Children's Task & Finish Group:

Risks associated with the reopening of education settings in September

SIGNED OFF BY CHAIR ON BEHALF OF TASK AND FINISH GROUP

1. Background

Different risks under consideration

This paper summarises the combined advice of the Interdisciplinary Task & Finish Group on the Role of Children in Transmission, with input from participants of NERVTAG, EMG, SPI-M and SPI-B.

When considering the "risks associated with the reopening of education settings in September", it is important to differentiate between different types of risk that may result from sending children to school:

1. The COVID-19 related health risks to students associated with attending educational settings;
2. The COVID-19 related health risks for staff, who are older and have a different physiology;
3. The impact increased attendance in reopened education settings will have on transmission in the wider community, including to household members of children in school.

And to balance these with the risks associated with continuing to keep schools closed:

4. The risks to student mental health, wellbeing, welfare, socialisation and development associated with children not being in school.
5. The medium and longer-term impact on educational attainment, health outcomes and productivity, as well as increasing educational and societal inequalities, associated with lost education.

The relatively low risk to students' health of returning to school are presented in detail in Section 2. There is high confidence that the severity of COVID-19 is lower in children than adults, and moderate confidence that children are less susceptible to infection.

In contrast, and covered further in previous SAGE/SPI-B advice[1] , the harms to student mental health and development of keeping educational settings closed are well established.[2] This evidence suggests that children isolated or quarantined during pandemic diseases are more likely to develop acute stress disorder, attachment disorder and grief.

Educational outcomes are seriously at risk, especially for disadvantaged pupils, and school closures can also impact emotional attachment, with a failure to positively support psychological wellbeing likely to have longer term negative implications for child development. Months away from school could mean that emerging learning problems are missed by teachers and educational psychologists.

Evidence also suggests that the impacts of school closures are likely to differ across age and social groups, with more vulnerable children, in particular, being likely to be affected the most. Failure to positively support psychological wellbeing are likely to have longer term negative implications for child development. We also know that school attachment and belonging are linked to later educational attainment.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886993/s0141-sage-sub-group-role-children-transmission-160420-sage26.pdf

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/895859/S0420_TFC_Comments_on_Sequencing_of_Social_Distancing_Measures__Schools_.pdf

There is evidence that adults have higher susceptibility to infection (low confidence) and clinical disease (high confidence) than children. It follows that staff in educational settings have a higher risk of experiencing severe symptoms than students. There is some, but limited evidence, that children play a lesser role in transmission than adults (moderate confidence). There is little direct evidence of transmission from pupils to teachers.

This suggests that any risk to teachers may be less associated with contact with students, and more associated with potential contacts with other school staff, or parents/carers. For many school staff the risk of severe health outcomes will be lower than people of retirement age. However, the specific situations where there may be an increased risk associated with any transmission (for example if a child is living with a vulnerable adult, or a staff member has an indicator of increased risk) will require further consideration.

In terms of the risk of increasing community transmission, schools and universities should not be considered in isolation from wider measures. Which sectors to open or keep closed in order to keep R below one is clearly a policy choice. It should be noted that, given the evidence on the reduced severity of disease among children, reopening schools carries fewer risks to those who will attend than settings which have already been opened, that result in more frequent adult interactions. As policy makers work to strike a balance between opening up different sectors of the UK, the ready reckoners work[3] will be important in highlighting the trade-offs that will need to be made. This group would strongly support the opening of schools being prioritised, maintaining sufficient latitude in wider transmission to make that possible in September.

Section 3 presents scientific advice on the most important measures to have in place in educational establishments in any COVID-19 scenario. Section 4 discusses the concept of 'bubbles' and segmentation; Section 5 presents considerations around approaches to reduce risk associated with the use of transport.

<u>Based upon the conclusions below, the key messages are:</u>

- There is **relatively low immediate risk** to children's health from SARS-CoV-2 (high degree of confidence), with evidence indicating that **children/adolescents have lower susceptibility to SARS-CoV-2 infection** (low confidence) **and clinical disease** (high confidence) than adults.
- There is some (but limited) evidence that children play a lesser role in transmission than adults.
- **In countries where schools have been open for some time, data suggests that school opening has made little difference to community transmission.**
- Measures to reduce transmission should consider a hierarchy of risk, address the **three transmission routes (close-range droplet, surface contacts, aerosol)**, and **duration of exposure**.
- **Ensuring good ventilation** and **designing physical layouts to maximise distancing**, together with administrative controls such as **regular cleaning of high touch and shared surfaces** are key.
- Risk mitigation plans should consider the range of interactions over a school day, and identify situations / locations **that pose a higher risk of transmission through the activity and environment**. Extra consideration needs to be given to **interactions between adult staff**, given their greater risk of disease and likely more significant role in transmission.
- The use of facemasks for children is likely to be unfeasible for younger children. Among older children there are still risks that this will increase face touching and risk substitution, but these may be mitigated through education. Given the low risk of transmission between children, the detrimental developmental impacts of extended face mask use by children (including affecting

