

## SPI-B Evidence Review for MHCLG Housing Impacts Paper

**Handling:** Note that this Evidence Review is focused on the social and behavioural aspects of the questions posed by MHCLG. The accompanying EMG Evidence Review focuses on the environmental aspects, and conclusions from both papers are integrated in the SPI-B/EMG: MHCLG Housing Impacts Paper.

### QUESTION 3: What do we know about how transmission is happening in households, and does it vary geographically, with housing type, with demographics, with cultural practices?

There is a lack of data on the characteristics of housing environments for people with COVID-19 and the routes of transmission and role of specific environmental, demographic and social factors are not known. There is currently no data on the number of residents for each property to characterise COVID-19 transmission rates as household data is not collected at the point of testing. In addition, current datasets do not account for different testing patterns during the pandemic. As a result, data on household transmission is limited and any interpretations should be made with caution.

Drawing on wider literature, the current evidence suggests overcrowding<sup>1</sup> within homes is a driver of infection, not population density. A household is overcrowded if it has fewer bedrooms than required to avoid undesirable sharing, based on the age, sex and relationship of household members<sup>2</sup>. Overcrowded living conditions increases risk of droplet and aerosol transmission within a household as isolation may be difficult due to limited space. More people in the home will increase the potential risk of transmission to others and this will be exacerbated if there is insufficient space due to sharing of bedrooms and living spaces. Shared spaces, surfaces and objects, such as kitchen and bathroom areas, have high potential for fomite transmission and this risk increases with the number of people and frequency of use. The areas with the highest COVID-19 death rate have the biggest overcrowding problem. At the beginning of the pandemic, London had the highest age-standardised mortality rates for deaths involving COVID-19 with 85.7 deaths per 100,000. This was higher than any other region and the national average, which was 36.2 deaths per 100,000. The local authorities with the highest mortality rates were all London Boroughs. Newham had the highest rate with 144.3 deaths per 100,000, followed by Brent with a rate of 141.5 deaths per 100,000 and Hackney with a rate of 127.4 deaths per 100,000 population. The age-standardised mortality rate of deaths involving COVID-19 in the most deprived areas of England was 55.1 deaths per 100,000 compared with 25.3 deaths per 100,000 population in the least deprived areas<sup>3</sup>. Overcrowding is more prevalent in London, in part due to limited affordable housing<sup>4</sup>.

Private rented homes are on average 28% smaller than owner occupied homes and many private renters live in shared housing to reduce costs which may lead to increased density of occupation<sup>5</sup>. The majority (79%) of private rented homes are located in large urban areas with the remaining households residing in small towns or rural locations<sup>6</sup>. Houses of multiple occupation (HMOs), where homes are rented to three or more people not from the same family with shared bathroom and kitchen facilities, are common in places with housing affordability issues. HMOs, temporary accommodation and shortages of social housing are linked to COVID-19 mortality rates and are sometimes associated with cramped and sub-standard conditions<sup>4</sup>. Isolation in low quality housing could result in increased exposure to damp and/or poor ventilation and increased risk of cardiovascular disease and respiratory disease which are risk factors for COVID-19 once infected<sup>7</sup>. The EMG Evidence Review includes further details on the impact of housing on respiratory health.

Retirement age and multi-generational households have a larger proportion of individuals with a COVID-19 high-risk condition compared to other households<sup>8</sup>. There is a positive correlation between multi-generational households and initial high case fatality rates observed in several countries due to increased inter-generation interactions between working age families living with their parents. Multi-generational social distancing should be promoted and consideration given to the impact of school closures which could result in grandparents assuming carer roles whilst working age family members are at work, increasing risk of transmission across generations within households<sup>9</sup>.

Larger households, in terms of number of occupants, have been associated with increased likelihood of SARS-CoV-2 PCR positivity. The effects of pandemic control measures could be delayed in larger households due to the increased risk of residual cross-infection after these measures are employed<sup>10</sup>.

