Clarification regarding Outdoor Transmission of SARS-CoV-2 and Other Respiratory Viruses, a Systematic Review

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On April 24, 2021, the Centers for Disease Control and Prevention (CDC) issued new guidance on outdoor activities [1]. In subsequent testimony before the United States Senate, a number reported in our article, “Outdoor Transmission of SARS-CoV-2 and Other Respiratory Viruses: A Systematic Review,” was cited that the proportion of SARS-CoV-2 transmission occurring in outside settings is less than 10% [2].

We are writing to clarify how we arrived at the less than ten percent summary number. Our abstract and results sections state that “five identified studies found a low proportion of reported global SARS-CoV-2 infections occurred outdoors (<10%).” Because of the small number of heterogeneous studies we reviewed, as well as their methodological limitations, we could not provide a meta-analytically pooled estimate of the exact proportion of SARS-CoV-2 transmissions that have occurred outdoors or the associated risk.

Ten percent was chosen as a conservative estimate based on the upper confidence limit of the proportion of cases attributable to outdoor settings reported in one of the studies we reviewed. The Lan et al study, a work-related outbreak in Asia, reported that 5 (5%) of 103 cases were linked to construction sites (3); 10% is the upper limit of transmission potentially linked to an outdoor setting from this study. However, this number does not reflect the potential for community-acquired infection, nor does it accurately classify the total person-time at risk for transmission indoors versus outdoors in this occupational group. The other studies included in our review were Qian et al (< 1%, or 2/7324 cases occurred outdoors) (4), Leclerc et al 2020 (< 1% transmissions or 95 out of 10,926 total cases reported on) (5), Nishiura et al 2020 (odds of indoor transmission 18-times higher than outdoors, no raw data available) (6), and Szablewski 2020, which described an outbreak of SARS-CV-2 during a summer camp (7). Given the paucity and limitations of identified data and timing of study (i.e., still early in pandemic), we reported 10% -- the highest upper confidence interval in any

of the studies we reviewed -- to signify a small risk when compared to indoor settings, but not so negligible that it should be ignored pending further studies that could help clarify the risk more accurately.

As we discussed, our review has several limitations. The reports we found may have underestimated actual infections because cases reported may have missed asymptomatic infections or infections not reported to state agencies. The interpretation of the findings of the articles we included also may have led to overestimation in the number of outdoor transmissions, as the definition of outdoors was heterogenous and that, for example, transmissions in construction sites and in camp settings may be related to indoor time and not outdoor time. Therefore, deducing risks attributable to any policy decision and impact on SARS-CoV-2 transmission based on these data is subject to the potential limitations of these studies. Further, as in any systematic review based on peer-reviewed publications, our review is subject to publication bias – results of all outbreak investigations may not be systematically published in peer-reviewed journals.

Given the growing body of evidence pertaining to the risk of outdoor transmission and policy implication of our findings, we are in the process of updating our systematic review. Additional relevant studies found to date range in study design and quality but augment our findings that the risk of respiratory virus transmission outdoors is much lower than indoors (8, 9, 10).

Among these is a study that examined low secondary transmission rates of SARS-CoV-2 infection among contacts of construction laborers in India: 496 close contacts of 18 SARS-CoV-2 infected construction laborers were assessed for infection and exposure time, both

outdoors and indoors, at work as well as at home. The study reports a low secondary attack rate (1.4%) among contacts of construction laborers at locations with free air flow compared to a 30-fold higher rate of transmission among households. Their primary data may help further delineate the incidence rate ratio of outdoor versus indoor infections – a number which may be more useful than proportions in explaining the relative risk of infections outdoors by accounting for person-time of exposure (8).

These updates support our initial conclusion that the risk of SARS-CoV-2 transmission is much lower outdoors than indoors. The proportion of infections happening outdoors is likely much lower than 10%, and most of the studies that we have reviewed thus far suggest that it is likely less than 1%.

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