[3] SPI-M-O: Comments on Social Distancing Measures – publication pending; SAGE 43 Minutes 23 June – publication pending

damage to general speech and language development) may be greater than the potential protective benefit of facemask use.
- It will be important to have **at-scale surveillance, and local plans for reactive action, if infections are identified,** in place by September to ensure any outbreaks are quickly identified and dealt with.
- Schools and universities are complex, interactive, systems. The potential unintended consequences of specific restrictions on wider patterns of interaction need to be considered.
- Measures should seek to **avoid joining up social networks** within an educational institution, such as contact between teachers and pupils from different classes, and especially different schools.
- We recommend that **the term "education bubble" is not used** in the context of education as this conflates the issue with very different household bubbles. **Segmentation** is a more appropriate term.
- **Segmentation of children has advantages** in limiting the extent of transmission, support easier detection of linked cases, and potentially limit disruption during an outbreak – meaning that only certain classes and staff need to be isolated. However, segmentation may be difficult to achieve in all settings, and could have downsides, such as reinforcing academic segregation.
- Internal DfT modelling suggests that there is likely to only be **capacity to accommodate a minority of children** who use public transport to get to school in September, whilst maintaining social distancing.
- **Separate transport, or staggered start times**, may reduce transmission risk on public transport (and improve the ability to maintain social distancing), although this would need coordination with local employers. Alternatives, such as active travel (i.e. cycling, walking-buses) could be encouraged, and would have broader health benefits.
- **Clear, consistent scientifically informed communication** to children, teachers, and parents will be vitally important and is something SPI-B could further support. It will be important to **co-construct advice** to schools with teachers, parents and students, in order to build trust and ensure any guidance is workable on the ground.
- Policy is moving towards managing interventions at a local, rather than national, scale. Schools and higher educational interventions should also be considered on a local scale. Work is being done to explore how and what science advice can be provided at these scales.
- It is beyond the scope of modelling to assess some of the questions posed. Further modelling could add value in informing the most effective testing and monitoring strategies within universities, and to inform outbreak response planning.

2. Role of children in transmission

What is the updated evidence (direction and degree of confidence) on covid risk for children generally and also for younger children (under 5s), older teenagers and young people of HE age (18-22), specifically: severity of disease; susceptibility to clinical disease; infectivity; and transmissibility to peers and adults.

<u>Severity</u>

As agreed at SAGE 31, evidence still indicates that the **severity of disease in children is lower than in adults** (high degree of confidence). In addition to the evidence assessed at that time, a study covering the largest cohort in the current literature of children admitted to hospital with laboratory-confirmed SARS-CoV-2 is now available. A deep dive into these data over the weekend of the 4-5 July updated previous analyses and found that children under 19 admitted to hospital with SARS-CoV-2 have less severe clinical disease than adults:

- **Of over 55,000 hospital patients with confirmed SARS-CoV-2, only 0.8% (431) were under the age of 19**. Of these, 17% (72/431) were admitted to critical care; 7% (28/408) received non-invasive ventilation; 9% (35/408) received invasive ventilation.
- **There were no deaths in children under 16 years of age in this cohort.** Three young people died, who were aged 16-19 years. Two of these young people had profound neuro-disability with pre-existing respiratory compromise. The third young person was immunosuppressed by chemotherapy for a haematological malignancy. This is extremely low compared to adult disease: overall in-hospital mortality of up to 26% has been described, with those over 80 being approximately 10 times more likely to die than those under 50[4].
- Admission to critical care was associated with age under 1 month, admission to hospital more than 5 days prior to symptoms, and Black ethnicity.
- **Among children there is evidence of 3 distinct clusters of symptoms: an influenza-like illness (headache, fatigue, fever, chest/joint pain), a respiratory illness (runny nose, sore throat, shortness of breath, wheeze/cough) and an abdominal illness (abdominal pain, vomiting, rash, diarrhoea**).
- 12% of all children in the above study met the definition for multisystem inflammatory syndrome, with the first case identified in mid-March.

