

Summary of SAGE paper for Welsh Government Education Department

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This paper is a synthesis of advice related to children and education arising from the Scientific Advisory Group for Emergencies (SAGE) and agreed by the Welsh Government COVID-19 Technical Advisory Group (TAG). It represents our latest understanding of the COVID-19 with respect to children and education. As further information and evidence emerges the advice to Welsh Government will change. Other recent reviews of schools are helpful and could be considered alongside this advice¹². Evidence on COVID-19 impacts on BAME populations should be considered alongside this review³. Further guidance on children who are shielded is required.

¹ <http://www.independentsage.org/wp-content/uploads/2020/05/Independent-Sage-Brief-Report-on-Schools-5.pdf>

² <https://www.gov.scot/publications/coronavirus-covid-19-schools-early-learning-and-childcare-settings---scientific-evidence/>

³ <https://gov.wales/written-statement-covid-19-and-bame-communities>

Technical Advisory Group Overarching Advice

General

- Significant changes to policies that will likely lead to increased population mixing should only be done when:
 - a robust contact tracing system that is capable of testing, tracking and protecting infected individuals is in place⁴,
 - the R_t value is understood and there are reliable indicators in place to estimate R_t ,
 - policies have been modelled, separately and cumulatively, to understand the likely impact on the rate of infection, and
 - a sensitive surveillance system is in place that is linked with a public health response system.
- Coronavirus does not persist very long in well-ventilated sunlit environments. The virus persists longer in the indoor environment.
- Structured risk assessments that consider the transmission mechanisms against a hierarchy of risk controls should be undertaken. It is recommended that this approach is used to consider risk during different activities to identify key points for mitigating risk. It is essential that risk reduction interventions take a “mitigate, monitor, modify” approach.
- In all situations, messaging and guidance need to be very clear and include an emphasis on care, responsibility, public health and hygiene.

Children and schools

- The impact of early years returning has a smaller impact on R_t than scenarios with older children.
- Scenarios where half classes return on a staggered a one-week on one-week off basis have the benefit of reducing transmission if groups do not mix (including staff), but this requires more analysis.
- Younger children might be less susceptible to clinical disease (moderate to high degree of confidence) than adults; there is not enough evidence to determine whether this is also the case for older children.
- It is not clear whether transmissibility by children is lower than in adults, but some variable evidence indicates that this may be the case for younger (up to age 11-13) children (low confidence).
- For a variety of reasons reopening options relating to younger children are lower risk than those related to older children.
- Indirect effects of re-opening schools (regardless of which option is taken) are likely to have a greater impact on transmission than schools themselves (e.g. work-related reopening, behaviour changes).
- Social distancing measures are likely not possible for young children.

⁴ As defined in TAG/SAGE advice dated 20 May 2020

- Further work is required to understand the wider impacts of COVID-19 on children and staff.
- Grandparents of primary-aged children remain at increased risk of severe outcomes. A substantial proportion of people in the high-risk age groups have 1 or more primary-aged grandchild.

1. SAGE Children's Task and Finish Group: Comments on sequencing of social distancing measures (schools) (SAGE 20 May 2020)

- The paper comments on elements relating to schools, and should be read in conjunction with the other SPI-M and SPI-B statements⁵⁶⁷.
- The group supported the principle of relaxing measures individually, with sufficient time between changes to enable impact to be assessed.
- Prior to any further relaxation of school closures, there needs to be clear messaging and communication, developed in partnership with parents and carers, children and education professionals.
- It is essential that strong testing and response systems, achieving 80%+ coverage and rapid turn-around in results, are in place (*see Figure 1*). Protocols should include the specific plans for schools, including criteria for reactive school closure. These need to be clearly communicated to parents and carers, children, and education professionals.
- Test, track and tracing of children may be more challenging given privacy and safeguarding issues for apps (and lower use of smartphones amongst young children), and difficulty of swabbing young children. There also needs to be consideration of thresholds for testing children – as transient fever is very common in young children.
- School openings cannot be viewed in isolation, and their interaction with other measures must be considered (*see Figure 1*). The impact of multiple relaxation measures on transmission is likely to be greater than the sum of their individual effects.
- It is essential to note that schools do not only affect children. Staff and parents will also be directly impacted; it is probable that opening of schools will increase transmission in these groups. Any relaxation of closures will also need to consider how to reduce risk from the potential mixing of adults at school gates, in the staff room etc, and have protocols in place for vulnerable groups.