There is little information on household composition, ethnicity, crowding and the risk of transmission, and considerable heterogeneity amongst ethnic groups in household composition and household crowding in the UK, including within broader Census classifications of ethnicity<sup>11</sup>.

Data is limited on the role of occupant behaviour and household transmission. Future research is required to understand the role of occupant behaviour across different types of households.

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#### QUESTION 4: Are there specific risks for particular types of households (e.g. multigenerational, HMOs) or specific communities (e.g. BAME, low income)?

If we take households as composed of social relationships it becomes apparent that they face external risks and internal risks of infection from COVID-19. External risks are those that flow into them from outside via workplace and educational interactions (including risks from associated travel) and broader social connections. Internal risks depend on the physical vulnerabilities of members of the household; the organisation of domestic work such as cleaning and laundry; and the intimacy of interactions between various members of the household. It is most likely that highly networked households containing vulnerable people (due to age, co-morbidity, underlying conditions) with workers in frontline, keyworker or low paid work will be most at risk. And that within households, people, usually women or paid domestic workers who carry out the majority of exposing work are most at risk and broader social connections. Internal risks depend on the physical vulnerabilities of members of the household; the organisation of domestic work such as cleaning and laundry; and the intimacy of interactions between various members of the household. It is most likely that highly networked households containing vulnerable people (due to age, co-morbidity, underlying conditions) with workers in frontline, keyworker or low paid work will be most at risk. And that within households, people, usually women or paid domestic workers who carry out the majority of exposing work are most at risk

In order to explore how internal and external risk factors intersect we will now examine various community and structural types of households.

#### Household Community Types

Internal and external risks are very diverse within and between different household community types. There is currently no evidence of UK transmission across household types as this data is not routinely collected. As result, it is not possible to anticipate particular risks based on community types. However, one way of approaching this is to categorise households on a scale of highly networked to low networked. Highly networked households would exist within a wide range of communities.

Support mechanisms and kinship in post-industrial working class, Hindu, Muslim, Sikh, Orthodox Jewish, BME and African-Caribbean communities extend far beyond the physical household<sup>18</sup>. This is due to a more collective and extensive concept of family and the need for mutual support for childcare, resources and domestic work. This makes it likely that households will have a greater density of connection in flows of care between them. These connections are very important for the economic and psychological well-being of these communities. This is why the government's recent

introduction of social restrictions in Northern England that allow meeting in pubs and restaurants but prevent people meeting in households is so problematic and confusing to the public. It does not match people's values and priorities nor their needs for support. The sense of responsibility between and among generations in highly networked households may make practices of isolation within and across households more difficult to follow. There is a small amount of evidence of fears of stigma and of hospital environments that may lead to less help-seeking behaviour, although all of these issues need to be further researched before conclusions are drawn and mitigations designed. If policy rushes in to target particular communities it risks labelling and stigmatising them as a greater source of national transmission because of their socio-cultural practices. This would be highly unfair and divisive.

### **Household Community Types Interim Conclusion**

Further research is needed into highly networked households across various community categories that at the same time addresses socio-economic disadvantage as a risk factor. Current government interventions run against the social support networks and values of such households and therefore are problematic.

### **Structural Types**

- **Single Occupancy**

The number of people living alone in the UK, predominantly single men aged 45-64 in rented accommodation, is around 8.2 million<sup>1</sup>. As reported in the recent ONS survey, key risks here are external, from low income, highly networked and key worker occupations<sup>2</sup>. Along with this, particular forms of socialisation such as pubs, clubs and bars along with related intimate connections might well lead to greater vulnerability. It is hard to estimate the issues related to various social ties these households might have as these would vary greatly depending on whether the lone members are grandparents, aunts or uncles, separated parents, younger singles in relationships or key animators in their communities. Internal risk here would be largely due to the older age profile of this household. Barriers to social isolation would be practical ones in terms of the necessity of continuing work (for low income precarious workers) or else the difficulties in securing essential food and medical supplies. In sum, in this household, low income single occupancy middle aged or older households associated with highly networked or key worker occupations would be likely to be at particular risk. These should be targeted for mitigations and communications.

