

A global overview of COVID-19 outbreaks in schools

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INTRODUCTION

COVID-19 remains pandemic and public health measures included school closures following a precautionary principle in that many previous epidemics (e.g. influenza) were mainly transmitted by children. This paper reviews school outbreaks to date, including in Malta.

METHODS

The internet and the medical literature were searched for reports of school outbreaks of COVID-19 and measures implemented in efforts to contain school spread.

RESULTS

Schools in several countries experienced outbreaks and some were related to insufficiently strict measures while others were due to older children and adolescents flouting restrictions. The different measures employed by different countries in their schools are displayed.

DISCUSSION

With adherence to the usual measures, schools can open safely with minimal risk to their communities in areas of low COVID-19 transmission. Vaccination is probably the ultimate solution to pandemic control.

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INTRODUCTION

COVID-19 remains pandemic since its initial global spread in January 2020.¹ It is only public health measures, such as social distancing (which include school closures) and vaccination, that have prevented millions of infections and deaths.²⁻⁴ School closures followed a precautionary principle in that many previous epidemics (e.g. influenza) were mainly transmitted by children.⁵ This is supported by a few studies, and for example, a temporal association was found between state-wide school closure and lower COVID-19 incidence and mortality. However, some or all of these reductions may have been related to other public health interventions.⁶

These closures have greatly impacted parents, especially working parents, with significant economic consequences.⁷ In addition, there are equally pressing concerns regarding the impact on children's mental and physical health,⁸ including increased risks of childhood obesity.⁹ Furthermore, wealth inequality and childhood poverty is further exacerbated in less privileged children who are unable to attend school.¹⁰

It has been estimated that children are about half as susceptible to COVID-19 infection as adults and they generally appear to be less severely affected, displaying milder symptoms than the general population, especially when compared to the elderly.¹¹ Furthermore, up to a short while ago, there was little evidence that children were significant COVID-19 spreaders and it had been suggested that reopening schools could be considered safe if accompanied by precautionary measures.¹²

A *Lancet* systematic review up to April 2020 included sixteen papers. The authors noted that

school closures in 2003 due to the related SARS virus that spread throughout mainland China, Hong Kong, and Singapore in 2003 probably contributed very little to the control of the epidemic. They also noted that modelling studies of COVID-19 predict that school closures alone would prevent only 2-4% of deaths, a much smaller value than other public health measures.¹³

A *British Medical Journal* review from December 2019 to May 2020 included fourteen papers and these showed that 15-60% of children were asymptomatic and 75%-100% of cases were from family transmission. School transmission via children did not appear to be a driver of transmission. The study concluded that children are not greater COVID-19 transmitters than adults.¹⁴

At the time of writing (early 2021), Malta was in partial lockdown as were several portions of Europe.¹⁵ This is because the easing of restrictions led to a resurgence of COVID-19 in a second wave of infections.¹⁶ This paper will review the effects on viral surges due to school openings up to summer 2020 and the effects in Malta thereafter.

METHODS

Outbreaks were located *via* an internet search in reputable news portals.

RESULTS

Ireland pre mid-March 2020

There were no identified paediatric COVID-19 transmissions in Ireland prior to school closures on 12 March 2020.¹²

Israel May 2020

Israel completely closed all educational facilities on 13 March 2020. Schools began to reopen (kindergartens, grades 1-3 and 11-12) in small groups on 3 May 2020, with the remaining classes

reopening on 17 May 2020. Schools were required to produce daily health reports and to mandate personal hygiene, face masks, social distancing and to ensure minimal interactions between children in different classes. Students were instructed regarding preventive procedures. Just 10 days later, a high school reported a major outbreak in which the first two cases had no epidemiological relation. The district health office declared 'outbreak status' and this resulted in the closure of schools, isolation instructions and testing. The entire school was tested and 153 (13.2%) students along with 25 staff members (16.6%) were COVID-19 positive. Overall, *circa* 260 persons were infected (including relatives and friends).

The outbreak outcome was overall mild in that 43% of affected students and 76% of staff were symptomatic with fever, cough, headache, sore throat and myalgia with no hospitalisations. It is possible that the outbreak was linked to an extreme heatwave in Israel between 19–21 May (Tuesday to Thursday, all school days). The Ministry of Health exempted schoolchildren from face masks for these three days.¹⁷

Salt Lake City, Utah, April–July 2020

12 children (≤ 13 years) from three Utah child care facilities, including an 8-month-old, were infected with COVID-19 and transmission occurred to 12 others including a mother who was hospitalised. 40% of the children did not show any symptoms.¹⁸

UK June–July 2020

In June 20, 20,500 and 23,400 schools opened with pupil attendance increasing from 475,000 to 1,646,000 by the end of July. Outbreaks were defined as two or more linked cases in one school. 200 children and staff were infected in thirty outbreaks, equivalent to 0.01 per cent of preschools and primary schools in England.¹⁹

Germany August 2020

Berlin was one of the first places in Germany to reopen schools after the summer holidays. Children were obliged to wear face masks in hallways, during breaks and when they entered classrooms but masks could be removed when they sat in their places and classes commenced. Teachers did not wear masks during lessons.