Susceptibility, infectivity and transmissibility

Evidence now available supports an updated assessment of susceptibility, infectivity and transmissibility as compared to that agreed in SAGE 31:

- Evidence indicates that **children/adolescents have lower susceptibility to SARS-CoV-2 infection** (low confidence) **and clinical disease** (high confidence) than adults, although evidence on any underlying mechanism is less clear.
- Data from prevalence/seroprevalence studies are mixed, with some finding no clear differences with age, although often with wide confidence intervals.
- **Limited evidence indicates that children play a lesser role in transmission than adults** at a population level (moderate confidence).
- Evidence and data remain unclear on infectivity in children (low confidence).

Specifically, a recent systematic review and meta-analysis[5] found evidence that **children / adolescents under 18-20 years have lower susceptibility to SARS-CoV-2 infection than adults**, with 56% lower odds of being an infected contact. It also found **weak evidence that children and young people play a lesser role in transmission at a population level,** with a cited systematic review of household clusters of COVID-19 finding only 3/31 (10%) were due to a child index case and a population-based school contact tracing study finding minimal transmission by child or teacher index cases. It provided no information on the infectivity of children and data were insufficient to explore differences between younger children, adolescents and adults.

The authors have since identified some more recent studies of relevance that were not included (dates between 16 May – 3 July), summarised below and in Annex A:

- 3 additional contact tracing studies were identified which are ‘unlikely to change original conclusions’.
- In a recent national Dutch study[6] investigating 732 PCR ‘pairs’, the vast majority of pairs were adults infected by other adults. Where children were one of the pair (23 pairs), children were infected by adults in 91% (21 pairs) and only infected by other children in 2 pairs (9%).
- A number of new studies in school and childcare settings were identified, mostly with very small sample sizes. One study in primary schools[7] found seropositivity in 8.8% of primary

[4] https://doi.org/10.1136/bmj.m1985
[5] https://www.medrxiv.org/content/10.1101/2020.05.20.20108126v1
[6] https://www.ntvg.nl/artikelen/de-rol-van-kinderen-de-transmissie-van-sars-cov-2/volledig
[7] https://www.medrxiv.org/content/10.1101/2020.06.25.20140178v2.full.pdf

school children, 7.1% of teachers and 11.9% of all parents and 61% of parents of an infected pupil. 2 parents were hospitalised and none died. The ONS population survey in the UK finds no clear differences by age here but confidence intervals are wide.

- Whilst some outbreaks in schools have been reported internationally, many involve small numbers of cases and adults are the source of the outbreak in some.
- **In countries where schools have been open for some time, data suggests that school opening has made little difference to community transmission**[8]: data to mid-June in Denmark, Finland, Norway and the Netherlands show COVID-19 cases falling and stabilisation/reduction in R. Where data is available (Denmark and Norway) no increases in infections in children/young people have been seen since schools reopened.

In the UK, a verbal report from the UK sKIDS study[9] indicates that of 138 schools participating in this surveillance (approx. 9000 participants, staff and children): 89 are having weekly swabs (6,637 participants); 49 are having bloods and swabs at the beginning and end of the term (2,346 recruited); and as of 28 June: 13,748 nasal (and some throat) swabs tested so far – **with only 5 positive**.

3. Protective Measures

- **What is the latest scientific advice on the most important measures to have in place in educational establishments in any covid scenario? How does this link to understanding and assessment of 'Covid secure'?**
- **Which protective measures that could be applied in education settings are likely to be relatively more effective in breaking chains of transmission of the virus (therefore reducing impact on R)?**
- **Is there additional information that SPI-B can provide on the practicality of requiring certain behaviours within school settings, potential adherence to those measures and any unintended consequences/harmful interactions (i.e. face masks and young children)? What are the key messages to communicate for school closures and local (or regional) variation across BSIs?**
- **Are rotas relatively more or less effective with respect to older children given they have more contacts including out-of-school contacts than younger kids?**
- **Is there additional information on the schools environment (and heterogenity) that is important when considering transmission risk i.e. outdoor space, sports lessons, changing facilities?**

General principles

As set out in EMG papers[10], selection of measures should consider a hierarchy of risk and should address the **three transmission routes (close-range droplet, surface contacts, aerosol)**. It is important that duration of exposure is also considered. Risks will be higher when people spend significant time together (e.g. within a classroom) than in brief interactions (e.g. passing in a corridor) and so it is most important to focus on measures where students and teachers have the greatest interactions.