- **Lone Parent**

Lone parents represent 14.9% of UK households. In these households a single parent (around 90% women, of an average age of 39) lives with one or more 'dependent' or 'independent' children<sup>3</sup>. External risks come from low paid, precarious work environments particularly in highly networked retail, service and social care occupations<sup>4</sup>, along with extensive inter-household contacts with elderly relatives and other lone parent households to provide reciprocal childcare<sup>5</sup>. Internal risks come from the reciprocal dependence and intimacy between parents and children that make mitigations seem 'unnatural' and impossible to achieve. They are also likely to closely share household work such as cleaning and laundry that may lead to the possibility of infection by COVID-19. If children are young they will also share close physical proximity. If children are older adolescents the parent may be at risk of infection from the broader social contacts and interactions of this group. Isolation would be difficult within these households as their economic precarity means restricted spaces along with shared domestic responsibilities and close relationships. The greatest vulnerability would be most likely to be among older lone parents in small, rented, poor quality

domestic spaces working in high risk occupations. This group should be particularly targeted for mitigations and communications. A potentially important mitigation for this group could be the provision of Covid-safe state-subsidised childcare similar to the former SureStart centres as this might generate less inter-household and inter-generational transmission due to reliance on informal childcare.

### **Couples**

Two person households are the most numerous in the UK at 9,609,000<sup>6</sup>. External risks will depend on occupation and whether the people in these households are of working age. Internally cohabitation of partners will carry particular risk of transmission as close interactions, familiarity and care could make isolation seem 'un-natural' or even 'immoral.' Clear communications about the moral responsibility of protecting each other through isolation if one member of the household becomes unwell with COVID-19 could help.

### **Nuclear family with children**

In the UK, married, cohabiting and civil partnership-based families represent two thirds of the total households. Families with dependent children stand around 8 million, while families with non-dependent children are around 2.9 million out of a population of 27.8 million households<sup>7</sup>. One in four young adults aged 24-30 live with their parents<sup>8</sup>. External risks would vary greatly among this group depending on occupation and intensity of kinship and community connections. Internal risks would come in particular from the dominant division of labour in which women carry out the majority of household cleaning, cooking and laundry<sup>9</sup>. This makes women a particularly vulnerable group within these households as they may be exposed to other family members' infections through clothes and the cleaning of surfaces. At the same time the loss of their labour in the household due to social isolation if they become unwell with COVID-19 could lead to unfamiliar new responsibilities for the rest of the household, which could cause tension and prevent mitigating practices. While we would not want to reinforce the burden of domestic work on women, it may well be important to communicate safer COVID-19 practices to them, and at the same time reinforce the need to share responsibilities at times of illness.

### **Extended Multifamily**

Multifamily households including multigenerational households are the fastest growing household in the UK, but represent 1 percent of all households<sup>10</sup>. External risks would come from intergenerational transmission, particularly from adolescents and working age adults travelling to workplaces to older family members<sup>11</sup>. Internal risks would come from different kinds of intimacy and intensity of interactions within these households. For example, lodgers with no close relationship with other family members would potentially face fewer risks, while pairings of couples and grandparents-grandchildren (especially adolescent and young adult grandchildren) generate more risk between them. Household labour may be more shared in this setting, however, meaning that the burden of cleaning and laundry work in situations of social isolation of one family member could be better managed. It would be important to communicate and mitigate the particular vulnerabilities of grandparents or older family members in this type of family.

