systems

1. <https://www.scientificamerican.com/article/how-superspreading-events-drive-most-covid-19-spread/> -- super spreader events account for most cases of COVID-19; the language here around aerosol and large respiratory droplets is ambiguous and problematic (see Note 4. below) but the main takeaway is that close-quarters and unventilated spaces where people are *talking and breathing heavily* is very problematic (small particles will remain suspended and can infect multiple people). [This is evidence of aerosol transmission](#), spread throughout an apt. building in S. Korea.
2. <https://www.nytimes.com/2020/07/04/health/239-experts-with-one-big-claim-the-coronavirus-is-airborne.html> -- at the behest of scientists all over the world, the WHO recognized aerosol transmission of SARS-COV-2
3. <https://www.theatlantic.com/health/archive/2020/07/why-arent-we-talking-more-about-airborne-transmission/614737/> this is one of many pieces demonstrating that ventilation is an absolute necessity.
4. Despite emerging evidence, CDC's stance is still that SARS-COV-2 is largely spread by "respiratory droplets" from people coughing, sneezing, breathing, or talking; though sneezing and coughing expels different size droplets from breathing and talking, we've turned our attention to mitigate sputum from coughing/sneezing, and largely ignored aerosols (except with regard to dentistry). Several articles in the NYT, Atlantic, and others discuss it, and call upon CDC to set standards, **but there is no comprehensive approach to do so. CDC absolutely needs to compile a working group of ASTM/NIOSH and a slew of HVAC industry heads to establish air quality standards for aerosol contaminants in public spaces.** Congress needs to make a congressional inquiry to DHHS pertaining to the reasoning that CDC is not prioritizing standards for indoor air quality, related to COVID-19.
5. The narrative of "flatten-the-curve" was appropriate for a time when more information was required to understand the problem at hand; that narrative has morphed into "no-one-can-catch-this-ever," and this framing of the problem can cripple us.
6. <https://www.bmj.com/content/372/bmj.n494> -- The virus is likely not going away.
7. Early models of the outbreak ignored aerosol transmission, and face coverings have been promoted as necessary in preventing transmission, if not government-mandated. Masks (PPE) and face coverings (not PPE) are not the same, though they are often referenced synonymously. From a CDC-led working group, [ASTM has now issued guidelines for face coverings](#).
8. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2440799/> -- cloth face coverings are useless for particles under 10 microns, but can be effective for larger particles, like spit. I'll also mention that much policy has been driven by this study -- <https://pubs.acs.org/doi/10.1021/acsnano.0c04676> -- that had to be so heavily corrected that it should've been outright retracted. The conclusion that the authors drew in the corrected version was that cloth face covering provided 1-3% efficacy for aerosols (as was previously referenced by Dr. Birx), with no humidity implications or mobility on the face (which would render this to effectively 0% effective), as opposed to the originally proclaimed 20%.
9. <https://advances.sciencemag.org/content/early/2020/08/07/sciadv.abd3083> -- this doesn't have a handle on small, aerosol particles, but does definitively show that small particles are expelled in talking, and, presents an at-home method for attaining efficacy of facial coverings made from various, testable materials.
10. CDC has stated that SARS-COV-2 is not fomite transmitted, but we continue to hyperbolically and theatrically wipe down surfaces.
11. <https://www.bbc.com/news/world-asia-53188847> -- Japan adopted the Three Cs to avoid: enClosed spaces, crowds, close quarters. While much rhetoric pertaining to the positive outcomes Japan had rendered from this approach has been pointed at face coverings, the increase in cases as more people venture indoors again dispels that belief.
12. <https://fortune.com/2020/08/05/sweden-anders-tegnell-face-masks-school-opening-coronavirus-covid-19-europe/> -- Sweden only closed its borders to non-Euro citizens and the economy (and schools) remained open throughout the pandemic; the number of cases has decreased significantly as more people have been exposed and recovered, but a significant number of fatalities had occurred. Sweden is not looking to attain "herd immunity," per se, but it will be interesting to see if citizens are more robust to subsequent waves (which will likely be less virulent) than neighboring countries who locked down completely in the interest of preventing transmission altogether. Though Sweden has been successful in weathering the worst without shutting down, the undue risk to those who were seriously at-risk was reckless. Imperative to note that Swedes wholly trust "The Agency."
13. High volume air exchange is regularly employed for clean rooms and biohazard labs, with standards set for relevant contaminants in a given environment. <https://www.ashrae.org/> has codified standards for HVAC operation, and the organization in July, 2020 released a protocol for opening schools & universities, although it's predicated on the previous standards. The caveat in the current protocol is to "run ventilation at a higher rate," but that standard for COVID is as-of-yet unknown. Nonetheless, we don't have to start from scratch, as many spaces with good ventilation have already been shown to be safe ([airplanes](#) & [gyms](#)).
14. 2021 CDC Guidelines for opening schools, "ventilation" means opening windows, where appropriate. "HVAC" [is not mentioned in the guidelines](#).