[8] See Annex: Update (3 July 2020) on susceptibility and transmission of SARS-CoV-2 by children and adolescents; Russell Viner, Roz Eggo

[9] https://www.gov.uk/guidance/covid-19-paediatric-surveillance

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892043/S0484_Transmission_of_SARS-CoV-2_and_Mitigating_Measures.pdf; https://www.gov.uk/government/publications/principles-of-understanding-of-transmission-routes-to-inform-risk-assessment-and-mitigation-strategies-updated-14-may-2020

Risk assessments of activities should consider all potential routes of transmission and are most effective if they **are developed jointly by employers and the individuals** performing the various activities which comprise any job.[11]

People with **different social networks** should try to avoid meeting, especially close, prolonged, indoor contact, or sharing the same spaces. For example, contact should be avoided between teachers and pupils from different classes and especially different schools, and sports teams from different areas should avoid sharing facilities and enclosed spaces.

Extra consideration needs to be given to **interactions between adult staff**, given their greater risk of disease and likely more significant role in transmission. Teachers working in classrooms with lots of protective measures in place, only to mingle at close quarters in the staff room would achieve little. SPI-B has previously provided advice on redesigning shared space and activities to minimise interaction between people from different networks in the workplace.[12]

Presence of infectious people

Within a hierarchy of risk, the most effective controls are those classed as "elimination and substitution" which significantly reduce the chance of having an infectious person present. In the context of an educational environment these are achieved through effective processes to ensure those who are symptomatic or who have been exposed to the disease do not come into the setting. **At-scale surveillance**, building on the COVID-19 surveillance in school KIDs (sKIDs) work, is an important tool for identifying cases or outbreaks, and further developing our understanding of transmission in education settings. This should be in place by September to ensure any outbreaks are quickly identified.

Case detection in schools will need to take account of the emerging evidence around different symptom clusters in children, referenced in Section 2.Infectious illness presenteeism is common in workplaces, educational and childcare settings, and will undermine attempts to keep infectious people away from a setting. There are a number of reasons and risk factors associated with presenteeism, and ways to mitigate them.[13]

Organisations should look to promote a positive working culture and develop sickness absence policies that reduce presenteeism e.g. emphasising the importance and benefits of taking sick leave and the increased risks of spreading infectious diseases to others. Specific job-related risk factors, such as lack of cover, should be identified so that counter measures can be developed. Since many employees are unsure about the threshold for taking sick leave, clear guidelines should also be given regarding what to do when they are sick.

At the individual level, workload should be properly managed and monitored. Although reducing workload is not always achievable, skills, resources and techniques can be enhanced to help workers cope with job demands.

Physical environment

Schools should consider their range of activities and identify those that pose a higher risk of transmission through the activity and environment. For example: high energy sports in poorly ventilated indoor spaces, crowded changing rooms, travel by bus between school activities, close interactions in a science lab. It will also be important to consider activities that pose a risk to those who engage with it, for example musical performances to family members. Many of these activities

[11] Managing infection risk in high contact occupations (June 2020) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/895922/S0540_Managing_infection_risk_in_high_contact_occupations.pdf

[12] https://www.gov.uk/government/publications/spi-b-communicating-behaviours-to-reduce-transmissions-between-social-networks-summary-27-may-2020

[13] Webster, R.K., Liu, R., Karimullina, K. et al. A systematic review of infectious illness Presenteeism: prevalence, reasons and risk factors. BMC Public Health 19, 799 (2019). https://doi.org/10.1186/s12889-019-7138-x

may be able to continue, but may require additional measures or adjustments to enable them to be carried out safely.

Important measures should include engineering and environmental actions such as **ensuring good ventilation** and **designing physical layouts to maximise distancing**, together with administrative controls such as **regular cleaning of high touch and shared surfaces**. Cleaning of shared spaces is important, particularly where a classroom or other space is used by multiple groups. Regular hand hygiene and good respiratory hygiene should be enabled through provision of appropriate facilities and use of education programmes and posters.