⁵ 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

⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886996/s0259-spi-b-scenarios-input-sage30.pdf

⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/887014/s0300-tfc-modelling-behavioural-science-relaxing-school-closures-sage31.pdf

- The consequences of changes in behaviour or contacts outside of schools as a result of schools reopening can potentially have a larger effect on transmission than the effect of school openings themselves: for example, enabling more parents to return to work.
- The impact of partial school openings on transmission is partly influenced by the proportion of children in school. However, it is essential to note that this is not a linear relationship, and will be affected by other measures in place, the detail of how the partial opening is implemented, the age of children etc.
- The findings from previous modelling of school openings cannot be directly applied to the current proposals, as this considered school openings in isolation, or alongside modest changes in other contacts (*see Figure 3*).
- The modelling of 4 May 2020 conducted by SPI-M can only provide broad insights. However, as the non-school measures implemented on 13 May 2020 and those proposed for Step 2 (opening of non-essential retail; bubbling) (**In England**) are much more extensive than those considered in the modelling, the impact of the same school measures modelled are likely to be higher than previously estimated.
- School openings cannot be understood solely in terms of the risk of infection and transmission. The cumulative impact of school closures needs also to be considered: the longer that schools are closed, the more profound the difficulties will be and the greater the cost and challenge to overcome them – it is a fine balance and secondary impacts need to be carefully considered.

2. TAG CMO Brief: Changes to measures (30 May 2020)

- It is not yet possible to accurately assess the impact of changes already made in non-pharmaceutical interventions (NPIs) e.g. two households meeting outside. Changes in transmission which have happened in the past two to three weeks will not yet be reflected in clinical data.
- Behavioural responses in the event of multiple, simultaneous changes to current restrictions were highly unpredictable and that the possibility of large, unintended, negative consequences with respect to adherence to remaining measures was significant.
- Presentation of school reopening options under different Track, Trace and Protect (TTP) scenarios and with varying levels of work and leisure contacts (e.g. from reopening non-essential retail) illustrates how the impacts of multiple, separate changes accumulate.
- Figure 1 is illustrative rather than fully-quantitative and should not be used to extract predictions of the impacts of packages of measures. Modelling shows a clear relationship between relaxing measures and reopening schools and education settings on R_t . A robust contact tracing system (80%) has a significant impact on the R_t compared to scenarios with no contact tracing

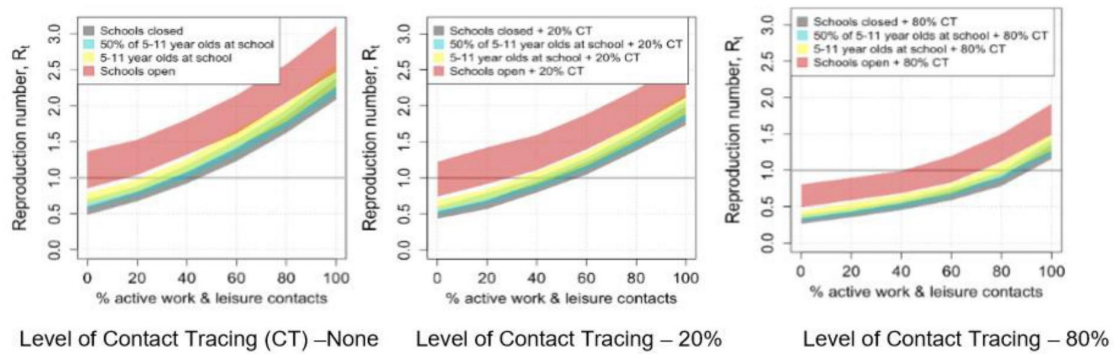


Figure 1. Changes to R_t with school opening and relaxation of other Non-Pharmaceutical Interventions with 0, 20 and 80% contact tracing.

- Figure 2 of different R_t models, shows varying trends for schools reopening (no contact tracing).

