Improving the prevention of infectious diseases in UK schools

April 2024

Author Information

Jessica Dennehy[1], James Logan[1,2], Will Dyall[1], Freya Spencer[1] and Alexandra Hiscox[1]

[1]**Arctech Innovation**, The Cube, Londoneast-uk Business and Technical Park, Yew Tree Avenue, Dagenham RM10 7FN
T: 0203 105 3522
E: info@arctechinnovation.com
W: www.arctechinnovation.com

[2]**London School of Hygiene and Tropical Medicine,** Keppel Street, Bloomsbury, London WC1E 7HT, UK

Arctech Innovation is a research and innovation spin-out company from the London School of Hygiene and Tropical Medicine, with a mission to protect people's health by developing new and innovative solutions to better predict, prevent and control the spread of pests and infectious diseases, globally. This research was conducted by the social impact division of Arctech Innovation, within a collaborative grant at the London School of Hygiene and Tropical Medicine. This work was financially supported by Reckitt, who were independent from the development of study protocols and report writing.

We would like to thank the International Scientific Forum on Home Hygiene for peer-reviewing and publishing this report: https://ifh-homehygiene.org/consensus-report/improving-the-prevention-of-infectious-diseases-in-uk-schools/

We would also like to thank individuals from UNISON and NASEN for peer-reviewing the draft report and Rebecca Lipman for writing support.

Contents

Author Information 2
Executive Summary 4
About the report 5
About the survey 5
Background: The impact of COVID-19 on schooling in the UK 7
Development 7
Education 7
Absences 8
SEND systems: the hardest hit 8
Beyond COVID-19: ongoing health crises in the classroom 9
Who's in charge of prevention? 9
Our findings: the toll of COVID-19 on teachers and schooling in England 12
An educator's typical pandemic day 12
Attitudes towards hygiene and safety measures in schools 13
Disruption in the classroom 15
Remote teaching 15
Mental health 16
Policy and guidance 19
Clarity 19
Implementation 20
Discussion and Recommendations 21
Final Remarks 34
References 35

Executive Summary

The COVID-19 pandemic was devastating to education, but was that avoidable? And how can we do better in the future? Those are the key questions behind our research into the UK's educational staff experiences and reflections on the pandemic.

On the whole, our findings paint a negative picture. We confirmed that the gaps between government guidelines and real-world implementation were, in some cases, considerable. The rules and guidance were often unclear, teachers said, and even when they felt they had done their best to adhere, depending on the actions, they were still not convinced of their efficacy. And the high stress levels teachers reported during the pandemic has exacerbated staff shortages across the country.

Just as troubling is the ongoing impact on education. Many teachers and students were frustrated and less engaged with remote learning. They also reported struggles with communication in classrooms due to mask and bubble mandates. Many students are still struggling to catch up — and teachers are bearing that burden today. Staff mental health and morale is also still recovering to pre-pandemic norms.

This is unlikely to be a one-time thing. COVID-19 is still mutating, and the risk of other emerging and re-emerging infections becoming global pandemics poses a significant ongoing threat. That's why it's important to find a way to do better. Specifically, to keep teachers and classroom assistants engaged in reasonable levels of infectious disease control in the classroom — while keeping them safe and happy, and maintaining quality of teaching and student support.

In this paper, our results are compared with the findings of other research in this sector and linked up with relevant scientific evidence and government guidelines and policies where available. Recommendations are provided for future responses during three periods: when infectious disease risks are considered low, during early-outbreaks and full-outbreaks, and are grouped thematically across hygiene and cleaning, masking, ventilation, remote learning, mental health and government guidance. These are put forward in areas where there are worrying gaps in compliance, best practices or poor staff and student welfare.

The recommendations made in this report reflect that reducing the risk of infectious disease in schools requires intervention at all critical points. Implementing a baseline level of control strategies as a matter of routine, pre-outbreak, will reduce endemic infection rates and provide a framework which can be intensified to meet new challenges when they arise. This baseline strategy should make use of a targeted hygiene approach[1], which focusses on hand hygiene, cleaning regimes applied to frequent hand contact surfaces and practices to reduce spread of infection via the air. This will enable school staff and pupils to understand the links between when, where, how and why to practice good hygiene, leading to sustainable behaviours for improved future health. Ensuring occupied spaces are well ventilated by investing in building-level strategies and improving Heating Ventilation and Air Conditioning Systems (HVAC) should always be valued as an essential baseline control measure. Preparedness plans should be made to enable rapid changes to these strategies during epidemics which apply to the specific transmission route of a new infection, such as mask wearing and social distancing for an airborne disease. Putting this targeted framework in place across all schools in the UK will streamline control strategies, making communication of guidelines more succinct and helping to safeguard the wellbeing of all those working and learning in educational settings.

About the report

Following the COVID-19 pandemic, during which time schools were shut down and eventually re-opened in phases, studies have shown a variety of mid to long-term consequences to the health, education and social development of UK's students. Teachers and other educational staff also reported experiencing degrees of disruption, anxiety and trauma.

To better understand what happened in UK schools, and create strong recommendations for how such events can be prevented in the future, Arctech Innovation conducted a survey to collate the experiences of headteachers, teachers and classroom assistants across the UK who were tasked with implementing government advice and taking responsibility for COVID-19 health and safety within their own schools and classrooms during the peak of the pandemic.

Using the survey results, as well as findings from third party published or peer-reviewed research, this paper puts forward recommendations for better current and future infectious disease control practices and strategies in educational settings. Recommendations are designed to support the government's commitment to develop health resilience, including hygiene, to meet future health challenges and threats. Therefore, they focus on a basic targeted hygiene framework applicable for normal ongoing implementation in schools as well as provisional plans for intensifying baselines interventions. This will ensure we are equipped to tackle unforeseen challenges, such as COVID-19, as well as endemic infections such as scarlet fever and invasive group A streptococcal (iGAS) disease outbreaks.

Ultimately, lessons from our study will contribute to the delivery of the UK government's three ambitions: 1) to ensure that by 2030 90% of children leaving primary school will achieve the expected standard in reading, writing and maths, 2) in the worst performing areas in the nation where the first is too ambitious, to achieve at least an increase of one third in reading, writing and maths standards and 3) to increase the national GCSE average grade in both English language and maths to 5 by 2030[2].

About the survey

An online survey was conducted between June 2021 and May 2022 to capture the experiences and areas of greatest concern of nearly 700 teachers and support staff across the country who implemented government advice on a local scale within their own schools and classrooms between the first lockdown in March 2020 until the closure of the survey (Figure 1, Table 1).

The survey was disseminated via emails directly to schools and by connecting with survey respondents through unions, conferences and social media. The database of UK schools, stratified by district, downloaded from the Office for National Statistics was used to ensure the survey was widely available to a sample population representative of all age groups, geographic locations and school types.

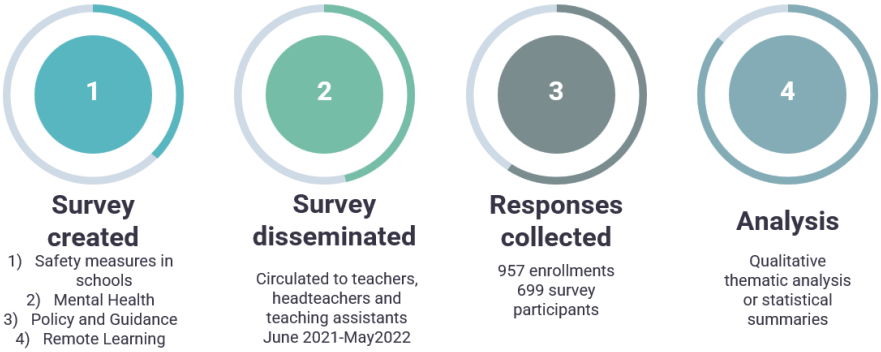

Figure 1. Survey timeline

Table 1. Summary of survey sample characteristics for 699 teachers and teaching support staff who completed the full survey. Where applicable, participants were able to select multiple answers.

Variable	n
Total participants	699
Year Group taught	
Nursery and Reception Years (3-5 years old)	104
Key Stage 1: Years 1 to 2 (5-7 years old)	191
Key Stage 2: Years 3 to 6 (7-11 years old)	269
Key Stage 3: Years 7 to 9 (11-14 years old)	130
Key Stage 4: Years 10 to 11 (14-16 years old)	123
Key Stage 5: Years 12 to 13 (16-18 years old)	69
Job role	
Teacher	44
Headteacher	38
Teaching Assistant	432
Other	1
School location	
East of England	36
East Midlands	34
London	36
North-East	28
Northern Ireland	15
West Midlands	37
North-West	70
Scotland	67
South-East	66
Wales	26
Yorkshire and the Humber	54
School Setting	
State-funded nursey	4
State-funded primary	314
State-funded secondary	98
State-funded SEN	57
Independent (day only)	9
Independent (boarding / mixed day and boarding)	6
Other	26
Teaching location	
Classroom < 15 pupils for > 5 hours	195
Classroom > 15 pupils for > 5 hours	267
Physical Education lessons indoors for > 5 hours	41
Physical Education lessons outdoors for > 5 hours	57

Background: The impact of COVID-19 on schooling in the UK

The UK works tirelessly to deliver the highest possible standard of education to its citizens. Providing young people with the knowledge and skills to succeed in adult life is not only the foundation of the nation's social justice, but is fuel for the engine of our economy.