### **Shared adults**

One or more adults sharing, usually rented accommodation, make up 2.8 percent of all households. This includes the subset of Houses of Multiple Occupation, of which there are estimated to be 497,000 in England and Wales<sup>12</sup>. External risks will vary according to work roles or educational

setting, however internal risks would be common across such households and would intensify according to the number of people co-habiting and the age profile (older groups having greater vulnerability, but younger adults potentially having greater exposure). Mitigations and isolation may be difficult to enforce mutually within these settings as there are no culturally agreed forms of mutual obligation linked to kinship. Shared responsibility for maintaining the health of the group may not be present. Distrust and conflict may develop if one member of the household is suspected to have or is confirmed to have COVID-19. Since there is no agreed upon social script for these households it is important to provide clear guidance on Covid-safe practices targeted to shared rented accommodation and especially Houses of Multiple Occupation and may be helpful to encourage use of social contracts.

### **Disabled people and carers**

There are 13.7 million disabled people in the UK distributed between different kinds of households<sup>19</sup>. Here internal risks are paramount when an intensity and closeness of care is necessary to support disabled people. Emergency external help should be available quickly to help out families where carers become unwell. This is best directly provided by the government, as charities are not always able to provide help at the same level across the country.

### **Older people**

People over 65 currently represent around 18 percent of the UK population<sup>13</sup>. External risks come from their relations with other households and community connections to places of worship, volunteering and socialising. Internal risks occur when older people are a couple with close, familiar relations of care, which will feel 'wrong' to disrupt if one of them becomes unwell. Clear specific guidance on how to deal with this situation among this epidemiologically vulnerable age group would be helpful.

### **Socioeconomically Disadvantaged**

Socioeconomically disadvantaged households are more adversely affected by mortality from COVID-19<sup>14</sup>. Recent outbreaks clearly relate to deprivation indices with Liverpool, Manchester, Birmingham, Rochdale and Blackburn with Darwen all in the top 20 English boroughs in the index of multiple deprivation<sup>15</sup>. External risks come from the fact that low-income workers are less likely to work from home and are more likely to be frontline or key workers. They also face more pressure to continue working when unwell (as recent outbreaks in food processing units illustrate) and may need to use public or shared transport. Internal risks are compounded by high density housing with poor environmental conditions and ventilation. These households can potentially be helped by government intervention to enforce safe workplaces, grants to support unwell, low paid precarious workers and enforcement of safe home environment rules on the rental sector.

### **Domestic Workers**

The household is a site of paid work with cleaners, nannies and carers entering the home<sup>16</sup>. These are highly networked occupations with few enforceable rights and high levels of unregulated provision<sup>17</sup>. Such employees often have a blurred status as employees and/or kin or 'part of the family' which makes it difficult to request safe working conditions. In addition, they take over the more potentially infectious work of cleaning, laundry and close childcare. Similar to the care home workers who were a source of transmission in the first wave they and their households are also potentially at higher risk of infection. This situation could be ameliorated through greater legal

clarity over domestic workers' rights for safe working environments and communications on mitigation targeted at them and their employers.

### **Household Structural Types Interim Conclusion**

Overall without further research it is not possible to know which of these household types is most at risk as factors are multiple and intersecting. Although it seems likely that across the board socio-economically disadvantaged and houses of multiple occupation would be most at risk of external and internal transmission. Socio-economic disadvantage makes isolation and other protective practices very difficult to achieve. Houses of multiple occupation are often high density and do not necessarily share social scripts for cooperation or clear guidelines for domestic work.

However, until we have further evidence it is likely to be most effective to identify particular groups across and within households who because of their occupations, age profile and household role are likely to be at greater risk and/or more vulnerable to infection. Particular communications and mitigations could be targeted at these groups. Across households these would be middle aged and older members and those with existing health conditions; women who provide child-care and cleaning and paid domestic workers; low-paid, precarious and key/frontline workers in highly networked occupations; disabled people and their carers. Within households the following groups are most likely to be at greater risk and/or important to target for communications/mitigations

1. Lone households = low income male middle aged or older associated with highly networked or key worker occupations
2. Lone parents = older in small rented, poor quality domestic spaces working in highly networked or key occupations
3. Couples and Nuclear family = women, especially middle-aged women carrying out domestic work
4. Extended multifamily = elder relatives and women
5. Shared adults = students/young people, middle aged or older men, people in precarious, highly networked or key worker occupations
6. Socio-economically disadvantaged = women and female children

Mitigations should include not only communication and hygiene interventions, but also some broader policy changes including the provision of safe, affordable childcare outside the home and more legal provisions for domestic workers.

