Role of Ventilation in Controlling SARS-CoV-2 Transmission
SAGE-EMG

Executive Summary

- Ventilation is an important factor in mitigating against the risk of far-field (>2m) aerosol transmission, but has no impact on other transmission routes (high confidence). The importance of far-field aerosol transmission is not yet known, but evidence suggests it is a risk in poorly ventilated spaces (medium confidence).
- Far-field aerosol transmission depends on the interaction of multiple factors including the viral emission rate, the ventilation rate, the duration of exposure, the environmental conditions and the number of occupants.
    - It is more important to improve ventilation in multi-occupant spaces with very low ventilation rates than in spaces that are already adequately ventilated (high confidence).
    - Activities that may generate high levels of aerosol (singing, loud speech, aerobic activity) are likely to pose the greatest risk; in some spaces even enhanced ventilation may not fully mitigate this risk (medium confidence).
    - Virus survival in air decreases with increasing temperature and humidity. In most environments this effect is likely to be less important than the ventilation rate, however environments with low temperature and low humidity (e.g. chilled food processing, cold stores) may pose an enhanced risk (medium confidence).
- Providing the ventilation rate remains the same, increasing the occupancy of a space increases the probability of airborne transmission by four fold. Exposure risk may be further increased if distances between people are reduced to <2m. (medium confidence).
- Measurements of elevated CO_2 levels in indoor air are an effective method of identifying poor ventilation in multi-occupant spaces. In low occupancy or large volume spaces a low level of CO_2 cannot necessarily be used as an indicator that ventilation is sufficient to mitigate transmission risks (medium confidence).
- Ventilation should be considered as part of a hierarchy of risk controls approach. Source control measures such as restricting or reducing duration of activities and enhanced use of face coverings should be considered alongside ventilation for reducing far-field aerosol transmission risks.
- Assessing ventilation in many environments requires engineering expertise, and mitigation measures are setting specific taking into account the nature of the building and users, ventilation type, length of exposure and activity. Unlike distancing and hand washing, ventilation requirements cannot easily be distilled into one simple approach that everyone can follow.
- Any changes to ventilation must consider other negative consequences including financial, energy use, noise, security and health and wellbeing impacts from thermal discomfort and exposure to pollutants.
- The effectiveness of ventilation in many environments is strongly influenced by user behaviour (high confidence). Clear messaging is needed about the reasons why good ventilation is important and how to effectively operate ventilation systems or achieve good natural ventilation.