Development

Education plays a core role in shaping and enhancing the social, physical and mental wellbeing of children. During the initial phases of the COVID-19 pandemic, face-to-face attendance was significantly impacted. The knock-on effects of this are still being studied, but initial findings suggest significant damage to many children's development.

Ofsted released a series of briefings, named the 'Education Recovery Series', between Autumn term 2021-Summer term 2022. The first briefing raised concerns about pupils having lower resilience and confidence and greater anxiety as a result of remote learning[3]. These issues are further exacerbated for disadvantaged and vulnerable groups, who have suffered more during the COVID-19 pandemic, hindering progress towards narrowing the attainment gap between disadvantaged children and their peers from 2011 to 2019[4].

Education

In Autumn 2021, the average primary school pupil had experienced learning loss of 1.9 months in maths and 0.8 months in reading because of pandemic measures. Disadvantaged children lost an additional 0.3 months in maths and 0.4 months in reading[5]. The second briefing in the 'Education Recovery in Schools' series reported an observable knowledge gap due to content not being taught when schools were partially closed or because pupils did not learn well remotely[6]. Similar issues were reported the following term, with knowledge gaps in phonics, mathematics and writing stamina.

The final briefing of the 'Education Recovery in Schools' series, published in Summer 2022, reported that while many children have caught up academically, some are still not where they need to be to progress to the next stage. This is highlighted particularly for Reception, Key Stage 1, Year 6, 7, 8, 11 and 13[7].

Some schools also reported a decline in pupils taking certain subjects for GCSE, A level and International Baccalaureate, including triple science and English. Senior Leadership Teams also highlighted concerns about Reception Year cohorts, particularly in relation to children's weaker speech and language development.

As stated in the recently published government report "Opportunity for all: Strong schools with great teachers for your child"[2], children will not achieve their potential in a school with poor standards of attendance and behaviour and therefore responsibility has been attributed to both the government and school leaders to ensure all children attend school and learn in calm, orderly, safe and supportive environments. Securing this environment must also consider wider societal issues such as mental health.

Absences

Despite the reopening of schools in June 2020, absence rates of pupils in educational settings (including positive COVID-19 cases and not attending due to COVID circumstances) was 8.5% in the Autumn 2021/22 term, a higher absence rate than for the same period of the school year in pre-pandemic years. The majority of the increase in absence was due to illness[8].

For educational staff, the impact has also been significant. On 21 July 2022, it was estimated that between 5.1% – 5.5% of teachers, school leaders, teaching assistants and other staff were absent[9]. This is down from 6.8%-8% reported to be absent on the 7 July 2021, however still higher than pre-pandemic levels.

The pandemic's health impacts rage on: according to the Office for National Statistics, there are currently 87,000 British children and young people aged 2-16 living with Long COVID; 30,000 of whom were still experiencing symptoms 12 months after their initial infection[10]. There are currently no treatments or cure for Long COVID, which poses unexpected, long-term debilitating health challenges, as well as mental health challenges for both pupils and staff, all contributing to children's ability to access quality education.

SEND systems: the hardest hit

The pandemic affected some student and educator populations more than others, with notably disproportionate impact on those with the most disadvantaged backgrounds and with special educational needs and disabilities (SEND).

Even before the pandemic hit, the SEND system was identified as having poor quality education, a lack of joint commissioning (the process of health and social care organisations collaborating and sharing responsibility for integrated care services and their outcomes) and problems with identification and assessment of needs[11].

During the pandemic, research conducted by Ofsted found that children and young people with SEND were often not receiving education, were missing support for physical and mental health, and were often out of sight of safeguarding professionals[5].

The number of children and young people identified as having SEND or disadvantaged backgrounds in the UK has continues to increase, in January 2022 a total of 355,566 (4%) of UK pupils received an Education Health Plan (EHC) and 1,129, 843 (12.6%) of pupils received SEND support[12]. As recovery from the pandemic begins, it is evident that these children are more vulnerable than they were before and therefore reform to the SEND system has become even more urgent than it was before the pandemic.

Ofsted inspections also show that COVID-19 related absence remains a significant concern, specifically for pupils with SEND and disadvantaged[13]. Additionally, while factors such as behaviour in schools have improved since the return to face-to-face learning, the pandemic is continuing to have a negative impact on mental health and wellbeing. Challenges to catching up include disruption to external services for pupils with SEND, increased waiting lists for mental health services, staff absences, workload of special educational needs and/or disability coordinators (SENCos) and higher rates of absences for pupils with SEND[7].

Beyond COVID-19: ongoing health crises in the classroom

COVID-19 infections have dominated headlines in recent years, but COVID has not been the only infectious disease to impact the young people in the UK. During the Autumn term of 2022 (19 September - 25 December) there were 33,836 notifications of scarlet fever in the - a significant leap from 2017 to 2018 (the last comparably high academic year) when there were 30,768 scarlet fever notifications spread across the entire year. These infections highlight the need for baseline strategies to be implemented as part of daily school routines, to mitigate endemic infection, and allow for rapid scale up in the face of new infectious disease outbreaks.

For invasive group A streptococcus (iGAS) infections, during the same term, there were 151 iGAS cases in children aged 1 to 4 and 102 cases in children aged 5 to 9 compared to 194 and 117 cases for each age group respectively across the whole year of the last comparably high season in 2017 to 2018. Altogether, along with COVID-19, this demonstrates the ongoing threat infectious disease outbreaks pose to educational settings[14].

Who's in charge of prevention?

UK schools began to re-open in June 2020 and operational guidance in schools was published in July 2020. Forty six updates were made to these guidelines between July 2020 and February 2022[15] (Table 2). Across all guideline updates, core control measures remained in place. These key control measures, to be enforced by school leaders, included:

1. Good hygiene for everyone (hand, respiratory, PPE)
2. Maintain appropriate cleaning regimes, using standard products such as detergents
3. Keep occupied spaces well ventilated

The rationale for initial government guidelines were based on assumptions that children played a minimal role in community spread, schools were not foci of transmission and children were not harmed by infection[16]. These assumptions were disproven, and warnings were provided by the Scientific Advisory Group for Emergencies (SAGE) of the significant roles that schools played in infection transmission[17].

All operational guidance was issued directly by the government to schools and little was done by local authorities to standardize implementation or give further advice to individual schools. Schools were left to interpret and implement government guidance, leaving many teachers to navigate the implementation of infection control measures with little support.

Table 2. Government guidelines for educational settings from March 2020-April 2022[16]

Date	Policy Decision
March2020	Schools closed
June2020	Schools reopened with advice released to parents and carers[15]
July2020	Government released operational guidance for schools, specifying control measures for: 1. Good hygiene for everyone (hand, respiratory, PPE) 2. Maintain appropriate cleaning regimes, using standard products such as detergents a. Put in place and maintain an appropriate cleaning schedule, including regular cleaning of areas and equipment (minimum beginning and end of day) with a particular focus on frequently touched surfaces such as door handles, light switches, work surfaces, remote controls and electronic devices 3. Keep occupied spaces well ventilated 4. Follow public health advise on testing, self-isolation and managing confirmed cases of COVID-19
Autumn term 2020	Schools restarted with implementation of staggered start times, hand and surface hygiene measures, class or year bubbles, physical distancing for older children where possible, self-isolation for confirmed cases and contacts and compulsory masks in communal areas in areas of local lockdown for secondary school children
September 2020	Implemented bubble systems and physical distancing in secondary schools where possible
November 2020	Advised against masks in classrooms for primary and secondary school children
January 2021	Schools closed partially and implemented rapid testing of asymptomatic secondary school children, staff and household members of school children and staff, with isolation if positive (3 tests to be carried out onsite and the 4th and subsequent test to be carried out at home)
February 2021	Schools advised against students and staff wearing masks and advised against testing in primary school children
March2021	Schools reopened with implementation of isolation of cases and contacts, hand and surface hygiene, social distancing, bubbles, and masks and rapid testing in secondary schools (twice per week)
May2021	Masks requirements removed across the UK
August2021	Policy removed for quarantine for contacts of cases in those under 18 years, school driven contact tracing and bubble systems

September 2021	CO2 monitors implemented in schools (delivery delayed and utility limited) with recommendations to increase ventilation once CO2 levels reached >800ppm (levels consistently greater than 1500ppm indicate poor ventilation and actions to be taken as a priority)[18]
January 2022	Masks implemented in secondary school classrooms (removed after 3 weeks in England)
April2022	Removal of free rapid testing in schools

At its peak, the COVID-19 pandemic forced over 1.6 million children out of school and it was widely accepted that school closures would result in substantial loss of learning, despite transitions to remote learning.[19]

Our findings: the toll of COVID-19 on teachers and schooling in England

The survey provides us with a real-world understanding of the pandemic's impact on teachers and students both in school and learning remotely. It also helps us understand how government guidelines for COVID-safety were applied and adhered to on the ground, and how educators felt about their efficacy.