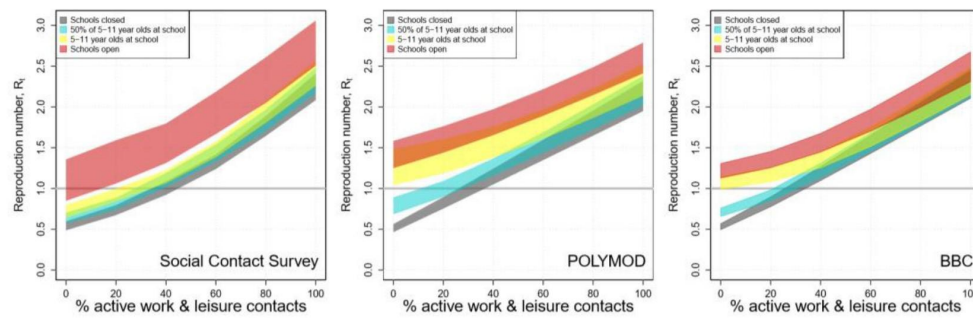
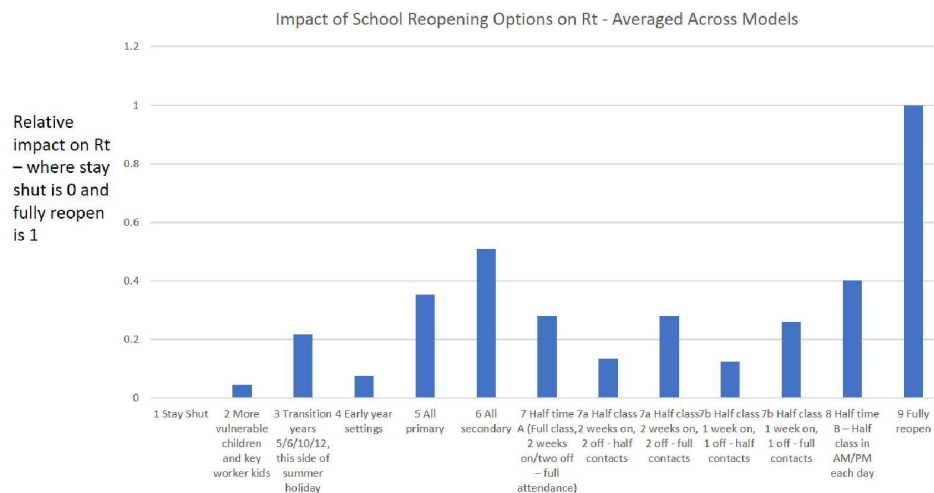


Figure 2. Different R models with schools opening and relaxation of NPIs

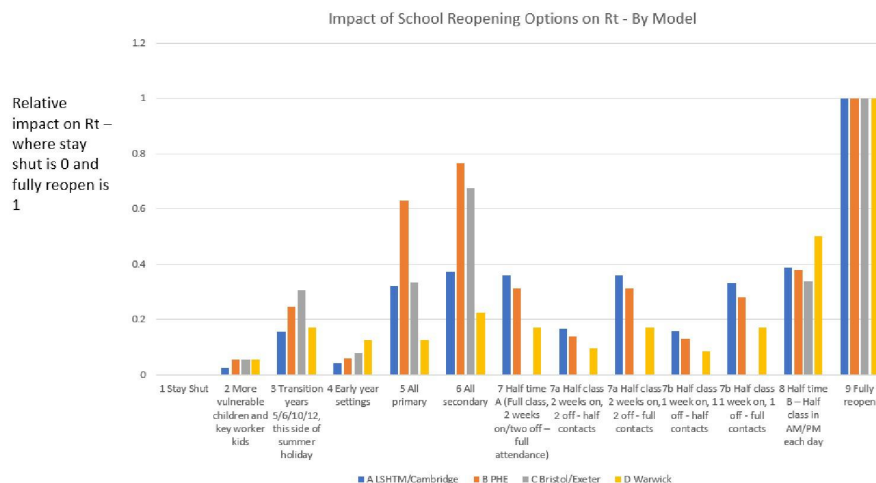
- With schools closed and R 0.7-1.0, as now, there is little headroom with no contact tracing in place.
- The more modest re-opening options are lower risk, but the level of risk depends on TTP performance. It will be important to know accurately the actual, proven TTP performance at the time when changes are made.

3. Modelling options for Schools Reopening (modelled without additional concomitant relaxations) (SAGE 04 May 2020)



Note – modelling of option 7 (the rota system) is the least robust of all scenarios, and further exploration is needed.

Figure 3. Modelling of different scenarios for schools reopening.



Note – modelling of option 7 (the rota system) is the least robust of all scenarios, and further exploration is needed.

Figure 4. Different R_t models with varying scenarios for schools reopening.