### **Conclusions:**

Overall, in the absence of concrete evidence on household transmission of COVID-19 it is very important to proceed in ways that do not reinforce stigma and stereotypes of various types of 'risky' community households. Policy should be built first in relation to household structural types and groups at risk across households. Further epidemiological and statistical research should explore a broad category of highly networked households. It is important too to acknowledge that given the significance of family connections between households for support and kinship it is likely that government policies which restrict these connections before closing places of public recreation will not be well-received.

Across household structural types and groups at risk we recommend that the following are particularly targeted for mitigations and communications - although once again it is important not to stigmatise particular types of households or people within them.

### **Overall**

- socio-economically disadvantaged households
- houses of multiple occupation

### Across Households

- middle aged and elderly members
- women who provide child-care and cleaning
- paid domestic workers
- low-paid, precarious and key/frontline workers in highly networked occupations
- disabled people and their carers
- Socio-economically disadvantaged = women and female children

These recommendations can be summarised to suggest that it is most likely that highly networked households containing vulnerable people with workers in frontline, keyworker or low paid work will be most at risk. And that within households, people, usually women or paid domestic workers who carry out the majority of exposing work are most at risk. Further statistical research based on information on specific household clusters and networks of cases would need to be carried out in order to examine the validity of this hypothesis. We recommend that data on household clusters is collected through contact tracing and made available for analysis. This could be supplemented by follow up ethnographic interviews and data collection that examined the social relations within and between households (Atlas Care Maps) in areas of outbreaks such as Leicester and Oldham. This could be compared with the statistical data on transmission. In addition further studies of how the demographic, age and behaviour profile of households intersect to produce vulnerable and highly exposed groups are needed. Overall the impact of social relations and practices of household labour in creating exposure to COVID-19 needs to be much better understood.

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### QUESTION 5: What environmental and behavioural measures are known to be, or likely to be, effective to mitigate household transmission?

The environmental and behavioural mitigation measures recommended by the SAGE Environmental Modelling Group<sup>1,2</sup> and Public Health England, along with guidance from the NHS for people at home<sup>3</sup> identifies measures to reduce risk of transmission. However many of these (distancing, reduced use of shared facilities, increased ventilation, and length of exposure) may be difficult to achieve in homes, and housing characteristics can affect their implementation (see Appendix A for table of these mitigation actions, adapted for the household setting from the EMG SAGE paper Using understanding of transmission routes to inform risk assessment and mitigation strategies (13/5/20)).

There is some evidence that behaviours such as handwashing<sup>4</sup>, surface cleaning and mask wearing in the home can reduce transmission of infection, including COVID-19<sup>5-7</sup>. There is also evidence that interventions employing appropriate behaviour change techniques can increase intentions to implement behaviour to reduce transmission in the home<sup>8</sup>, and can increase infection control behaviour<sup>9</sup>.

Isolating positive cases and quarantining contacts of cases in the home will increase risk of transmission within the household and possibly also morbidity and mortality due to a higher infecting viral load<sup>10</sup>. This risk is greater if there is limited space and facilities for mitigation measures (especially distancing and self-isolation), if more than one household member is at high risk of exposure or becomes infected, and if any household members are vulnerable to infection. Offering accommodation for highly exposed household member(s), contacts of positive cases or vulnerable household members to self-isolate could potentially reduce this risk<sup>11</sup>.