An educator's typical pandemic day

To set the scene, we asked how respondents spent their working hours during the pandemic.

Naturally, when not working remotely, the majority of time is spent in classrooms. Respondents most often said there were more than 15 seated pupils in their classroom throughout the week during the pandemic. Most (75%) stated that they spent no time alone during the work week. And the majority (89%) spent very few hours in shared offices and staff rooms.

Face coverings, like masks, were provided to most of (78%) respondents to wear in school. Most (87%) said they wore the coverings indoors when not teaching (e.g. in corridors, staff rooms and toilets), although few wore them while in classrooms (only 25% said more than half of school staff wore masks while in classrooms).

Social distancing was another common theme during the pandemic. Teachers overwhelmingly said that their classroom was changed to enable social distancing (76%) — the most common approach was seating pupils side by side and facing forwards (86%) and many moved unnecessary furniture out of the classroom to create more space (59%). Nevertheless, two-metre distancing between pupils was rarely maintained. Only 23% said schools implemented regulations requiring the distance, and only 16% and 22% said they and their students were able to strictly adhere to social distancing while in the classroom and corridors, respectively.

The majority of respondents (81%) said they had dedicated cleaning staff responsible for cleaning the classroom, but 67% said they or other teachers were also responsible. In 14% of cases, pupils also had cleaning responsibilities. This shared workload makes sense given the frequency of cleaning throughout the day, which cannot always wait for cleaning crews.

How often classroom items are cleaned, according to respondents:

- desks and furniture
    - 54%: several times a day
    - 38%: the start and end of the day
- shared play and learning equipment
    - 33%: several times a day
    - 37%: the start and end of the day
- whiteboards and electronic devices
    - 41%: several times a day
    - 41%: the start and end of the day
- door handles and handrails
    - 64%: several times a day
    - 30%: the start and end of the day

The majority of respondents felt safe while cleaning (70%) and when asked how long they personally spent cleaning each day, most (90%) said less than one hour, while about 9% said between 1-2 hours.

Finally, COVID-19 safety signage for students and teachers to read were displayed in the majority (69%) of schools and classrooms. But respondents were generally wary of their efficacy (Figure 2).

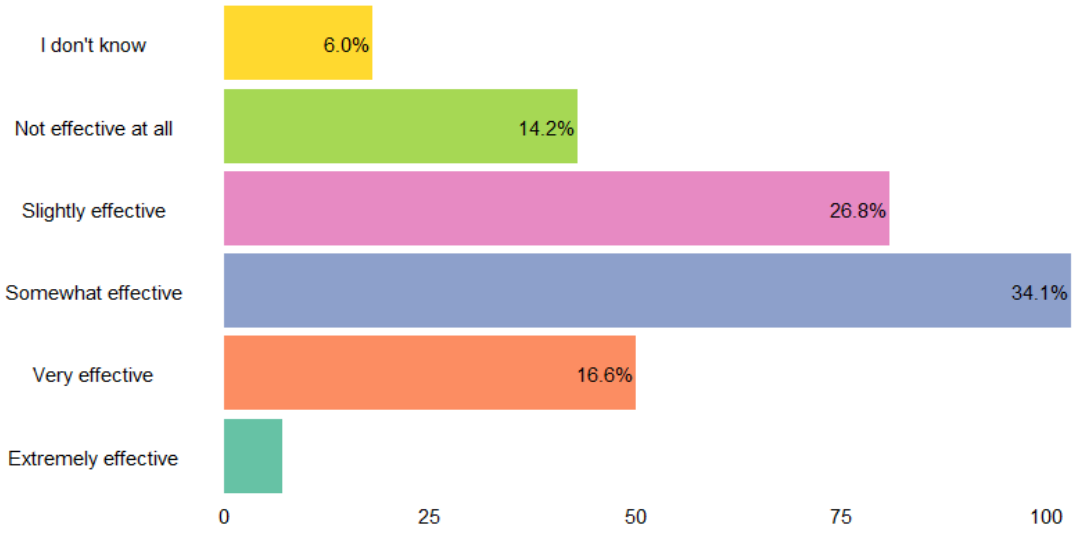

Figure 2 .How effective is the COVID-19 safety signage in your school? (n=309)

Attitudes towards hygiene and safety measures in schools

Safety measures recommended by the government and implemented in schools during the pandemic included additional cleaning measures, staggered start times, hand hygiene measures, class or year bubbles, physical distancing for older children where possible, self-isolation for cases and contacts and masks for secondary school children.

When asked which additional measures made a difference to their feelings of safety while teaching, respondents overwhelmingly selected opening windows for ventilation (81%). Other popular choices are wearing face coverings (67%) and additional classroom cleaning (52%). Interestingly, teachers

were less enthused about the use of lateral flow tests (9%), the added safety of one way-corridors (23%), classroom social distancing (27%) and staggered drop-off and pickup times (32%).

Opening windows — the action most associated with feelings of safety — was also one of the actions most administered by respondents. Most said opening windows for ventilation were implemented at their school (93%) and 75% said they personally kept the classroom window open all day.

Despite the additional cleaning efforts and the feelings of safety it induced in respondents, when asked to rate the standard of cleaning of their classroom, few said it was Excellent (12%). Most said it was Good (42%) or Fair (30%). And 14% rated it as Poor or Very Poor.

Half of respondents felt that there were no safety measures implemented which helped them feel safer whilst teaching.

This is because safety measures were either not followed or respondents perceived that they did not work (50%). (Figure 4). When asked what other safety measures would make them feel even safer while working, respondents most often selected increased compliance with the use of facemasks and improved ventilation (Figure 3).

But one bottom line statistic probably says it all: when asked if respondents want more COVID-19 safety measures implemented in their school, most simply said no thanks (63% no, 37% yes). The health & safety fatigue is real.

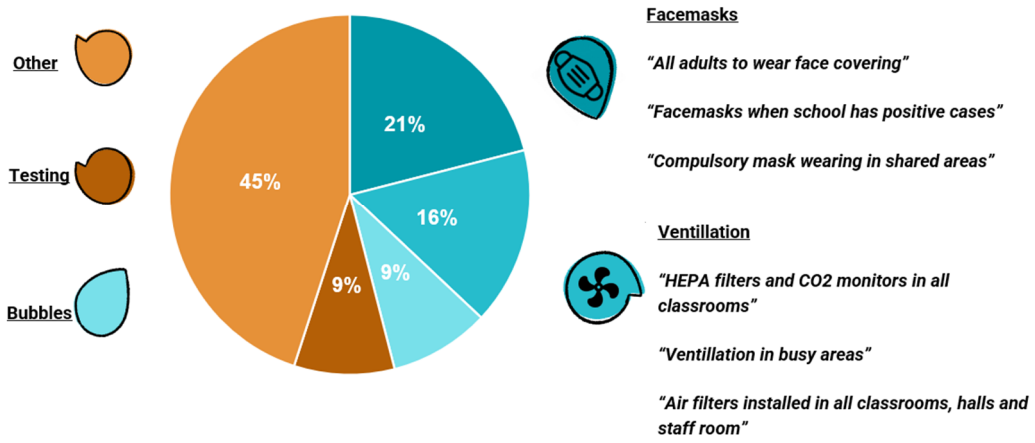

Figure 3. Respondents were asked to explain what other COVID-19 safety measures would make them feel safer whilst working in school? Free text responses have been grouped thematically (n=204).

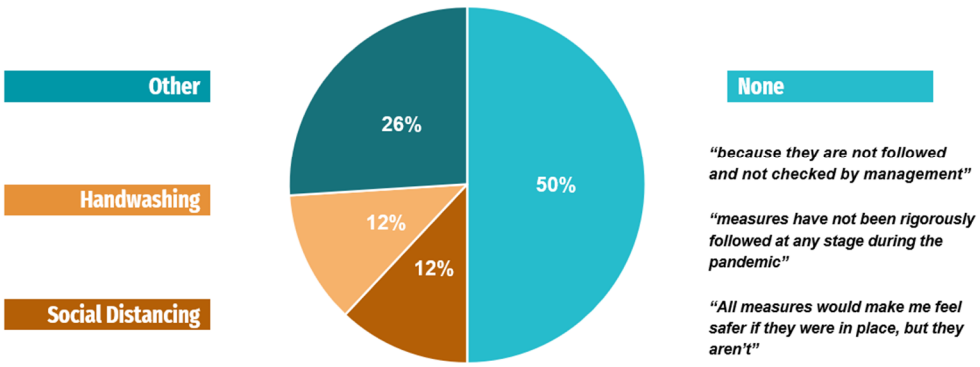

Figure 4. Following the multiple choice question 'Which, if any of these, COVID-19 safety measures make a difference to how safe you feel whilst teaching in school?' Respondents were asked to provide further information. Free text responses have been grouped thematically (n=34).

Disruption in the classroom

Did safety measures negatively affect the quality of education? According to respondents, there was some impact. Face coverings, along with social distancing and bubble systems, were regarded as the most disruptive and challenging to implement. But many reported that social distancing and bubble systems made no difference and should not be implemented.

The biggest impact may have been felt by students in SEND systems. A quarter of respondents said the additional safety measures had an overall negative impact on their ability to assist students with disabilities. Although 46% reported no change.