- Different effects on R_t depend on:
 - Age of Children
 - Numbers of Children going back
 - Systems to break the size of the network (which are split in to two mechanisms)
 - Rota systems (scenario 7s) to break size of networks

- The extent to which fewer children in school will reduce the number of contacts within their network (this is uncertain)
- The modelling of Scenario 7 is the least robust of the scenarios, and further exploration is needed.
- Modelling conclusions are sensitive to susceptibility of infectivity of children.
- The behavioural science dynamics identified in the report will make each approach more or less effective in preventing spread of infection and supporting or undermining student educational, developmental, social and psychological impacts.

4. Paper reporting systematic review of studies investigating infection & transmission in children (SAGE 21 May 2020)

- The degree to which children and young people are infected by and transmit the SARS-CoV-2 virus is unclear. Clinical series and testing cohorts based upon screening of symptomatic cases provide biased estimates of susceptibility in children. The role of children and young people in transmission of SARS-CoV-2 is dependent on susceptibility, symptoms, viral load, social contact patterns and behaviour.
- A SAGE study undertook a rapid systematic review of contact-tracing studies and population-screening studies to address the question “What is the susceptibility to and transmission of SARS-CoV-2 by children and adolescents compared with adults?”
- A search of PubMed and medRxiv on 16 May 2020 identified 6327 studies, with additional studies identified through hand-searching of cited references and professional contacts. The study team assessed quality, summarized findings and undertook a random effects meta-analysis of contact-tracing studies.
- The study concluded that:
 - There is preliminary evidence that children and young people have lower susceptibility to SARS-CoV2, with a 56% lower odds of being an infected contact.
 - There is weak evidence that children and young people play a lesser role in transmission of SARS-CoV-2 at a population level.
 - The study provides no information on the infectivity of children.

- 18 studies met inclusion criteria; 9 contact-tracing, 8 population-screening and 1 systematic-review. Studies were of predominantly low and medium quality. Meta-analysis of contact tracing studies showed that the pooled odds ratio of being an infected contact in children compared with adults for all contact tracing studies was 0.44 (0.29, 0.69) with substantial heterogeneity (63%).
- Findings from a systematic review of household clusters of COVID-19 found 3/31 (10%) were due to a child index case and a population-based school contact tracing study found minimal transmission by child or teacher index cases.
- Findings from population-screening studies were heterogenous, included both infection prevalence and seroprevalence studies, and were not suitable for meta-analysis.
- Large studies from Iceland, the Netherlands and Spain and an Italian municipal study showed markedly lower prevalence amongst children and young people, however studies from Stockholm, England and municipalities in Switzerland and Germany showed no difference in prevalence between adults and children.

5. SPI-B Research Note on the Wider Impacts of School Closures on Children (SAGE 21 May 2020)

- This research note identifies the existing evidence, main gaps in the evidence base, and proposes ways to address these gaps in respect to the wider impacts of current and possible school interventions on children. This information will contribute to a greater understanding of the full picture when considering the impact of the interventions on the transmission of COVID-19, as well as on educational, social, and psychological outcomes of the children.
- Consensus that the known gaps exist around understanding:
 - a. The variability of impacts (age, stage, vulnerability);
 - b. Impacts on education;
 - c. Impacts on the social and emotional development of children;
 - d. Impacts on teachers, parents and caregivers; and
 - e. The practicalities of closure and reopening.

A. Variability of impacts (age, stage, vulnerability)

What does the existing evidence say?

- Impacts are likely to vary dependent upon age group. We begin formal schooling in the UK very early when compared to our European neighbours – Reception and Y1 children (age 4-5) are likely to be affected least.
- Those in times of transition and exam years – Y6 moving into secondary school, and those at the top end of secondary are likely to be affected more. No formal ‘ending’ of their schooling, no exams, prom etc.
- Many children will adapt and be just fine. There will be opportunities for families to bond more closely and to undertake a range of activities together. The Effective Pre-School, Primary and Secondary Education (EPPSE) project shows what types of child-adult interactions help learning and demonstrates the importance of children’s home learning environments. Education is far broader than the classroom and the curriculum.
- However, the more vulnerable children in our society are likely to be affected the most. This is expected to be the case among a range of vulnerabilities. For example, those with SEND (special educational needs and disability) are very likely to be adversely affected. Children with EHCPs (Education, Health and Care Plans) can still attend a setting – many parents are choosing not to send children with SEND to school.
- A period of learning at home is also likely to reinforce inequalities between children, and months away from school could mean that emerging learning problems are missed by educational psychologists. Assessments of development undertaken remotely are limited. This, potentially, means that opportunities for early intervention into any emerging concerns will be missed.
- SEND is a very wide-ranging term, and will include children with learning needs, sensory needs, physical difficulties and social, emotional and mental health (SEMH) difficulties. Attachment is likely to be a significant issue, especially for children with SEMH. For some children school provides the most stable and secure part of their lives. For some children, especially with SEMH, a secure emotional attachment to a teacher or school staff member may well be stronger than with their own parents – these children will be adversely affected by a lack of emotional attachment. We know that a failure to positively support psychological wellbeing are likely to have longer term negative implications for child development (WHO, 2004; Norredam et al, 2018). We also know that school attachment and belonging are linked to later educational attainment (Wong et al., 2019).