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**QUESTION 6: What barriers are there to delivery of the above mitigations (e.g. cost, feasibility, public acceptance, understanding of measures)? What are the potential solutions for addressing these barriers?**

There is evidence that although the public have increased awareness and implementation of a range of mitigation behaviours, these are not implemented as actively in the home as would be desirable to reduce infection transmission, especially when household members are infected or vulnerable. This is partly due to limited awareness of the necessity and benefits of mitigation measures in the home<sup>1</sup>, or sociocultural objections to some aspects of such measures (e.g. limiting family interaction)<sup>2</sup>. It is sometimes due to limited understanding of what needs to be done, why and how. In addition, the risks of household labour for transmission of COVID-19 to family members is little understood, placing women in particular at risk. More widespread promotion of guidance to increase understanding of the benefits and methods of implementing mitigations in the home is needed, using theory and evidence-based behaviour change techniques and co-design and implementation with all target communities. Recommendations for how to develop and promote guidance for behaviour to reduce infection transmission have been made in previous SPI-B papers<sup>3, 4</sup>.

There is evidence that there are emotional barriers to some aspects of mitigations that may interfere with family interaction, such as social distancing, social isolation and mask wearing<sup>5</sup>. There are also significant barriers and costs in terms of the time, effort and resources required. Interventions need to be co-designed with families and communities to create acceptable strategies for reducing risk while avoiding social isolation and excessive burden and maintaining family cohesion.

There are often insuperable practical obstacles to implementing mitigations sufficiently when a household member is at high risk; these include the need to provide intimate care for dependents (children, household members with health conditions), and lack of space within the home for social distancing and self-isolation. These barriers are most common in low income households, which is likely to contribute to inequalities in transmission risk<sup>6</sup>. Households with vulnerable member(s), high exposure and limited resources may benefit from practical support for self-isolating or quarantining within the home, such as support with shopping, pre-packed food to minimise shared time in the kitchen, provision of cleaning supplies, liaising with external organisations for wider support and anonymised helplines to respond to any concerns.

Offering accommodation outside the home for household member(s) or vulnerable household members during periods of very high risk could overcome the problem of limited space and facilities for mitigations (especially distancing and self-isolation). There is evidence<sup>7</sup> that this offer would be welcomed by some people who feel that household members are at high risk that they cannot mitigate sufficiently, provided that basic needs were met, including: ensuring that quarantining did not expose to higher infection risk; ensuring that provision is made for caring for dependents; providing sufficient support such as appropriate food (e.g. vegetarian), cooking facilities, internet

access for working. Offering suitable accommodation to people in this situation could potentially be cost-effective if it prevents onward transmission to vulnerable household members more susceptible to severe infection, and hence higher rates of hospitalisation and mortality. Offering accommodation to the vulnerable household member may be necessary in some circumstances (for example if they live in cramped accommodation with a carer who is ill or has tested positive) but needs to be carefully considered and well managed as moving outside the home poses risks to some vulnerable people<sup>8,9</sup>. Albeit potentially more acceptable, self-isolation outside the home of symptomatic household members or those with a positive test offers less benefit as much of the transmission is likely to have already occurred and other household members may have acquired the infection. However, a prompt offer of suitable accommodation to a sole member of the household who has to quarantine (as provided to some healthcare workers and carers when infection levels were very high) could be acceptable and beneficial for some large households or households with one or more vulnerable members.

There may be emotional and/or sociocultural barriers to accepting accommodation for vulnerable household members to self-isolate, particularly in communities that hold traditional caregiver ideologies<sup>6</sup>. Promoting acceptability and trust of this mitigation will require effective and timely communication to minimise misinformation and delays to help-seeking behaviour. The optional nature of providing accommodation must be very clearly emphasised and inclusion of culturally acceptable services (food, language, etc.). Some mitigations may not be under the control of occupants, for example ventilation or cleaning regimes (e.g. for lifts, foyers). Level of occupancy and availability of unoccupied space for social distancing or self-isolation may be determined by housing providers rather than occupants. Where this is the case guidance and regulation may need to be directed at housing providers rather than occupants.

Mitigation measures may be limited in their effects if communications do not take into account the possibility of stigmatising certain kinds of households. At all times national and local government interventions should pay careful attention to not label specific groups or varieties of households as risky and a source of transmission. Otherwise they will increase social tensions and make compliance difficult.