When asked to provide further detail, factors which respondents perceived to be responsible for negatively impacting their ability to support pupils with SEND included difficulty in maintaining social distancing (23%), enforcing face coverings (18%) and a lack of rapport and social interactions due to school closure (9%).

Remote teaching

Remote working was another new reality faced by students and educators. As a sample, between January and February 2021, nearly a quarter (24%) of respondents said they spent all of their time teaching remotely. Slightly fewer, 22%, said more than half of their time was spent remotely versus 21% who said roughly half, and 33% who said less than half.

When asked about the impact of remote work on the quality of their teaching, respondents largely said it remained the same (63%) but significantly, 25% said it worsened versus 13% who said it improved. Impact on the levels of one-on-one support between teacher and pupils were also impacted: 46% said they were unable to provide it (although 41% said they were still able to).

Overall, pupil engagement and increased workload were reported to be the biggest remote-teaching challenge for respondents (30% and 17% respectively).

Most respondents (63%) also felt it was difficult to adapt lessons to remote formats (versus 31% who found it "Fairly" easy to adapt and 6% who found it "Quite" or "Very" easy). Respondents also reported that technical difficulties were experienced either daily (29%) or weekly (29%). For an unlucky 7% of respondents, technical difficulties were experienced "in every lesson". According to one respondent in a write-in: "Not enough training was given and nobody knew what to do. It was stressful when things went wrong and there was no one to ask for support".

Fortunately, across all key stages, respondents felt schools were generally well equipped with the necessary facilities (e.g. laptop/internet/software) to remote teach (70%). However, 30% of the respondents who provided further information said they were not sufficiently resourced with equipment as teaching assistants were still required to share equipment with students on occasion (32%).

Mental health

Educators bore a lot of stress during the pandemic. Few entered the profession expecting to take on pandemic-level infectious disease control, increased workloads when transitioning to online learning, increased responsibility for both the emotional and physical welfare of their students as well as increased pressure to maintain academic grades and recover delayed learning due to absence.

Nevertheless, they were called to action, and it has taken a toll. Most (61%) felt being a teacher during the pandemic had an overall negative impact on their mental health and wellbeing. And 65% felt a sense of loneliness/isolation while working during the pandemic. The survey further reveals a high proportion of respondents felt worried for their own, colleagues' and students' safety during the pandemic (83%, 83% and 78% respectively) (Figure 5).

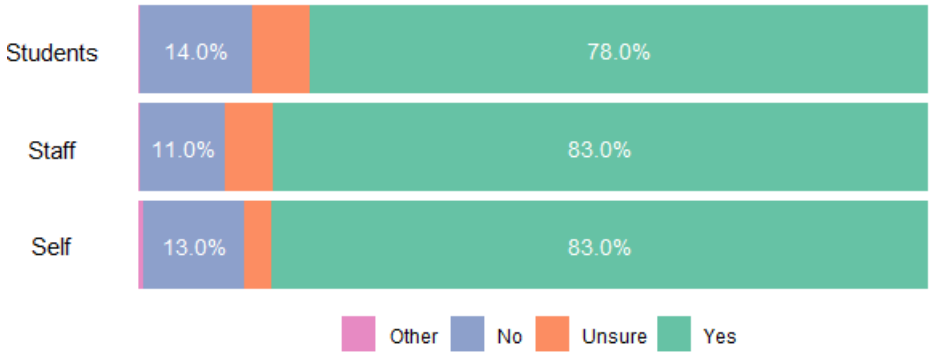

Figure 5. In the last 12 months have you been concerned for your 1) students' (n=466); 2) colleagues' (n=466) and 3) own (n=465) safety regarding contracting COVID-19 infection? Respondents were asked separately about the safety of each group (n = number of responses to each question).

Relationships with work colleagues were also impacted — 93% said they had "good" relationships with work colleagues before the pandemic versus 71% who felt the same at the time of the survey. Their connections with the community also suffered (73% felt part of their community pre-pandemic, versus 51% at the time of the survey).

We also asked respondents to rank their level of stress before COVID-19 and during the peak of the pandemic, scored 1-10 (with 10 corresponding with highest level of stress experienced). Results show an average increase in the stress levels by more than two points (22.5%), and there was a significant increase in the median (30%) (Figure 6). Overall, during the pandemic, stress shifted from a normal distribution to a distribution heavily skewed towards higher stress levels.

A high proportion (62%) of respondents considered leaving the teaching profession during this period

When asked to provide further information, lack of support was the most mentioned factor (40%).

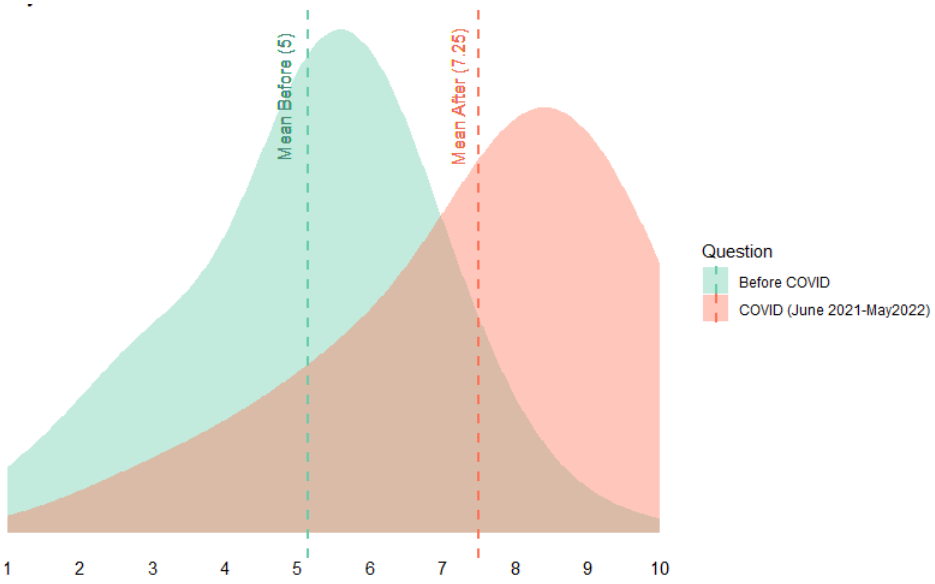

Figure 6. Respondents rated their stress levels from 1-10 comparing pre-pandemic levels and the period of the pandemic assessed by the survey (June 2021-May 2022) (n=414)

Now that "business as usual" has been restored, stress levels have not diminished. Worryingly, 86% of respondents said they would attribute their current stress levels to the ongoing pandemic — including 39% who said it was a "significant" contributor.

And many are taken aback by the pandemic's ongoing impact on students' health, education and social development. When asked to select which factors worried them most about school re-openings, 80% respondents selected they were worried about spread of COVID-19 for staff and pupils, but in a not too distant second, 61% said selected that they were worried about loss to pupil's learning and 57% selected pupils' ability to adapt to returning to school.

When asked to write in further information about concerns around schools reopening, factors such as pressures from Ofsted, staff absences and changes in children's behaviour following lockdown were reported. One respondent wrote: "I am concerned about keeping pupils attending school when there are soaring staff absences, unrealistic expectations and a lack of understanding from Ofsted.

"Children's behaviour is very different now — they are noticeably lacking in social skills and resilience"

During the pandemic, most respondents said they required support for mental health and wellbeing. This was most often given by family and friends (62%) and partners and spouses (48%). Fewer leaned on relationships with colleagues (39%) or and managers/senior leaders (13%). Formal counselling services were used by 8.4%, but this may be because only about a third of respondents were offered access to counselling services (34%).

Policy and guidance

Finally, the survey explored attitudes towards government guidance and policy, specifically focusing on clarity and impact.

Clarity

Nearly half (49%) of respondents found the government's COVID-19 school guidance difficult to understand. The areas requiring further clarity included close contact/self-isolation rules (selected by 71%), appropriate use of PPE by teachers (46%), social distancing (45%), ventilation (38%) and school cleaning (36%) (Figure 8).

When asked to elaborate on the gaps in government guidance, respondents felt the guidance was vague or contradictory, lacked understanding of specific year needs and was not appropriate or timely for pupils with SEND. Telling write-ins included: "Guidance for SEND settings was often delayed in coming out and was not appropriate to the setting" and "further guidance was needed for outbreak situations" (Figure 9). Nearly all survey respondents felt that school staff should be consulted more widely about changes to the government's COVID-19 school guidance (93%).