Winter is an important consideration that potentially increases risks. Poor weather **restricts outdoor activities** (including play) and tends to lead to poorer internal environments with **lower ventilation**. It may be necessary to consider additional heating to compensate for increased airflows. The virus survives better in low temperatures, low humidities and reduced UV light which are all characteristic of winter.

There is a very small evidence base for the effectiveness of NPIs within educational settings. Several studies have considered the impact of hand hygiene on respiratory diseases including some in school settings. Although some studies show a reduction in absenteeism, systematic reviews suggest no significant effect on respiratory disease transmission.[14,15] Studies in schools generally show a stronger effect on gastrointestinal illness.

Very few studies consider cleaning, however one brief study sampled university classrooms that were cleaned on a daily basis and repeatedly found coronavirus 229E [an endemic coronavirus responsible for the common cold] suggesting frequent recontamination.[16] A study in California shows inadequate ventilation is associated with increase illness absence.[17] Studies also show associations between poor indoor air quality, low ventilation and respiratory conditions such as asthma.

<u>Interaction between education and other systems</u>

Application of measures should consider the community network surrounding an educational setting and the potential unintended consequences of decisions. For example, a decision in a university setting to not reopen social areas may prompt staff and students to visit external cafés or travel home to eat, which could lead to higher risk of transmission.

A systems approach could be applied to evaluate interdependencies within and between a setting, and particularly to identify interfaces between education and other settings that may be specific risk points. This could potentially be linked to network models.

Evidence suggests that many children continue to leave the house and mix with others during school closures, despite public health recommendations to avoid social contact.[18]

<u>Behavioural considerations</u>

[14] Willmott, M. *et al.* (2016) 'Effectiveness of hand hygiene interventions in reducing illness absence among children in educational settings: A systematic review and meta-analysis', *Archives of Disease in Childhood*, 101(1), pp. 42–50. doi: 10.1136/archdischild-2015-308875.

[15] Wang, Z. *et al.* (2017) 'The effect of hand-hygiene interventions on infectious disease-associated absenteeism in elementary schools: A systematic literature review', *American Journal of Infection Control*. Elsevier Inc., 45(6), pp. 682–689. doi: 10.1016/j.ajic.2017.01.018.

[16] Bonny, T. S., et al. (2018) 'Isolation and identification of human coronavirus 229E from frequently touched environmental surfaces of a university classroom that is cleaned daily', *American Journal of Infection Control*. Elsevier Inc., 46(1), pp. 105–107. doi: 10.1016/j.ajic.2017.07.014.

[17] Mendell, M. J. *et al.* (2013) 'Association of classroom ventilation with reduced illness absence: A prospective study in California elementary schools', *Indoor Air*, 23(6), pp. 515–528. doi: 10.1111/ina.12042.

[18] Brooks, S. *et al.* (2020) 'The impact of unplanned school closure on children's social contact: Rapid evidence review', doi: 10.31219/osf.io/2txsr.

SPI-B have previously provided advice on the behavioural considerations around schools reopening under various scenarios[19]. This highlighted the complexity of behavioural issues that will need to be considered in implementing any policy, including the importance of clear consistent scientifically informed communication to children, teachers, and parents.[20] This is something SPI-B could further support.

To demonstrate this in relation to some of the "Protective Measures" identified above, some of the behavioural considerations are set out below:

- Social/physical distancing in schools (especially at the younger age groups) is unlikely to be very feasible, and likely very difficult to enforce
- Segmentation of school children is likely to be most feasible in primary school and in years 7-9 of secondary school. It would be much harder in years 10-13 because of different academic sets and academic options. Space and availability of staff impose further constraints on segmentation, but these may be surmountable with increased resourcing.
- Perspex barriers within classrooms are not currently being widely implemented but could be with increased resourcing. It would be important to consider where these could be placed to provide appropriate protection but without interfering in class activities or introducing other risks such as blocking ventilation flows.
- Enhanced use of audio equipment (e.g. microphones) may be particularly beneficial in lecture type environments in universities to reduce the use of projected voices that could generate higher levels of droplets.[21] There may be a need for clear messaging to promote this action.
- Some environmental interventions in schools rely on appropriate behaviours to be effective. This includes ensuring adequate ventilation in schools that are naturally ventilated through opening windows, which rely on teachers taking action.