- 94% of vulnerable children are not in school. A recent Department for Education (DfE) (2020) report found that the risk to vulnerable children's welfare has increased significantly as a result of school closures. Vulnerable children not in school are most likely at home. The risk of harm and abuse in the home is likely to be higher due to isolation, financial stress and based on experiences in other countries. For example, incidents of domestic violence in China tripled over the course of the epidemic (similar in Italy)
- Parents and carers are reporting that previously available formal and informal support has decreased as a result of the coronavirus outbreak. Additionally, there is some evidence to indicate that EHC needs assessment and review work are being withdrawn. This may result in an escalation of needs
- CSC referrals have decreased to around school holiday level, and National Panel Notifications for Serious incidents are not increasing. There are concerns of underreporting which may lead to a substantial surge demand in the future.

What are the main gaps in our evidence base?

- Lack of evidence that needy and vulnerable children are actually in school, despite schools remaining open for children with SEND and EHCPs – where are these children? What are they doing? How are they being supported, and importantly, safeguarded?
- How are child protection services functioning currently in terms of referrals, follow-up, etc. and with respect to vulnerable children?
- Who is actually attending schools at the moment – are they targeting vulnerable children?
- How are schools accomplishing safeguarding functions when most children are not in schools?
- Why are children with SEND/EHCPs not attending?
- Differential impacts on different categories of SEND – physical/sensory difficulties etc.
- Could we target groups of children to attend school?

B. Education

What does the existing evidence say?

- Educational outcomes are seriously at risk, especially for disadvantaged pupils
- Schools are struggling to adjust their teaching patterns to engage pupils in out of school learning, especially in deprived areas. Teachers are reporting that they expect students' studies to be impacted significantly.
- It is assumed that most students have access to devices and the Internet, though an important minority do not.
- Inequities are commonplace, with the majority of teachers surveyed by DfE felt that Year 8 students were likely to undertake less work per day than they should be. This translated to 14% believed to be doing less than an hour a day in affluent areas, compared to 43% in less advantaged areas.

What are the main gaps in our evidence base?

- What teaching is actually taking place at home?
- Parents are their children's first educators and time to support their children's development at home could be positive. However, it cannot be assumed that all parents have the knowledge, confidence, resources and time to support learning opportunities for children. Schools and settings have a role to play here.
- We need to understand the evidence base on different approaches to distance learning among school age children with a view to enhancing the effectiveness and equity of provision now. This could potentially be met through a rapid review by UCL Institute of Education's EPPI Centre. Private schools reportedly have excellent interactive systems – could we learn from them and perhaps require sharing of resources?
- How can we best help and support schools and staff that are open in meeting the development and learning needs of their pupils whilst they are out of school – the need to build resilience in the school system.
- Do we have good data on the proportion of children and families who are practically able to sustain online and home-based learning?

C. Social and emotional development

What does the existing evidence say?

- Almost 7 in 10 (67%) respondents noted school closure had impacted on their child's mental health and almost 3 in 10 (26%) on their child's physical health.
- Many children will miss the opportunities for pro-social interactions with their peer group.
- The most vulnerable will also be negatively affected by existing family distress, housing, poverty, lack of outside space and opportunities for play and exercise, crucial for positive mental health and wider development.
- Secondary impacts on children's social and emotional development may be unexpected in their range. These will likely worsen the longer that schools remain closed, and the country is subjected to lockdown. For example, parental unemployment – along with the effect that this will have upon parental mental-health and the subsequent impact upon their children – again attachment issues loom large.
- Time out of school also generates substantial psychological inequalities on children. This is best understood with respect to summer holidays, where the relationship between parental socioeconomic position and mental wellbeing is mediated by loneliness, lack of socialisation, lack of physical activity and hunger. It is reasonable to expect that similar mechanisms apply here (Morgan et al., 2019).
- When considering mental wellbeing at population levels (i.e. across children), symptomatology and wellbeing will be on a spectrum with likely bell-shaped distribution, rather than in terms of discrete cases (e.g. prevalence of depressive disorders).