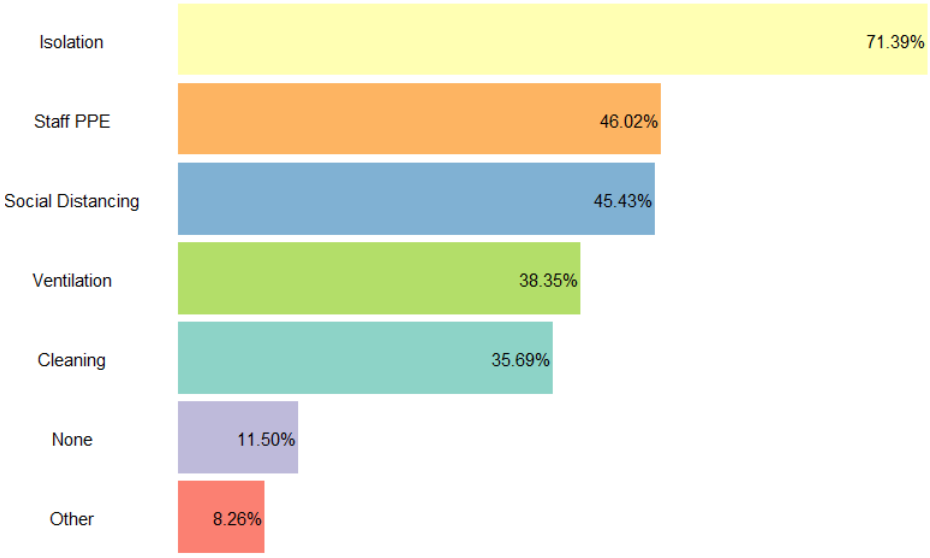

Figure 8. Please choose the areas of government COVID-19 school guidance which you feel require further clarity? Respondents were able to select more than one answer (n=350).

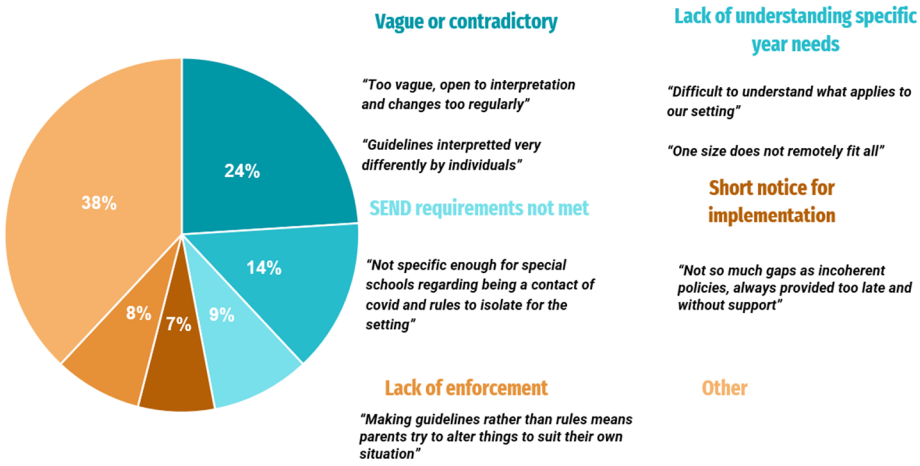

Figure 9. Following the multiple-choice question 'Do you think there are gaps in the government's COVID-19 school guidance?' respondents were asked to provide further information. Free text responses have been grouped thematically (n=141).

Implementation

Over half of respondents felt the government's guidance was either difficult (43%) or extremely difficult (10%) to implement and when asked to explain further, nearly half said this was due to insufficient training (46%).

Discussion and Recommendations

The survey makes it clear that, professionally, educators had an overall negative reaction to the pandemic response. Many feared for their safety and that of their students and fellow staff, and they largely lacked confidence in the extra health and safety measures they were asked to administer. We also saw that application of those measures varied significantly across respondents, not least due to confusion about how, when and why they were supposed to be implemented, and frustration that recommended measures were not suited for the reality of their school setting. For schools and educators supporting pupils with SEND, an additional challenge was faced where some pupils remained in schools and many control measures were not feasible to adhere to. Altogether, teachers report increased levels of stress and a lack of support. Many said they strongly considered leaving the profession.

On top of all this, it is clear students' education and social development suffered from school shutdowns, remote learning and some safety measures (like masks and grouping) in schools. Many students are still recovering.

This puts UK education staff and their leaders in a difficult position going forward. COVID is not fully behind us — new variants pose future threats — and other infectious diseases from flu, scarlet fever and iGAS infections are already showing breakthrough figures.

Teachers will once again, inevitably, be asked to prevent disease spread — so how can we do it better?

We reviewed the available science on the importance and effectiveness of various infectious disease control measures, and matched that up with survey findings to find the successes and failures. In acknowledgment of the gaps, we provide recommendations for future responses during three periods: when infectious disease risks are considered low, during early-outbreaks and full-outbreaks.

#1 Hygiene and Cleaning

It seems likely from the available evidence that the primary route for SARS-CoV-2 transmission is via aerosols or infected droplets emitted from an infectious person during, not only coughing and sneezing, but also talking, singing etc.[20].This suggests that key interventions are isolation, social distancing ventilation and mask wearing. However, hands and frequent hand contact surfaces have been shown to contribute to transmission in densely occupied settings[21] Therefore environmental cleaning and hand hygiene are key Infection Prevention and Control (IPC) measures for preventing the transmission of infectious diseases in schools[22,23,24].During the pandemic a great emphasis was placed on hygiene and cleaning of surfaces including desks and handrails. The guidelines published by the government did not specifically state who was responsible for the additional cleaning measures and classroom cleaning became an additional burden,-which exceeded teaching staff's expected job descriptions and available time.

Washing hands is shown to be beneficial in prevention of infection from contaminated surfaces as this breaks the route by which the virus is picked up and introduced to a person. A recent meta-analysis found that interventions promoting handwashing with soap in LMICs reduced Acute Respiratory Infections by 88% (risk ratio of 0.83, 95% Cl 0-76-0·90) and Lower Respiratory Infections by 64% (risk ratio of 0.78, 95% Cl 0-64-0·94) and therefore could help to prevent the large burden of respiratory disease[25].

Transmission via surface contact can contribute significantly to rate of infection. For example, modelled data representing a COVID-19 outbreak on the Diamond Princess Cruise ship, attributed as much as 30% of transmission to surface contact[26]. Therefore, in an outbreak or high transmission situation, public perception of respiratory infection risk should consider the risk of contamination through touching a contaminated surface, not washing hands afterwards and then touching eyes, mouth or nose.

In the survey, we saw that half of teachers selected "additional classroom cleaning" as a measure that made a difference to their feelings of safety. And in write-ins, many respondents emphasised a wish that more of this was done or adhered to by others. This was reflected in a public poll conducted to understand the public's knowledge of when hygiene is needed in everyday life. The results suggested people in the UK unable to use their knowledge of how the virus spreads to make informed decisions about when to practice hygiene. In particular, there is a belief that deep cleaning, including non-targeted disinfectant usage on environmental surfaces, gives added protection, leading people to practice additional cleaning and disinfection in situations where there is little benefit[27].

Compliance is essential to successfully implementing any hand or contact surface hygiene intervention and therefore it is important that local authorities (such as UKHSA Health Protections Teams HPTs) support schools to facilitate and motivate children to adhere to hygiene protocols, such as ready access to handwashing and strategically placed hygiene messaging. It is also important to educate children on the 'journey of the germ', to understand how different control measures work together to prevent the spread of infection.

Population risk management requires intervention at all critical points to maximise transmission risk reduction and therefore a targeted hygiene approach based on risk management should be implemented in schools. This will enable the public to make cognitive links between when, where, how and why to practice good hygiene, and in doing so, promote implementation of effective hygiene measures and sustainable behaviours[1].

Recommended actions and supportive policy/guidelines

Pre outbreak	Early outbreak *in addition to pre- outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
• The role of targeted hygiene in infectious disease prevention and control should be integrated into the curriculum by the National Government • Senior Leadership Teams should disseminate strategically placed handwashing or sanitising guidance for staff and pupils • Handwashing / sanitising mandates for staff and students should be implemented link up by teaching staff at frequent intervals of the day (e.g. arrival, before lunch, end of day) • Senior Leadership Teams should use a risk-based approach to implement handwashing / sanitising and surface contact cleaning protocols including when, where and how (e.g. handwashing at arrival, before lunch and end of the day and surface contact cleaning for frequently touched surfaces at least twice a day)	• Local Authorities (such as UKHSA HPTs) should ensure all schools are adequately equipped with resources (sanitisers, hand soap, handwashing stations) and accompanying guidance documents • Guidance disseminated by the National Government should be tailored for the target disease profile(s).	• Research-driven educational resources should be disseminated by Senior Leadership Teams to inform staff and students about how standard hygiene practices can be intensified, including when, where and how
Considerations for staff supporting pupils with SEND		
• Teachers and learning support staff should be provided with PPE and tailored guidance to implement additional hygiene measures where other control measures (e.g. social distancing, masking etc.) are not applicable. Further government funding should be allocated to the National SEND Reference Group, to develop emergency preparedness plans applicable to pupils with SEND.		

#2 Masks

Although not conclusive, a range of evidence indicates that face coverings can be effective in contributing to reducing transmission of COVID-19 in schools[28]. The effectiveness of face coverings stems mostly from "source control" — reduced emissions of virus-carrying particles when worn by an infected person. There are other and new variants with higher risk of airborne transmission, as suggested for Omicron, and facemasks may be an even more important control measure during peak seasons[29]. This highlights the importance of implementing a baseline level of hygiene strategies, which may not include mask wearing, that can be intensified during specific periods such as epidemic levels of flu during winter.