COVID-19 was reported in at least 41 schools in Berlin, two weeks after 825 schools reopened. Data was scant at the time of writing but Berlin city education authorities reported that hundreds of students and teachers tested positive and quarantined. All age groups were affected including elementary schools, high schools and trade schools.²⁰

Dundee August 2020

17 teachers and two pupils at a school in Dundee tested positive, along with three community contacts.²¹

Lanarkshire August 2020

One teacher and two pupils tested positive.²¹

Multiple American Universities August 2020

The University of Alabama reported that more than 550 people (students, faculty and staff) had tested positive for COVID-19 since resumption of in-person classes on August 19. Most cases were from the university's main campus in Tuscaloosa and the city's mayor shut down bars for 14 days and placed restrictions on other establishments. It was also reported that the campus had conducted >46,000 tests with positivity rate of *circa* 1%.²²

The University of Southern California (USC) reported >100 positive students at the University Park Campus in Los Angeles and noted that all of these came from "off-campus living environments."²²

The University of North Carolina at Chapel Hill cancelled in-class instruction after positive cases of COVID-19 shot up dramatically.²²

The University of Illinois at Urbana-Champaign had one of the most comprehensive plans by a major university to prevent and suppress outbreaks. All would wear masks and the 40,000 students would take tests twice a week with quick, inexpensive saliva tests. Students could not enter campus buildings unless an app vouched a negative test. But these plans failed to account for students partying, resulting in a sudden spike of almost 600 cases in a matter of days.²³

The *New York Times* summarised the situation in the US succinctly: “The Times has counted more than 81,000 additional cases at colleges since late July; of those, more than 61,000 cases came since late August. Thousands of new infections have been reported in recent days. Some universities just started reporting data, and The Times recently contacted others for the first time.”²⁴

UK September 2020

Three schools in Teesside in the north-east of England had confirmed cases of COVID: St Benedict’s RC primary school in Redcar, St Aidan’s Church of England primary in Hartlepool and in Middlesbrough Outwood Academy Ormesby.²⁵

France September 2020

France closed 22 of its 62,000 schools after the first week of in-person school resumption. Ten were on the French Indian Ocean island of Reunion. French schools have reported circa 250 suspected virus cases per day since they started reopening.²⁶

Malta

A teachers’ union estimated the local effect on schools. Official government figures on 15th February 2021 confirmed 2227 cases among

educators, students, and school staff since the start of October 2020 i.e. in the 140 days between 28th September (back to school date after summer holidays) and 14th February, an average of 111 school-related COVID-19 weekly cases were reported. In the same period, there was a weekly average of 847 COVID-19 cases. Thus, 14.75% of all cases emerged from schools. The percentage is actually slightly higher as Christmas holidays are not factored in and some schools reopened after the 28th September.²⁷

The number of children with active COVID-19 in Malta peaked on 03/03/2021 and this occurred one week prior to the record number of total Malta daily cases ($n=510$, 10/03/2021). This resulted in a nationwide partial lockdown including school closures. In late March, over 260 children were COVID-19 positive (10% of all active cases) and numbers then started to decline at most ages, apart from the 0 to 5-year age group, a cohort that continues to exhibit milder symptoms when compared to adults. It is thought that the paediatric surge was due to the UK variant B.1.1.7 which is considered to be a more highly transmissible strain.²⁸

As total cases declined over a one-month period, schools reopened and there have not been any new significant clusters attributed to schools.²⁹

Schools reopened thus:

- Monday, April 12: Childcare centres, kindergartens, primary schools.
- Wednesday, April 14: Middle schools.
- Friday, April 16: Secondary schools.³⁰

DISCUSSION

WHO guidance made available on the 21st August 2020 for children and masks stated that children aged:

- ≥ 12 years should wear a mask.
- 6-11 years may need to wear a mask if in a high risk area or if interacting with high-risk individuals (e.g. the elderly), with adult supervision. Children should be helped to don and doff masks safely.
- ≤ 5 years should not normally wear masks.³¹

Countries and regions have thus far been inconsistent in their prevention guidelines,³² but the concept of “bubbles” (large groups of students who although presumably socially distanced, only risk intra-bubble exposure) is increasingly mooted.

France

- No limit on class sizes, and distancing is not compulsory in situations where it would stop a school being able to fit all its pupils in.
- Masks compulsory indoors for staff and students over the age of 11, even if they manage to stay more than 1m apart.
- Schools are no longer required to prevent different classes and groups of students from mixing.
- Schools are encouraged to stagger start and finish times to prevent large groups building up.
- Floors, desks and surfaces that are touched regularly, such as door handles, must be cleaned and disinfected at least once a day.

Italy

- Students will be seated 1m apart and class sizes will be smaller.