What are the main gaps in our evidence base?

- There is a lack of evidence on medium to longer term impacts of this upon mental health. Understandably there are only a few studies into this - Sprang et al (2013) report that children isolated or quarantined during pandemic diseases were more likely to develop acute stress disorder, attachment disorder and grief. Around 30% of the children who were isolated or quarantined met the clinical criteria for posttraumatic stress disorder. Time is an important issue – the longer this goes on, the more profound the difficulties will be and the greater the cost and challenge to overcome them – it is a fine balance and secondary impacts need to be carefully considered.

- Relatedly, what are the inequity-generating impacts on children's mental wellbeing of this pandemic (and its responses), and how severe are these gradients? Is this moderated by strong community/voluntary/school responses or parental coping?
- What is schools' capacity to implement different interventions aimed at supporting mental health and wellbeing? Are schools anticipating 'system overload', both in terms of missed work and catch-up learning and in terms of a backlog of pressing student needs to be addressed?
- Urgent areas where experts are expressing concern, but require data to understand the impact are: a. Increases in child suicide. b. The impact of the lack of socialisation on pre-school children.

D. Impacts on teachers, parents and caregivers

What does the existing evidence say?

- DfE (2020) estimates that approximately 24% of children of critical workers live in households where all adults are critical workers
- Approximately 2%-4% of keyworker children are in school. Early Years provision is more of a concern, with reports from NHS and in the media of staff being unable to work due to childcare commitments.

What are the main gaps in our evidence base?

- DfE has a limited ability to monitor the impact of school closures on the ability of critical workers to go to work
- What messages of support are being offered to parents? To children? How are messages being conveyed to families and children?
- What are the chronic stress/mental health impacts on parents who are having to work at the same time as caring for children?
- What are the impacts of parental chronic stress/mental health on the wellbeing of children?

E. Practicalities

What does the existing evidence say?

- There are risks of opening too soon – teacher health and workload will have an impact – concerns about children being ‘super-spreaders’ infecting staff and therefore their families.
- Social distancing in schools will be very hard to implement - if not impossible, for younger children.
- There will also be important contextual effects to consider upon return to school. What this means is that the impact of poor mental wellbeing will be experienced in schools above and beyond the aggregate decreases in mental wellbeing. This is important because it means child outcomes will likely reflect a double burden of both poor mental health and contextual effects of poor mental health.
- Again, we can also expect these contextual effects to be inequitable in their impact, focusing primarily on schools where existing high burdens of deprivation and poverty exist.
- There are also likely wider impacts on children in context arising from access to services, e.g. child protection—for which school is a key referral mechanism.
- Universal impacts are perhaps best understood as shifting the risk curve. We know that within populations and sub-populations risk is normally distributed, so the focus of general intervention is to shift the risk distribution up or down, rather than targeting the ‘neediest’.

What are the main gaps in our evidence base?

- In preparation for when schools reopen, we need to consider the implications of this period of closure. How will this change the role that parents seek to have in their children’s education? What additional social and educational support will our children and their teachers need as they try to bring life back to normal?
- What is the state of schools’ readiness to return children—in terms of physical health and protective measures; mental health and addressing child distress; exacerbation of existing vulnerabilities?
- What additional interventions to support return to school and associated challenges would schools most like to access?
- We need to understand the proposed interventions and challenges/solutions to applying the interventions to different age groups within (and without) of school settings. For example, encouraging and enabling young adults to engage in

social distancing vs keeping early years children from interacting. What is the evidence/experience of this?

