Good morning Chairman Pinsky, Vice-chair Kagan, and members of the committee.

Thank you for inviting me to speak at this hearing. As Chairman Pinsky mentioned, I'm a Senior Scholar at the Johns Hopkins Center for Health Security and an Assistant Professor in the Department of Environmental Health and Engineering.

My focus here will be on layered public health interventions that can be put in place in schools to reduce risks from COVID-19. *The opinions expressed here are my own and do not necessarily reflect the views of the Johns Hopkins University*.

What I'm going to talk about today is founded on expertise gained through my research and over a decade of work on pandemic preparedness. I'm providing this information based on the state of the science today with the understanding that we will continue to learn more about this pandemic and the best ways to reduce risks. As a parent of school-aged children who were in Maryland public schools last year, I also am well versed in the incredible costs of losing in-person schooling.

I begin my testimony from the where Dr. Kotloff left off, with the understanding that COVID-19 is a disease that should be taken seriously. That while most kids do not suffer long term effects, some do, and even die, and it is worthwhile to prevent rampant transmission in schools.

At the school of public health, I've worked with a team of public health experts that are advising schools on policies and how to approach school safety. This is a complicated task and often, the devil is in the details. – For example, How to we balance the advantage of lunch in classrooms to encourage spacing vs. increased risk of vermin from food scraps. How many people can be on a school elevator at one time? What do we do about bussing? - Often compromises must be made. And even more tricky, communicating those details to avoid confusion and achieve broad buy-in and compliance is difficult but extremely necessary.

My research group at the Center for Health Security has worked on how to think about public health interventions – how to balance benefits and drawbacks, when to use them and when not to use them. The first thing we suggest is to think about specific goals of the intervention. I'm providing a flow chart here for considering a broad range of school-related and non-school related public health interventions as an example. These colored boxes showing the goals of delaying importation or geographic spread of the disease, interrupting chains of transmission, slowing community transmission, and reducing deaths. Many of these eventually overlap in second and third order effects but they are separated for simplicity.

In this case, the main goal is to control chains of transmission in schools so that they can stay open. We can safely assume that cases will be identified in kids and that these cases themselves will not be surprising but that the important component is to prevent these cases from becoming large clusters and super spreading events. A secondary goal is to prevent these cases from causing greater burden of disease in the community.

So, we should focus on what we can do in schools to prevent kids or teachers who are sick from getting a lot of other people in the school sick.

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We also think about what levels of stringency are required for the intervention to work. If a less intrusive version can work, that's certainly preferred. For example, we could range from mask use by high-risk individuals and their close contacts, to mask use in limited high-risk settings, to universal mask use depending on what's called for by the virus characteristics and epidemiological situation. In Maryland, with the Delta variant and current transmission levels, universal masking is needed.

No one measure will provide perfect protection from the virus that causes COVID-19. But a constellation of imperfect solutions will go a long way to reduce risks to kids and to others in the community who may be affected by increased transmission. These measures can include masking, ventilation, air filtration, spacing, and testing, among others. Several of these are self-explanatory but I'll describe a bit more on masking and ventilation, which are two of my highest priorities. Vaccination as an intervention is also important but that was already covered by others on the panel.

Although masking has some personal protective properties, it's role as source control in relation to people who are sick is critical. This means that the decision to wear a mask affects not only the wearer, but the people around them. Evidence from both lab tests and real-life observational studies show that masks significantly reduce transmission. A study I'd like to highlight looked at schools in North Carolina and showed that universal masking greatly reduces transmission in schools. The value of masks is also reflected in studies in schools in other states including Utah, Wisconsin, and California.

Students in families where adults have chosen not to get vaccinated have more routes through which they can be infected and potentially pass infection on to others. In situations where there is significant transmission in the community and especially when distancing is difficult, this is a low-cost way to reduce risks overall. Importantly, masks should fit properly and be worn properly.

Ventilation is another critical component that others at my Center led by Gigi Gronvall and Paula Olsiewski, have studied extensively. Research has shown that both natural ventilation and improved indoor air filtration systems can reduce disease transmission. Upgrading school air systems to increase outdoor air exchange or improve their filtration capacity – in addition to masking - is a good step in reducing transmission in schools. Similarly, HEPA air filtration units placed in each classroom can help to reduce risks. Allowing students to conduct activities outside more often, including lunch breaks when masks must be removed can reduce opportunities for transmission as well.

Reducing risks from COVID-19 does not have to be an all or nothing approach, although opponents can always point to one inconsistency or another, the combination of many risk reduction measures adds up. The approach to these measures must also acknowledge changing epidemiological conditions and altering viral characteristics. A more transmissible variant and more cases require more intervention than when cases are low. Given substantial transmission in Maryland as we reopen schools, we need to implement all CDC supported mitigation measures to the extent possible in order to allow students to return to in person learning while decreasing the risk of transmission in school

We know that we cannot live a zero risk life, but given the costs of closing schools or quarantining kids, it makes sense to establish systems that make it so that we can do the things we want and need to do while reducing risks in ways that are meaningful and manageable. Thank you.