The current SAGE advice[22] on cloth face masks is that, on balance, there is enough evidence to support recommendation of community use of cloth face masks, for short periods in enclosed spaces where social distancing is not possible. However this advice did not specify if the benefits were the same for adults and children. A more recent EMG-SAGE paper outlines the evidence for different types of mask and highlights practical considerations, e.g. for cloth masks mechanistic effectiveness depends on material and fit, as well as wearing properly.[23]

On the specific use of facemasks for children, this is likely to be unfeasible for younger children and among older children there are still risks that this will increase face touching and risk substitution, but these may be mitigated through education. The risks of affecting damage to general speech and language development is far greater than any risks of children transmitting. Viewing of faces is essential for brain development in both younger and older children, and in learning to speak/phonics, much of which is based on phonemic awareness. This is particularly important for children from less-language rich environments, or bi-lingual children, or children from English as an additional language (EAL) backgrounds.

Wearing a facemask could also negatively impact deaf or hearing-impaired children, children with other sensory needs, and children who struggle with emotional recognition and emotional regulation. Facemasks could also negatively impact children's ability for play and interaction.

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[19] The role of children in transmission (Annex G: A full account of SPI-B input on the scenarios), 30 April 2020

[20] Interdisciplinary Task and Finish Group on the Role of Children in Transmission: Modelling and behavioural science responses to scenarios for relaxing school closures. 30 April 2020

[21] Asadi, S. *et al.* (2019) 'Aerosol emission and superemission during human speech increase with voice loudness', *Scientific Reports*. Springer US, 9(1), pp. 1–10. doi: 10.1038/s41598-019-38808-z.

[22] 27th SAGE Meeting on Covid-19, 21st April 2020

[23] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892043/S0484_Transmission_of_SARS-CoV-2_and_Mitigating_Measures.pdf

Importance of co-construction of communication

As SPI-B have consistently advised[24] guidance should be developed in partnership with teachers, parents, and students to ensure that it is feasible to implement and develops and maintains trust in government policy.

Local authorities and community members are likely to be able to identify potential barriers and suggest potential solutions. Each school is different, each setting unique and each will have things that they can do easily, others less so. Additional work is required to identify perceptions of risk, understanding, and information needs across these groups. Most importantly, these groups must perceive that the risk of infection is low before they will be willing to attend or send their children to school.

Targeted messaging and support are needed to explain measures and required behaviours in school settings, as well as increasing peoples' awareness of the risks involved in social interaction both inside and outside school. There is considerable evidence that different messaging is required for young people, for young people this needs to be based around peer modelling and young people's priorities[25].

Schools which are more likely to be sites of transmission (high poverty, low resource), may be those with the least capacity to take up additional interventions due to background stressors and under-resourcing. These schools will require additional resources and support as they are most likely to struggle with infection control after widespread return. There is a risk of stigma and enhancing inequalities if school closures happen more often in poor areas.

Effectiveness of rotas

School openings cannot be viewed in isolation, and their interaction with other measures must be considered. Previous modelling on rotas (cohorts split into groups attending school on alternating cycles – for example: week on, week off), as discussed at SAGE 31[26], was carried out in the context of previous stricter interventions.

The benefit of rotas is in breaking transmission chains within schools and workplaces. The "on" window in school should be short enough to prevent multiple infection generations, with the "off" window long enough for any onset of symptoms to be detected before returning to school in the next cycle. However, there may be minimal benefit of rotas, beyond segmentation of the population, if children mix extensively between rota groups outside of school – as may be the case under the current measures.

Rotas and school segmentation could pose particular challenges for households with working parents/carers and children in different year-groups in terms of childcare and pick-up/drop-off times.

Age of children

Transmission risk is not solely determined by the number of contacts made, but is also affected by the duration and type of contact. The risk of a wider outbreak will also be impacted by the degree of clustering in contacts. Younger children tend to have a greater number of contacts and higher contact time, but also have more clustered contacts limiting the potential for extensive transmission chains. Older children have a higher degree of social mixing and variation in who they contact.

[24] SPI-B: Principles for co-production of guidance relating to the control of COVID-19 (July 2020)

[25] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886994/s0257-sage-sub-group-modelling-behavioural-science-relaxing-school-closures-sage30.pdf

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886994/s0257-sage-sub-group-modelling-behavioural-science-relaxing-school-closures-sage30.pdf

As discussed in section 2, it is possible that susceptibility and infectivity is higher in adolescents than younger children. However, older children have greater capacity for self-regulation though this may not always translate into greater adherence to social distancing and handwashing.