- Behaviour – how does age and type of setting impact the understanding of, and compliance with, social distancing measures? Ditto variation by CiN/CLA/EHCP.
- Is there a role for social media in understanding compliance across different groups? And of perception of risk?
- If transmission is largely behaviourally driven then what are the relative risks for;
 - a. Pre-school/ early years – no sense of social distance, adult controlled low(ish) density locations.
 - b. Primary – more sense of self and others, still adult control but more per setting.
 - c. Secondary – more autonomy, larger numbers, lower self-control
 - d. Post-compulsory – 18-24 increasingly “adult” control and regulation.
- We need to understand more about the behaviour of children prior to and during school openings.
 - a. 5-16 settings
 - i. Who is still attending? How are they getting to and from school?
 - ii. School work?
 - iii. Going to shops?
 - iv. What are they doing with their 1-hour outdoor time? Supervised?
 - v. Are they following rules?
 - b. Early Years settings
 - i. Who is attending? Frequency of attendance?
 - ii. Where and how often going out and about?
 - iii. Where is the balance of risk in considering reopening for Early Years settings; while we know that young children play in closer proximity, they are also fewer in number in any given setting

A. Proposals to address identified issues

The list of proposed actions includes:

- Headteacher/school surveys.
- Each school is different in detail, layout, building type and quality, and children’s social backgrounds; Headteachers and senior staff need discretion to apply guidance to suit local situations and childrens’ needs (collectively and individually); it should be recognised that a ‘one size fits all’ approach is not appropriate (TAG).
- Surveys into the practice of educational psychologists – and their views of the impact of this upon their practice.
- Local authority data on schools that are open.
- Involvement of professionals – educational psychologists – in researching and planning for this.

- A survey of educational psychologists (colleagues at UCL have already offered to do this).
- Survey/portal on the frontline: The issues need to be identified from the bottom-up, as well. We need to commission work to find out what the issues/challenges are for teachers, for parents, and for children. Use teachers and parents as citizen scientists in their communities.
- Identify solutions to better enable families to practically sustain education? What has already been considered? For example, providing tools for every child (unused tablets in schools) and ensuring access to wifi (free/subsidised?) for every child?
- Identify ways to capture the sectors and occupations of parents in order to understand the relationship between school attendance (especially of key workers) and presenteeism/absenteeism across sectors.
- We need to identify the impact of interventions on behaviour across different age groups inside and outside of school.
- We need to identify how age and type of setting impact the understanding of, and compliance with, social distancing measures?
- Move beyond simply trying to identify what people (children, teachers, parents) are doing, to understanding what is driving the behaviour.

6. Understanding transmission routes to inform risk assessment and mitigation strategies

- The SAGE Environmental Modelling sub-group have proposed a framework for evaluating the behavioural, viral and environmental factors that control the transmission of SARS-CoV-2
- The approach can form the basis of quantitative assessment of transmission risk, however there is insufficient data available to currently do this with confidence.
- However, the approach can be used now to inform structured risk assessments that consider the transmission mechanisms against a hierarchy of risk controls. It is recommended that this is used to consider risk during different job activities to identify key points for mitigating risk.
- It is essential that risk reduction interventions use a “mitigate, monitor, modify” approach that is supported with national surveillance, test-trace-isolate, targeted research programmes and local monitoring approaches.

7. Paper by the US Department of Homeland Security on virus survival on surfaces and in aerosol

- *Survival on indoor surfaces.* At 24° C the half-life for SARS-CoV-2 dried onto stainless steel in simulated saliva was 14.5 hours at 20% relative humidity (RH), 7.1 hours at 60% RH and 8.3 hours at 80% RH demonstrating the stability of the virus in indoor environments. Increasing temperature and RH decreased the half-life (1.1 hours at 35° C and 65% RH). SARS-CoV-2 is stable on surfaces in indoor environments not exposed to sunlight.
- A model within the report suggests linear relationships with temperature and humidity in the range 20-35°C. There may likely be some small benefits in maintaining buildings at a warmer temperature (e.g. increasing from 20-22°C to around 26°C) where this doesn't cause significant thermal discomfort. However ventilation rates should not be reduced to achieve this. EMG believe that the evidence for improving ventilation in poorly ventilated buildings in order to dilute and remove bioaerosols is stronger than that for altering temperature and humidity. Hence changing building temperatures or humidity should only be considered where it can be achieved while still maximising the fresh air ventilation.
- *Survival on surfaces exposed to artificial sunlight* - Solar radiation rapidly reduced viral stability on stainless steel surfaces with virus half-lives of 2 minutes in high intensity full sunlight, 3 minutes in half sunlight and 4 minutes in quarter sunlight compared to ca10 hours in the indoor environment. Outdoor surfaces exposed to sunlight are lower risk for virus transmission and sunlight may be effective as a disinfectant for potentially contaminated non-porous surfaces.
- *Survival in indoor aerosols.* No decay within an hour at 20° C at a range of relative humidities in the dark. Some evidence for increased decay at 30°C and 70% RH. Dstl have also generated limited data under dark conditions showing similar behaviour. SARS-CoV-2 is stable in the aerosol state in indoor environments
- *Survival in outdoor aerosols.* Full intensity sunlight rapidly inactivated SARS-CoV-2 in aerosols (half-life 2-3 minutes). Moderate intensity sunlight also rapidly inactivated viral aerosols with slightly longer half-lives (4-6 minutes). This shows that the outdoor environment will be a lower risk for aerosol transmission, although it should be noted that this timescale will not significantly influence close range (less than 2m) risk. Outdoor SARS-CoV-2 aerosols exposed to sunlight are rapidly inactivated. The outdoor environment presents a far lower risk for long range viral aerosol transmission due to rapid inactivation and dilution of the virus.