The survey found that the increased use of masks is associated with increased feelings of safety, which demonstrates public ability to make cognitive links between airborne disease transmission and effective control measures. Ours is not the only survey to conclude this: in a Unison support survey 71% said face coverings in secondary school classrooms are an important safety measure[30]. However, our survey also highlighted conflicting attitudes towards the use of facemasks, as they were reported to be one of the most disruptive control measures used in schools during the pandemic. These findings were also reflected in a Department for Education (DfE) survey, conducted in March 2021, in which secondary school pupils reported facemasks to make themselves and others feel safe (70% and 87% respectively), however 80% also reported that facemasks made it difficult to communicate[31]. This attitude aligned with the teaching community in another survey conducted by the DfE in April 2021, which found 94% of teachers and school leaders thought that wearing face coverings has made communication between teachers and students more difficult[32]. Many in our survey also indicated that masks weren't always worn outside of the classroom (e.g. hallways, staff rooms, restrooms).

It is clear that during times of outbreaks schools need to be supported in intensifying baseline interventions to implement mask wearing policies, where appropriate, along with methods to mitigate against communication difficulties. For example, support should be provided to accelerate initiatives led by the Department for Health and Social Care (DHSC) to pilot transparent masks in a range of settings and ensure schools are integrated into these studies[33].

Technology can also be better utilised alongside masks. For example, departments can create educational videos with subtitles or automated closed captions and educators can use microphones — both of which are especially beneficial to children with hearing difficulties.

Retrospective research to model the impact of masking on the number of school days lost due to COVID-19 (including staff absences and Long COVID) should also be conducted, to demonstrate the value of masks in educational settings and to better inform best use case scenarios of mask wearing (age groups, appropriate environments within schools etc.) considering both the risks and benefits.

Recommended actions and supportive policy/guidelines

Pre outbreak	Early outbreak *in addition to pre-outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
● The role of face coverings in reducing COVID-19 (and other airborne infections) should be integrated into a curriculum by the National Government to provide staff / pupils with basic knowledge of disease transmission and promote future adherence ● The National Government should fund research into the most effective use of mask wearing in schools (considering risks and benefits) ● Schools should be included within ongoing Government- or Union-led initiatives to improve communication when mask wearing, such as transparent masks and facilitating technology	● Informed by scientific and medical evidence, mask wearing should be implemented by Senior Leadership Teams in a flexible manner in schools where appropriate ● National Government-led guidance should be released to ensure teaching staff are equipped with the necessary knowledge / information to communicate the benefits of mask wearing with pupils to encourage adherence. Senior Leadership Teams should ensure this is disseminated within teaching staff.	● Informed by scientific and medical evidence, mask wearing should be mandated by the National Government in schools where appropriate ● Tools to improve communication when mask wearing, such as transparent masks and facilitating technology, should be made readily available to teachers through National Government budget allocations and Local Authority dissemination - along with guidance on how to best use them
Considerations for staff supporting pupils with SEND		
● Where mask wearing is not appropriate, Local Authorities should ensure teachers and learning support assistants are provided with additional protection and guidance around IPC ● Government-led initiatives exploring the use of masks in public settings should engage with key communities and stakeholder representatives of SEND groups		

#3 Ventilation

Improving air quality has been reported as key to reducing the spread of respiratory infections, including COVID-19, in indoor spaces and is therefore essential to minimising future disruption to education[34,35]. Ventilation also doesn't just reduce the risk of illness. Studies have shown that it can also improve pupils' concentration, cognitive performance and productivity, in addition to reducing a range of respiratory infections [36,37].

Our survey demonstrated that the majority of respondents believed this measure to be effective and regularly opened classroom windows for increased ventilation. Similarly, in a study undertaken by the Office of National statistics in 2021, exploring attitudes to preventative COVID-19 measures, over 90% of schools reported opening their windows and doors periodically to ventilate however 29% of secondary schools reported this to be challenging as well as 46% of primary schools that reported mechanical ventilation to be challenging. It also found the largest barriers to improving ventilation in both primary and secondary were temperature (83%), heating cost (62%) and rooms becoming too windy or wet (49%)[38]. Investment in improved ventilation control through Heating, Ventilation and Air Conditioning (HVAC) systems may help to overcome these challenges.

Schools must be equipped with the necessary resources to assess how well-ventilated their spaces are and to balance ventilation with thermal comfort over the colder months. Eighteen months into the pandemic, the government launched initiatives to address the issue of airflow in schools (including the provision of 386,000 CO_2 monitors to UK schools and 8,000 HEPA filtration units)[39]. However, concerns remain about the effectiveness of these devices. Educational unions have reported a lack of centralised guidance on CO_2 thresholds requiring action and control measures other than opening windows, which may not be possible for every classroom in schools of varying sociodemographic status and physical construction[40]. Concerns have also been expressed that there were not enough CO_2 monitors for all classrooms, schools were unable to use the CO_2 monitors, recommended actions did not improve ventilation and that schools were not eligible for air purifiers.

The current ventilation and air cleaning standards for buildings are not designed with a focus on reducing airborne infectious disease transmission and therefore most buildings are not designed or operated in a manner that supports the rapid dilution or removal of infectious respiratory particles[37]. Improving schools' ventilation infrastructure and air filtration systems is an evidenced based, long-term and sustainable disease control solution. Ultimately, it would minimise the risk of diseases beyond COVID-19, such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), tuberculosis, measles and influenza. Other benefits include reduction of allergens in the air that trigger respiratory illnesses such as asthma, and reducing indoor air pollutants that are common in schools such as mould, dust, carbon dioxide, and carbon monoxide[41].

Ventilation should be valued as an essential control measure moving forward. Now is the time to take advantage of the government support and funding towards outbreak preparedness in schools and to upgrade school infrastructure to improve ventilation and air filtration systems.

Recommended actions and supportive policy/guidelines

Pre outbreak	Early outbreak *in addition to pre-outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
● Senior Leadership Teams should ensure all teachers are informed with the updated government guidance of ventilation measures in classrooms during non-outbreak times [42] ● Senior Leadership Teams should install and ensure use CO_2 monitors in all classrooms to assess whether ventilation and air filtration systems are performing as intended ● National Government regulations should be implemented to ensure remedial action is conducted to improve ventilation or air filtration systems when CO_2 levels are identified to be consistently high, specifically considering building-level strategies, Heating, Ventilation and Air Conditioning (HVAC) systems and HEPA filtration systems. These actions should be reported by the Department of Education.	● Teachers should maximise outdoor air delivery and minimise or eliminate recirculation of unfiltered air through routine opening of windows / doors etc. ● Government should ensure schools are able to improve the building's air cleaning efficiency through air cleaning treatment, such as filtration (HEPA filtration units and correctly operating Heating, Ventilation and Air Conditioning (HVAC) systems)	● Senior Leadership Teams should provide teachers with room-specific guidance for window and air ventilation measures, with specific options for adaptation given structural or weather challenges. Ventilation challenges should be reported to Local authorities (such as UKHSA HPTs)
Considerations for staff supporting pupils with SEND		
● Government policies should state that pupils with SEND have access to sufficiently ventilated rooms		

#4 Mental health support

Securing the fundamentals of the curriculum and achieving education targets set out by the government can only be managed if every school in the UK has trained and experienced teachers. And if conditions don't change, we are at risk of losing our teaching staff.

Overall, stress levels have increased as a result of the pandemic, and the mental health of those in the teaching profession has been negatively impacted. A report conducted by the National Foundation for Educational Research in 2023 found the teacher recruitment and retention challenge in England has significantly intensified since the pandemic , with schools posting 93% more vacancies in 2022/23 compared to the year before the pandemic[43].

Our survey found over 60% of respondents considered leaving the profession during this time. This observation is supported by a study by the University of Connecticut that found mental health issues doubled among some teachers, with poor mental health resulting in high levels of burnout. Stress was the most common reason for leaving the profession during the pandemic, almost twice as commonly cited as insufficient pay[44,45].

It is important to note that over half of our survey respondents were not offered counselling during the survey period. Had it been provided, or barriers to access lowered, and had a more supportive culture among staff been fostered, it's possible mental health repercussions wouldn't be so significant. Notedly, there was a need for acknowledgement for the physiological and phycological trauma experienced by teachers during the peak of the pandemic as well as the on-going impacts of long-covid and educational recovery.

In 2021, the DfE published the Education Staff Wellbeing Charter. This is as a declaration of support for, and a set of commitments, to the wellbeing and mental health of everyone working in education[46]. This charter was co-created by a range of stakeholders across the educational sector including unions, Local Government Associations, Association of Colleges, Mind, Ofsted and multiple schools across the UK. The charter aims to show staff that schools take their wellbeing seriously. It also seeks to open a conversation with staff about their mental health, create wellbeing strategies and foster a wellbeing-focused culture. Importantly, the wellbeing strategy could support educational staff when they are dealing with seasonal increases in common diseases and unprecedented emerging disease outbreaks. Evaluation of progress will be conducted in 2023.