4. Education 'Bubbles' and Clusters

- **Does the concept of educational 'bubble' (classes or year groups) have specific impacts other than serving to generally constrain the increase in contacts?**
- **Current guidance for Early Year settings is that children should attend only one setting if possible. What would be the impact of removing the restriction?**
- **If an individual is exposed the multiple 'education' bubbles (for example university halls of residence and course lectures) does this remove any potential gains in limiting contacts elsewhere -or even increase risks of clusters? is there a hierarchy, or principle, to how different education bubbles might affect transmission?**
- **Given emerging understanding of clusters – what are the associated risks for 'class', 'course', and 'accommodation' "bubbles" mixing across education settings or likewise for 'course' and 'employment' bubbles to mix in FE (due to apprenticeships etc)? i.e. do overlapping 'bubbles' increase risk more significantly than the increase in contact numbers alone?**

SAGE has consistently advised caution around the application of bubbles, within which all social distancing measures are not followed, to managing the epidemic. Bubbles of large households with multiple people in them, represent a significant extra risk.

However, in this instance we recommend that the term "bubble" is not used in this context. What is being described relates to segmenting of the population (potentially with social distancing and other protective measures in place), rather than an extension of the household. As such, use of the term "bubble" risks confusion.

<u>Segmenting school children</u>

The value of segmenting school groups is not simply reducing transmission risk to the children and staff involved. Segmentation has a number of advantages:

- It limits the extent of local transmission and potential outbreak size;
- It may also support easier detection of linked cases - two or more cases in the same segment would provide a signal of where transmission is likely to be occurring.
- Finally, it could limit disruption during an outbreak – meaning that only certain classes and staff need to be isolated. With no controls or segmentation in place, relatively few infections could result in the majority of a school community needing to be isolated.

However, whilst segmentation of classes or year-groups will likely reduce the number of interactions with students and individual contacts, it may not reduce their social interactions within their friendship groups.[27]

Moreover, segmentation will also restrict schools' ability to implement academic groupings whereby students are placed in different classes by academic ability for different subjects. There is evidence to suggest that academic segmentation is not associated with overall gains in achievement. However, this could also lead to increased inequity if the segmentation of year-groups reinforced segregation of children and academic streaming. Further consideration also needs to be made to the requirements

[27] Brooks, S. *et al.* (2020) 'The impact of unplanned school closure on children's social contact: Rapid evidence review', doi: 10.31219/osf.io/2txsr.

for children to be able to exercise and play, and how this would be incorporated into any proposed segmentation.

Whilst segmentation has proven effective in other settings, the implementation of this needs to be considered against the relatively low transmission of SARS-CoV-2 between children, and essential wellbeing and development of children through academic learning and exercise.

Attendance at multiple early years settings

Attendance of multiple early years settings risks joining up chains of transmission, creating extensive networks. The close contact/intimate care provided in early years setting may increase this risk. This would also make outbreak response and control more difficult, as children, parents and staff at multiple providers would potentially need to be traced and isolated.

Infection dynamics and networks in universities

This section draws on unpublished work by two groups for their home institutions, and a subsequent discussion of a subgroup SPI-M-O members. It does not specifically consider the breadth of UK institutions and the wider sector.

It is essential to note that universities do not only affect students: university staff (including ancillary and support staff) will comprise a significant minority of the population, and will likely be from older and more vulnerable groups relative to students. Any analysis of universities and the student population will be sensitive to assumptions on the asymptomatic fraction and relative infectivity of asymptomatic cases in young adults.

Infection dynamics within a university are likely to be highly dependent on the interplay of different layers of networks across years of study, courses, accommodation and wider social networks (e.g. societies, sports etc). For instance, networks and student behaviour will likely differ for campus vs. city universities and by size and type of accommodation (e.g. self-contained flats vs. dorms).

Drawing generalisable conclusions from institution specific modelling is likely to be difficult. However, a further area where modelling could add value is informing the most effective testing and monitoring strategies within universities and outbreak response planning.

Segmentation of the university population

As for schools, transmission risk in universities is affected by the duration and type of contact, not simply the number of contacts. The risk of a wider outbreak is also influenced by the degree of clustering. If contacts are highly clustered then this will limit for potential for extensive transmission chains – for example, students from the same course living and socialising together.

