4.2.9 Preliminary original research found that a strong purifier was more effective than masks or an equivalent increase in the room ventilation when both the infected and susceptible individuals are 1m away from the purifier (Figure 4, Pretty *et al.*, 2022). The impact on infection risk when one or both individuals are located further away is not known, but is important in understanding purifiers in the hierarchy of control measures.

4.2.10 In recent work by Moore *et al.* (2021), an algorithm for ranking the effectiveness of various control measures has been developed (as well as an interactive app for policymakers). For example, they have shown that improving ventilation and using masks is more effective than frequent lateral flow device testing (LFD). The algorithm could be adapted to compare more control measures, including air cleaning devices.

4.2.11 In winter, increasing ventilation to reduce exposure to disease must be balanced against the increased energy required and the impact on thermal comfort (CIBSE, 2021b). One measure to mitigate any reduced thermal comfort is to relax the dress code in the workplace or educational setting so that building occupants can dress warmly. Being considerate of user comfort can increase adherence to the actions necessary to reduce the risk of COVID-19 transmission (Scottish Government, 2021a). If having windows wide open would make a room too uncomfortable, leaving windows slightly open for long periods to allow cross-ventilation still improves ventilation, as does opening high windows instead of low, if possible (CIBSE, 2021b). This can be effective even if the windows are all on the same side. Security should also be considered when opening windows and doors. Fire doors should not be kept open in an attempt to improve ventilation, unless fitted with automatic closers so that they function as intended if there is a fire (CIBSE, 2021b).

4.2.12 The Welsh Government has issued guidance to schools and colleges in Wales which requires them to carry out a COVID-19 risk assessment, and contains practical advice to improve ventilation and thus increase the IAQ (Welsh Government, 2021a, b).

4.2.13 Ventilation reduces the risk of infection as good airflow dilutes the concentration of infectious viral particles in the air and can remove them. Ventilation can enhance the reservoir effect, where, in larger spaces, it takes longer for viral particles to disperse through the air, thus reducing the risk of infection (CIBSE, 2021a). Recirculation does not introduce fresh air but moves air and any contaminants present such as viral particles around the space. Recirculation between spaces should therefore be avoided (HSE, 2021b). If there is no alternative, recirculation in a single room is acceptable of there is access to fresh air from outside (CIBSE, 2021b).

4.2.14 The Welsh Government has provided CO_2 monitors and guidance for their use to schools and colleges (Welsh Government, 2021a.) Schools and colleges are advised to take both immediate and longer-term remedial

action if the CO_2 levels in a room persistently exceed 1500 parts per million (ppm). Although CO_2 levels can be used to indicate a lack of ventilation, they are not a proxy for the levels of airborne viral particles and cannot therefore reflect the impact of mitigations intended to reduce them (CIBSE, 2021b).

4.2.15 The impact of a poorly-ventilated space can be mitigated by reducing the number of people who use it; limiting the time spent there, and avoiding activities which lead to greater volumes of exhaled air such as exercise or singing, (HSE, 2021a). In addition, wearing masks could reduce the risk of infection.