Recommended actions and supportive policy/guidelines

Pre outbreak	Early outbreak *in addition to pre-outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
● The National Government should fund research to better understand the barriers to teacher's accessing counselling ● Senior Leadership Teams should remind teaching staff of any wellness benefits and resources available to them ● Senior Leadership Teams should provide teachers with relevant information about common disease outbreaks and daily control measures, to give them a better sense of preparedness	● The National Government should ensure all schools have access to counselling services and these services are made widely available to teachers by Senior Leadership Teams ● Teachers should be well informed by Senior Leadership Teams of policies and strategies during an outbreak (e.g. who to notify in the case of an outbreak and how to do so, procedures during times of staff absences etc.) ● Senior Leadership Teams should utilise resources provided by the National Government to measure staff wellbeing and respond to any changes. Results should be published by the National Government as part of the 'wellbeing charter'[46]	● Senior Leadership Teams should create open discussion platforms (e.g. weekly webinars or discussion forums) within their schools for teachers to connect with their peers, feedback concerns and offer immediate support ● Surveys and other tools used to measure staff wellbeing should be conducted more frequently at National Government, Local Authority and school level, to better identify any immediate gaps in wellbeing and how to address them
Considerations for staff supporting pupils with SEND		
● Senior Leadership Teams should ensure additional support and wellbeing monitoring activities are provided to teachers and learning support assistants, acknowledging the increased risks and feelings of responsibility they may incur when working with pupils with SEND ● Measures of supervision and support, specifically focusing on COVID-related trauma and future outbreak coping mechanisms, should be integrated into existing occupational health services		

#5 Remote teaching

Our survey shows educators often felt stressed and unsupported when remote teaching. Technical issues were a regular event. Educators also reported that remote teaching led to a lower quality of teaching and decreased pupil engagement. Remote teaching also reduced the ability of teachers and classroom assistants to give students normal levels of support.

This aligns with a report published by National Foundation for Educational Research (NFER) which raises particular concern about the lower engagement of children in schools with the highest levels of deprivation, especially pupils with limited access to IT, vulnerable pupils, pupils with SEND and disabilities, pupils eligible for Pupil Premium funding and young carers. Schools delivering content to pupils in an 'active' form, such as through online conversations between teachers and pupils, had higher engagement and increased probability of engaging disadvantaged pupils. However, despite teachers' abilities to provide remote learning support, a substantial deficit in curriculum coverage across schools was still reported[47].

The government's scheme to purchase laptops for schools to facilitate remote learning also fell short of what was promised, resulting in insufficient provision of equipment and technical barriers, impacting children unequally[48].

The COVID-19 pandemic made it clear that in-person learning is invaluable to high quality teaching. However, elements of remote learning can be utilised moving forward, allowing children to keep pace with their education when in-person attendance in school is impossible due to factors such as infectious illness, suspension, natural disasters or re-integration of absent pupils. To successfully enable this shift, there is an urgent need to improve equitable access to technology and increase preparedness of transitioning to distance learning at short notice.

Recommended actions and supportive policy/guidelines

Pre-outbreak	Early outbreak *in addition to pre-outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
● The National Government should provide curriculum support to adjust for remote learning such as 'active form' learning training, improving data systems to enhance teachers' ability to assess pupils' progress and strengthened communication networks amongst schools to share online resources ● Local Authorities and Senior Leadership Teams should provide access to round-the-	● Senior Leadership Teams should assess access to technological resources (laptops, wifi etc.) and report gaps in provisions to Local Authorities (such as UKHSA HPTs)	● The National Government should ensure they have addressed identified gaps in provisions to ensure equitable access to resources (provision of laptops etc.) ● School Leadership Teams should create open discussion platforms (e.g. weekly webinars or discussion forums) for parents to report remote learning concerns and provide immediate support

clock IT services and video training guides to address common problems		
Considerations for staff supporting pupils with SEND		
● Senior Leadership Teams should conduct risk assessments for pupils with SEND and disadvantaged pupils and share findings with Local Authorities to ensure correct remote learning provisions are in place when needed ● Evaluation and monitoring processes conducted by teachers should be tailored for needs of pupils with SEND or disadvantaged pupils to identify, report and respond to attainment gaps		

#6 Government guidelines and policies

In our survey, government guidelines and policies were reported to be both difficult to understand and difficult to implement. Specifically, respondents said they were 'vague', not tailored for specific year groups and did not meet SEND requirements.

This feedback is correlated with inconsistent implementation of COVID-19 measures, across schools and classrooms and varying experiences for pupils[6].

This suggests schools require further support and consultation from governments and local authorities to ensure guidelines are applicable to their setting. They also require better resourcing to implement control measures as recommended. This may include additional temporary staffing, protective equipment, updated protocols and resources for cleaning and IT supplies.

The current reference for pandemic response in school is the "Preventing and Controlling infections" report[49], but preventative control measures to tackle both respiratory and hygiene related infections in emergency settings is woefully neglected in this document. Resources should be allocated to update and disseminate this document to all UK schools.

The survey also highlights that several missing policies and guidelines for pupils with SEND are missing, or impractical. For example, staff did not find suitable protocols for when social distancing or face coverings are not possible or plans to address problems caused by lack of interaction during school closures.

Recommended actions and supportive policy/guidelines

Pre outbreak	Early outbreak *in addition to pre-outbreak guidance*	Full outbreak *in addition to early outbreak guidance*
● Existing guidelines (such as 'Preventing and Controlling Infections') should be periodically updated by the National Government and emphasised by Senior Leadership Teams in annual staff meetings, and the resources made easily available upon request ● A wider range of CPD-accredited courses in infectious disease control / prevention in educational settings should be made available through National Government engagement with the	● Local Authorities should increase engagement with Senior Leadership Teams (e.g. through weekly webinars) to answer school-specific concerns and ensure guidelines are applicable to specific school settings	● National Government and Local Authorities should respond in a timely manner to specific school needs, including provision of staff, PPE, clarification of protocols and policy guidelines , resources for cleaning and IT supplies

scientific community. Senior Leadership Teams should enforce mandatory engagement with these courses for all teaching staff.		
Considerations for staff supporting pupils with SEND		
● All outbreak-related guidance released by the government should include a SEND-specific section, which outlines potential challenges for pupils with SEND and alternative control measures ● The priority for staff supporting pupils with SEND to receive essential provisions (vaccinations, access to home testing, priority release of guidance etc.) should be established within emergency planning documents prior to outbreaks		

Final Remarks

While the peak of the COVID-19 pandemic is behind us, the virus still poses a significant threat through the likely emergence of new variants. As the recent monkey-pox concern and the ongoing scarlet fever and Strep A (iGAS) outbreaks have demonstrated, pathogens which have received little attention have the potential to develop into significant global health threats. It is only a matter of time before we witness another pandemic, in addition to recurring health threats like seasonal flu. In order to effectively respond to outbreaks in the future, there is a need to provide guidance on, and develop a baseline level of hygiene strategies for normal ongoing implementation in schools, which will mitigate endemic infection and provide a framework to intensify to meet new challenges. This baseline strategy should ensure good hygiene for everyone, maintain cleaning regimes focused on frequent hand contact surfaces and keep occupied spaces well ventilated. Rapid changes should be made to these strategies during epidemics to target the specific disease profile, such as mask wearing and social distancing.

It is clear that, even in the face of any future disease outbreak, keeping schools open must remain a priority to deliver on the government's strategies and provide students with the highest quality of education. This can only be done if a safe environment is maintained through investing in improved school infrastructure and ventilation systems to mitigate endemic spread of infection, implementing targeted control measures, and ensuring the wellbeing of teaching staff. Furthermore, the inequalities exacerbated by the pandemic for pupils with SEND and disadvantaged pupils must be addressed in preparation for future outbreaks.