- Students will also be divided into various learning groups
- Entry will be staggered and schools will be open for lessons on Saturdays.
- Students and teachers will have to wear masks.
- Teachers will also wear face shields.
- Lessons will be held outdoors where possible or in large spaces such theatres or museums.
- Distance learning will be available for secondary school students who live with vulnerable family members.

Germany

- All are advised to keep hands off banisters when taking the stairs.
- Masks are not obligatory and free testing is available for teachers.
- Classes have been reorganised into so-called "cohorts" of several hundred students.
- There are no social distancing rules within a cohort, but each group has its own area in the school grounds, cloakrooms and canteens.
- In some (not all) states, both pupils and teachers will have to wear masks.
- Some states are making masks compulsory in corridors and other communal areas.

Spain

- Students will maintain a distance of at least 1.5m except for younger children.
- Younger children will be allowed in bubbles of 15 to 20 pupils who will not have to distance.
- Schools will be asked to prioritise outdoor activities and stagger start, finish and break times.

- Masks will be compulsory for over-sixes on school transport.
- Masks will be required for pupils and teachers if distance of 1.5m cannot be maintained, except for children in bubbles.
- School facilities will need cleaning at least once a day, with toilets cleaned thrice daily.

Netherlands

- Students may be exempted from school if they, or somebody they live with, fall into high-risk categories.
- Some schools are mandating masks.
- Schools have been asked to ensure adequate ventilation.

Denmark

- Denmark and Norway were the first European countries to restart primary school children from mid-April and the rest reopened in mid-May.
- Arrival at schools is staggered.
- Pupils are asked to wash hands regularly.
- Children are kept in small groups with as little contact with others as possible.

Children

School outbreaks underscore the uncertainty related to the risk of infection in school settings, despite the insistence of both governments and experts that reopening schools may be safe with strict adherence to adequate precautions.

The overall consensus is that children are not super-spreaders of COVID-19.³³ Research from Public Health England showed that in schools, two thirds of outbreaks arose from staff-to-staff or staff-to-pupil transmission; staff are therefore far likelier to transmit the COVID-19 virus than children.

Outbreaks in schools were likelier in localities that had a high community transmission rate. The implications are that shops and/or bars/pubs and/or restaurants and/or other establishments may need to close in such areas so as to allow schools to reopen or to remain open.¹⁹

Restarting schools is an important connector of social networks in a global scenario wherein social distancing measures have deliberately disconnected such networks. It has been estimated that reopening schools, especially high schools, could increase the COVID-19 reproduction value (R) by 0.2-0.5.³⁴ Indeed, the UK chief and deputy chief medical officers have issued a joint statement noting that if the reopening of schools leads to a rise in overall cases and an increase in R, this could require “societal choices” as to what else needs to be restricted. Targeted and localised action may be necessary in areas with high transmission so as to control the driver for any particular outbreak.¹⁹

Guidelines by the World Health Organization and others have attempted to minimise risks of school re-openings.^{8,35} The principles are namely:

- Reopen schools in a staged fashion.
- Incorporate social and physical distancing.
- Ensure availability of infection control measures and efficient testing and contact tracing.
- Protect teachers and vulnerable students.
- Research and evaluation.⁸

Adolescents

The pandemic situation may be exacerbated by irresponsible behaviour at any age.³⁶ Adolescents seem to be particularly troublesome globally, with their propensity to party.³⁷⁻³⁹ For this reason, parties (such as “rave parties”) are to be targeted with hefty fines in an effort to dampen these events.⁴⁰ It is

almost as if youths ignore the possibility that they may suffer serious morbidity from COVID-19, including multisystem inflammatory syndrome,⁴¹ as well as further spreading the virus in school environments and among vulnerable relatives and contacts. When these youths comprise part of a university campus, the potential for viral spread is naturally multiplied and schools and universities must try to discourage this behaviour. For example, in August, Ohio State University issued >200 interim suspensions following a series of hefty parties wherein the media reported that health and safety rules were mostly ignored.²² Incidentally, adolescents studying abroad have had educational experiences curtailed, postponed or cancelled by COVID-19.⁴²

Teachers

There is also risk to teachers who may fall in one of the high-risk COVID-19 categories or who may be in unavoidable contact with individuals (such as family

members) who fall in these categories.⁴⁵ One obvious category is advanced age (>55 years) and indeed, a recent study in the United States estimated that more than 18% of all public and private school teachers and 27% of all principals are in this vulnerable age demographic. Private schools are worse off with equivalent values of 25% and 44%, a situation that will inevitably lead to a school personnel crisis.⁴³

CONCLUSION

This paper has only managed to outline the complex, tangled and sometimes contradictory advice and findings pertaining to the reopening of schools in the midst of the COVID-19 pandemic. It is hoped that the rollout of vaccines in adults will stem the spread of COVID-19 even with schools eventually reopening. Additionally, a child-appropriate vaccine will further arrest pandemic spread.⁴⁴

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