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### QUESTION 7: What are the key research questions in relation to factors identified above?

There is very little evidence regarding which mitigation behaviours are most effective at reducing transmission in the home when a household member is infected. In order to improve the evidence-base for guidance it would be valuable to investigate the relative impact on viral levels and infection rates of adherence to the range of recommended behaviours (e.g. self-isolation, social distancing, handwashing, frequency of cleaning shared surfaces, ventilation, mask-wearing).

Rapid research is needed to co-design and evaluate mitigation and communication strategies suitable for the wide variety of higher risk housing and households identified in this paper.

Furthermore, we need to investigate recorded household clusters to see if there are any patterns across and within communities. This could be carried through a combination of quantitative and qualitative research.

## Appendix A

**Table 1:** Mitigation measures associated with transmission routes and risk factors.

The most effective strategies are listed higher up the table and the least effective at the bottom.

Hierarchy	Mitigation	Transmission route	Risk factor addressed
Elimination	Avoid non-essential within home contact	All	All
	Ensure all household members adhere promptly to test, trace, and isolate procedures	All	Reduces interactions between susceptible and infected
Substitution	Change use of household spaces to reduce shared time in them and allow cleaning and ventilation between use e.g. rota for use of bathroom, kitchen	All	Time – reduces duration of exposure for susceptible individuals Amount on surface/in air - reduces duration of contamination from infectors
	Move to outdoor meetings or activities where possible (e.g. garden, porch)	Contact Short Range  Aerosol	Amount on surface – evidence for higher decay in sunlight Amount in air - evidence for higher decay in sunlight Ventilation rate – higher dilution in outdoor spaces
	Changes to or restriction of “loud” activities (e.g. reduce talking time, no singing, shouting)	Short range  Aerosol	Amount of virus generated – evidence that loud talking and singing produces higher number of aerosols and droplets
Engineering	Avoid sharing surfaces (e.g. leave doors open so no need to touch handle, avoid sharing crockery, keyboards)	Contact	Reduces number of contacts with contaminated surfaces
	Increase exposure to daylight.	Contact  Aerosol	Amount on surface – increase decay rate of virus Amount in air – increase decay rate of virus
	Screens/barriers	Short range	Amount of viral exposure – blocks transport of droplets

			from infected to susceptible
	Good sanitation, close toilet lid when flush	All	Amount of viral exposure – reduces contamination of air and surfaces
	Increased fresh air ventilation rate	Aerosol (Contact)	Reduces amount of virus in air – quicker dilution May have a small benefit in reducing surface contamination
	Change in air distribution (local extract, pressure controls, ventilation pattern)	Aerosol (Contact)	Reduces exposure to virus in air – prevents virus being dispersed within and between spaces May have a small benefit in reducing surface contamination
	Air cleaning devices	Aerosol (Contact)	Reduces amount of virus in air – removes or inactivates virus May have a small benefit in reducing surface contamination
Administration	Frequency and effectiveness of cleaning of surfaces	Contact	Reduces amount on surface, reduces duration of time that a surface is contaminated
	Hand hygiene promotion	Contact	Decreases amount on hands after exposure
	Changes to touch behaviours (e.g. education programmes)	Contact Short range	Reduces number of contacts with contaminated surfaces, reduces face/fomite touching if hands are contaminated
	Control of occupancy density	All	Reduces probability of an infector being present, reduces number of susceptible people available
	Distancing between people	Short range	Distance factor - reduces probability of being exposed to a high viral load
	Orientation of people	Short range	Face-to-face factor – reduces probability of

			being exposed to a high viral load
PPE	Gloves	Contact	Hand hygiene – reduces chance of hands being contaminated. NOTE gloves can become contaminated and hand contamination can occur during removal
	Face masks	Aerosol Short range	Reduces potential for droplet exposure through nasal membranes.
	Face shields/goggles	Short range	Reduces potential for droplet exposure through eyes for goggles and nasal membranes and some inhalation for shields (protect wearer only)