References

[1] Sally F. Bloomfield, Lisa M. Ackerley. Developing resilience against the threat of infectious diseases and anti-microbial resistance: Putting targeted hygiene into practice in home and everyday lives,Public Health in Practice,Volume 5,2023,100362,ISSN 2666-5352,https://doi.org/10.1016/j.puhip.2023.100362.(https://www.sciencedirect.com/science/article/pii/S2666535223000083)
[2] DfE. 2022. Opportunity for all: strong schools with great teachers for your child. Available at: Opportunity for all - Strong schools with great teachers for your child (publishing.service.gov.uk)
[3] Ofsted. 2021. Education recovery in schools: Autumn 2021. Available at: Education recovery in schools: autumn 2021 - GOV.UK (www.gov.uk)
[4]DfE. 2018. Gaps between disadvantaged pupils and their peers narrows. Available at: Gap between disadvantaged pupils and their peers narrows - GOV.UK (www.gov.uk)
[5] DfE. 2021. Understanding Progress in the 2020/21 Academic Year. Findings from the summer term and all previous findings. Available at: Understanding progress in the 2020 to 2021 academic year (publishing.service.gov.uk)
[6] Ofsted. 2022 Education recovery in schools: Spring 2022. Available at: Education recovery in schools: spring 2022 - GOV.UK (www.gov.uk)
[7] Ofsted. 2022. Education recovery in schools. Summer 2022. Available at: Education recovery in schools: summer 2022 - GOV.UK (www.gov.uk)
[8] Pupil absence in schools in England: autumn term, Autumn Term 2021/22 – Explore education statistics – GOV.UK (explore-education-statistics.service.gov.uk)
[9] Attendance in education and early years settings during the coronavirus (COVID-19) pandemic, Week 30 2022 – Explore education statistics – GOV.UK (explore-education-statistics.service.gov.uk)
[10] Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK - Office for National Statistics (ons.gov.uk)
[11] Ofsted. 2021. Research and analysis SEND: Old issues, new issues, next steps. Available at SEND: old issues, new issues, next steps - GOV.UK (www.gov.uk)
[12] Special educational needs in England, Academic Year 2021/22 – Explore education statistics – GOV.UK (explore-education-statistics.service.gov.uk)
[13] Ofsted. 2021. Press Release: Schools adapt teaching to help children catch up but COVID-related absence remains a concern. Available at: Schools adapt teaching to help children catch up but COVID-related absence remains a concern - GOV.UK (www.gov.uk)
[14] UKHSA. 2022. UKHSA update on scarlet fever and invasive group A strep. (UKHSA update on scarlet fever and invasive group A strep - GOV.UK (www.gov.uk))
[15] Department for Education. February 2022. WITHDRAWN: Schools COVID-19 operational guidance . Available at : WITHDRAWN: Schools COVID-19 operational guidance (publishing.service.gov.uk)
[16] Gurdasani D, Pagel C, McKee M, Michie S, Greenhalgh T, Yates C *et al.* Covid-19 in the UK: policy on children in schools BMJ 2022; 378 :e071234 doi:10. 1136/bmj-2022-071234
[17] SPI-M-O: Expert narratives for potential autumn and winter events, 29 July 2020 - GOV.UK (www.gov.uk)
[18] National Education Union. 2021. Use of CO2 monitors. Available at: no corners (neu.org.uk)
[19]Kaffenberger, M. 2020. Modeling the Long-Run Learning Impact of the COVID-19 Learning Shock: Actions to (More Than) Mitigate Loss. RISE Insight. https://doi.org/10.35489/BSG-RISE-RI_2020/017.

[20] Arienzo A, Gallo V, Tomassetti F, Pitaro N, Pitaro M, Antonini G. A narrative review of alternative transmission routes of COVID 19: what we know so far. Pathogens and Global Health. 2023 Nov 17;117(8):681-95.

[21] Ackerley L *et al*. STUDY REPORT: Targeted Hygiene: a risk-based approach to applying policies and hygiene interventions in public settings and large events: a case study of hygiene interventions at COP26 2021
[22] UNICEF. 2020. COVID-19 Emergency Preparedness and Response WASH and Infection Prevention and Control Measures in School. [online] Available at: <https://www.unicef.org/media/66356/file/WASH-COVID-19-infection-prevention-and-control-in-schools-2020.pdf> [Accessed 14 September 2022].
[23] Centers for Disease Control and Prevention. 2022. Hand Hygiene in School and Early Care and Education. Available at: Hand Hygiene in School and Early Care and Education | CDC
[24] Chard AN, Trinies V, Moss DM, Chang HH, Doumbia S, Lammie PJ, et al. (2018) The impact of school water, sanitation, and hygiene improvements on infectious disease using serum antibody detection. PLoS Negl Trop Dis 12(4): e0006418. https://doi.org/10.1371/journal.pntd.0006418
[25] Ross, I et al., (2023) Effectiveness of handwashing with soap for preventing acute respiratory infections in low-income and middle-income countries: a systematic review and meta-analysis. The Lancet. https://doi.org/10.1016/ S0140-6736(23)00266-0
[26] Azimi P, Keshavarz Z, Cedeno Laurent JG, Stephens B, Allen JG. Mechanistic transmission modeling of COVID-19 on the *Diamond Princess* cruise ship demonstrates the importance of aerosol transmission. Proc Natl Acad Sci U S A. 2021 Feb 23;118(8):e2015482118. doi: 10.1073/pnas.2015482118. PMID: 33536312; PMCID: PMC7923347.
[27] Bloomfield S, Ackerley L. Developing better understanding of hygiene is key to developing hygiene behaviour change in home and everyday life settings. Perspect Public Health. 2023 Apr 22:17579139231163734. doi: 10.1177/17579139231163734. Epub ahead of print. PMID: 37086031
[28] Department for Education. Evidence Summary. Coronavirus (COVID-19) and the use of face coverings in education settings. January 2022.
[29] Scientific Advisory Group for Emergencies. EMG and SPI-B: Non-Pharmaceutical Interventions (NPIs) in the context of Omicron, 15 December 2021. Available at: EMG and SPI-B: Non-Pharmaceutical Interventions (NPIs) in the context of Omicron, 15 December 2021 - GOV.UK (www.gov.uk)
[30] UNISON. Face coverings in schools make staff feel safer. 25 March 2021. Available at: Face coverings in schools make staff feel safer | News, Press release | News | UNISON National

[31] Department for Education. COVID-19 Parent and Pupil Panel. March Findings Report. May 2021. Available at: COVID-19 Parent and Pupil Panel March findings Report (publishing.service.gov.uk)
[32] Department for Education. COVID-19 School Snapshot Panel. Findings from the April Survey. September 2021. Available at: School snapshot panel: COVID-19 - GOV.UK (www.gov.uk)
[33] Department of Health and Social Care. News story: DHSC recognises the importance of transparent face masks to make communication easier. 8 July 2021. Available at: DHSC recognises the importance of transparent face masks to make communication easier - GOV.UK (www.gov.uk)
[34] UKHSA. 2022. Ventilation to reduce the spread of respiratory infections, including COVID-19. Available at: Ventilation to reduce the spread of respiratory infections, including COVID-19 - GOV.UK (www.gov.uk)

[35] Lidia Morawska *et al.*A paradigm shift to combat indoor respiratory infection.*Science*372,689-691(2021).DOI:10.1126/science.abg2025

[36] Laurent JGC, MacNaughton P, Jones E, Young AS, Bliss M, Flanigan S, Vallarino J, Chen LJ, Cao X, Allen JG. Associations between Acute Exposures to $PM_{2.5}$ and Carbon Dioxide Indoors and Cognitive Function in Office Workers: A Multicountry Longitudinal Prospective Observational Study. Environ Res Lett. 2021 Sep;16(9):094047. doi: 10.1088/1748-9326/ac1bd8. Epub 2021 Sep 9. PMID: 35330988; PMCID: PMC8942432.
[37] The Lancet COVID-19 Commission Task Force on Safe Work, Safe School, and Safe Travel. Designing Infectious Disease Resilience into School Buildings through Improvements to Ventilation and Air Cleaning. April 2021. Available at: Designing infectious disease resilience into school buildings through improvements to ventilation and air filtration — Lancet Commission on COVID-19 (covid19commission.org)
[38] Office for National Statistics (ONS). 2022. Ons.gov.uk. 2022. *COVID-19 Schools Infection Survey, England* [online] Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/covid19schoolsinfectionsurveyengland/attitudestovaccinesandpreventativemeasuresnovembertodecember2021> [Accessed 14 September 2022].
[39] DfE. 2021. Press Release: All schools to receive carbon dioxide monitor. GOV.UK. All schools to receive carbon dioxide monitors - GOV.UK (www.gov.uk)
[40] National Education Union. 2022. Coronavirus: Ventilation and temperature. NEU. Coronavirus: ventilation and temperature | NEU
[41] CAP. School Air Filtration and Ventilation Strategies To Improve Health, Education, Equity and Environmental Outcomes. August 31 2022. Available at: School Air Filtration and Ventilation Strategies To Improve Health, Education, Equity, and Environmental Outcomes - Center for American Progress
[42] UK Health Security Agency. Guidance: Ventilation to reduce the spread of respiratory infections, including COVID-19. 4 March 2021. Available at: Ventilation to reduce the spread of respiratory infections, including COVID-19 - GOV.UK (www.gov.uk)
[43] McLean, D., Worth, J & Faulkner-Ellis, H. National Foundation for Educational Research. Teacher Labour Market in England. Annual Report 2023. Available at: teacher_labour_market_in_england_annual_report_2023_embragoed.pdf (nfer.ac.uk)
[44] Dilberti, M. K., Schwartz, H. L., & Grant, D. (2021). Stress topped the reasons why public school teachers quit, even before COVID-19. Retrieved from: https://www.rand.org/content/dam/rand/pubs/research_reports/RRA1100/RRA1121-2/RAND_RRA1121-2.pdf
[45] Greenberg, M. T., Brown, J. L., & Abenavoli, R. M. (2016). Teacher stress and health effects on teachers, students, and schools. Edna Bennett Pierce Prevention Research Center. Pennsylvania State University
[46] Department for Education. Guidance: Education Staff Wellbeing Charter. 10 May 2021. Available at: Education staff wellbeing charter - GOV.UK (www.gov.uk)
[47] Lucas, M *et al*., (2020). Pupil Engagement in Remote Lear*ning. National Foundation for Educational Research.* Nuffield Foundation . Available at: Schools' responses to Covid-19: Pupil engagement in remote learning (nfer.ac.uk)
[48] Why the government's £400m laptops roll-out is crashing. *Schools Week* 2021 Jan 29 https://schoolsweek.co.uk/why-the-governments-400m-laptops-roll-out-is-crashing/
[49] UK Health Security Agency. Preventing and Controlling Infections. 10 October 2023. Available at: Preventing and controlling infections - GOV.UK (www.gov.uk)