Segments will have greater impact if there are fewer contacts outside the group, a factor which will be influenced but the wider social distancing measures in place. 'Nesting' different networks or segments of the student population together – for example ensuring those on the same course live together - may help to reduce transmission risk. This would need to be balanced against wider considerations such as student diversity and mental health. Reduction of any overlapping networks with other universities, particularly any shared halls of residence would also further reduce outbreak risk, and size of outbreaks if they occur.

5. Transport

Given the numbers of children likely to use public transport (DfE/DfT could provide) - to what extent (qualitatively or quantitatively) will mixing on busses exclusively for children and those where children may come into contact with members of the public (general public transport) serve to

increase rates of transmission? Does the assumption that dedicated (secondary) school busses where children would sit in the same year group carry less risk given the similarity in bubbles/ contacts they will have in school settings than via public transport where this level of control in contact will not be as efficient? What is the relative risk of car sharing vs single occupancy car travel and public transport?

<u>Travel to schools</u>

Having separate transport for schools, away from members of the public, should in theory reduce transmission. Shared transportation would increase risk of transmission. However, it would be very difficult to create an applicable generalised model of this scenario.

As it currently stands, all students travelling on public transport are already required to use masks. However, given the potential low transmission of children compared to adults, it should be considered if masks are necessary on buses for schools.

Internal DfT modelling suggests that there is likely to only be capacity to **accommodate a minority of children who use public transport** to get to school in September, whilst maintaining social distancing. Alternative modes of transport, or staggered starts, are likely to be necessary. Capacity looks particularly limited in London.

Staggering start times may help avoid students using transport at rush hour (and improve the ability to maintain social distancing), although this would need coordination with local employers. There may also be other options available such as active travel options (i.e. walking buses), though these become less likely in the autumn/winter and capacity to increase this beyond current levels may be limited. Early engagement between DfT and DfE on this issue will be important.

A final point of consideration is the rural/urban divide amongst students, and the variability of transport that comes with this. Some may spend considerable amount of time on public transport. Similarly, transport patterns will vary greatly between schools, for example in the degree of reliance between buses, which could be commissioned specially, or trains, which couldn't.

- **In universities (where accommodation and teaching arrangements are very different and heterogenous) what is the likely impact on transmission of the virus of cross-country travel to university? What are the potential impacts on infection incidence of:**
    - **mass travel patterns and contacts at the beginning and end of University terms?**
    - **students leaving one household (home) to join another one temporarily (for a term) and returning home at the end of term?**
- **Can we model the impact of migrations at beginning and end of term, from homes to universities and then back home at end of term does to infection incidence? Are there also half-term migrations? What information would DfE need to provide?**

<u>Potential for seeding from universities</u>

The relative importance of universities in changing the geographical distribution of infection will depend on the background incidence and extent of regional variation across the UK and overseas. This may be partially mitigated by local lockdown measures.

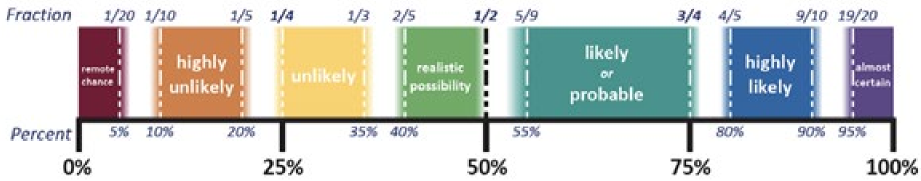
Migration at the end of term may warrant more attention than that at the start of term, as universities may act as amplifiers. If there is an outbreak at a university (even if not widespread transmission), then students returning home could pose a risk for spread across the UK. This will be further exacerbated if people return infected but asymptomatic. Students are also more likely to be integrated with the wider community at their home address.

Another potential issue is students returning home after falling ill or being diagnosed with COVID-19 to avoid having to quarantine alone. The potential for "spillover" into the local community during term-term will depend on the university in question and level of integration with the wider population. All measures to reduce the risk and size of outbreaks within universities and rapid detection and containment of outbreaks within universities would all help limit transmission to the wider community.

Modelling

The potential seeding of cases from student migrations could be modelled, but any findings will be highly dependent on background incidence, regional variation and whether university outbreaks are in place. The response to sick students, and whether they return home during quarantine is likely to be more of an impact. Further work on testing and monitoring, and outbreak response is recommended as a higher priority.

For reference: PHIA probability yardstick – to be used when expressing likelihood or confidence



Annexes

Annex A - paper from Viner and Eggo

Annex B – SPI-M Comments on schools and universities: Response to DfE commission