- *Intensity of sunlight.* No data is provided on the UV levels used for moderate and high intensity sunlight. It is assumed that these values correspond with the UV intensity scales used in weather forecasting where moderate intensity is defined as a UV index reading of 3 to 5 (meaning moderate risk of harm from unprotected Sun exposure) and full intensity is a UV index reading of 6 to 7 (meaning a high risk of harm from unprotected Sun exposure).

8. Risk of COVID-19 amongst parents and grandparents of primary school children (under 11 years old) (SAGE 19 May 2020)

- Risk of disease and death is highest amongst the elderly. Being elderly, male, and having pre-existing conditions, make you more likely to die from COVID-19.
- Parents of primary-aged children are younger than the general population 93% of parents of primary-aged children are <50 years old. <50-year olds are between 4 to 14 times less likely to die from COVID-19 than older age groups.
- Parents with comorbidities carry an increased risk. Grandparents of primary-aged children remain at increased risk of severe outcomes. A substantial proportion of people in the high-risk age groups have 1 or more primary-aged grandchild.

9. Summary of actions taken in European countries (TAG 01 June 2020).

Several European countries have opened up schools, some as early as the middle of April but several through the early part of May. These countries have taken broadly similar approaches but with considerable differences in the timing and detail of the release measures. Although the evidence suggests that the opening of schools has had little effect on the effective transmission value R so far, several countries undertook to open other parts of their societies and economies at the same time so it is not possible to attribute any one unlocking measure with any change in R. Furthermore, despite little change in R for most countries, it is too early to tell whether the release measures have had, or will have, a sustained impact on R (i.e. a sustained increase). There follows a summary of the typical approaches taken in one or more countries:

- Smaller class sizes to allow social distancing, maximum of 15 if the classroom size allows.
- Up-skilling of teaching assistants to support the greater number of classes.

- Students return part time in order to facilitate smaller class sizes (Group A taught Monday to Wednesday lunchtime, and Group B taught the same syllabus but Wednesday afternoon – Friday)
- Classes are not allowed to mix. In order to do this staggered break and lunch times are being implemented.
- If a phased approach to releasing school years from lockdown is brought in, then the focus should be on children that are transitioning or due to take final exams (final year GCSE, final year A level, final year primary and final year infants).
- Due to the reduced length of school week per pupil the focus should be on core subjects only (Maths, English, Languages and Science).
- Allowance of one month between the phased return stages to monitor the impact on the virus. The observed criteria to proceed to the next stage of release should be based in the number of new infections, hospital admissions and deaths, and hospital occupancy rates.
- Digital learning for anyone over the age of 16. Virtual lectures/classes and one to one sessions with teachers via video link.
- Libraries to be closed.
- Education on the impact of the virus and the importance of hygiene measures.
- Enforced hygiene measures including social distancing and regular handwashing.
- Children under the age of 11 allowed to play together in small groups but not outside of their own class.
- As younger children are more resilient to the virus younger, age groups are to return to school first.

The graph below shows the R value for Germany up to 13 May. Schools in Germany began to open on 4 May but other cautious economy and society relaxation measures started earlier than this, i.e. from 20 April. The graph shows a 'flat' R value of less than 1 (albeit with some random variation of R of approximately between 0.7 and 0.9). Although R has been 'flat' since late March, which is reassuring, it is too early to say whether the release actions have been successful; consequently, a phased approach has been adopted by several countries.

COVID-19: point estimation of the 7-day R value, Germany, 6th March to 13th May 2020