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Holidays over: A review of actual COVID-19 school outbreaks up to September 2020

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**ABSTRACT**

In the absence of an effective vaccine and/or treatment, COVID-19 remains pandemic. It is only public health measures, such as social distancing (and these included school closures), that have prevented millions of infections and deaths. School closures followed a precautionary principle in that many previous epidemics (e.g. influenza) were mainly transmitted by children. This is supported by few studies and yet, these closures have significantly impacted parents and children. We are now in September 2020, with public health restrictions being lifted in an attempt to attenuate the negative economic impact of the pandemic. The easing of restrictions has led to a resurgence of COVID-19 in a second wave of infections. In the meantime, summer school holidays are coming to an end in the northern hemisphere and it is salutary to review the effects on viral surges due to school openings thus far. This review shows that as schools open, outbreaks that affect both pupils and staff occur probably due to failure to adhere to public health principles: hand washing, distancing etc. Reopenings should clearly be done slowly and cautiously so as to control potential COVID-19 outbreaks before they get out of hand. Reopenings may also require targeted closure of other establishments/facilities (such as restaurants and shops) so as to keep the locality’s COVID-19 reproduction rate below 1.

1. Introduction

In the absence of an effective vaccine and/or treatment, COVID-19 remains pandemic since its initial global spread in January 2020 [1]. Unchecked, this virus could have led to a devastating number of deaths [2]. Indeed, it is only public health measures, such as social distancing (and these included school closures), that have prevented millions of infections and deaths [3,4]. School closures followed a precautionary principle in that many previous epidemics (e.g. influenza) were mainly transmitted by children [5]. This is supported by 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 significantly 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 [12], and it had been suggested that reopening schools could be considered safe if accompanied by precautionary measures [13].

A *Lancet* systematic review 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. The review 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 [14].

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 [15].

We are now at the end of summer 2020, with public health restrictions being lifted in an attempt to attenuate the negative economic impact of the pandemic [16]. The easing of restrictions has led to a resurgence of COVID-19 in a second wave of infections [17]. In the meantime, summer school holidays are coming to an end in the northern hemisphere and it is salutary to review the effects on viral surges due to school openings thus far.

2. Ireland pre mid-March 2020

There were no identified paediatric COVID-19 transmissions in Ireland prior to school closures on 12 March 2020 [13].

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3. 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 the containment of children to minimal interactions between classes. Students were instructed on 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 and 21 May (Tuesday to Thursday, all school days). The Ministry of Health exempted schoolchildren from face masks for these three days [18].

4. 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 [19].

5. 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% of preschools and primary schools in England [20].

6. Germany August 2020

Berlin was one of the first localities 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 is scant at the time of writing but Berlin city education authorities have reported that hundreds of students and teachers have tested positive and are in quarantine. All age groups have been affected including elementary schools, high schools and trade schools [21].

7. Georgia August 2020

Similarly in Georgia, COVID-19 positive children were detected just one day after schools reopened with over a thousand students and teachers quarantined [22].

8. Dundee August 2020

17 teachers and two pupils at a school in Dundee tested positive, along with three community contacts [23].

9. Lanarkshire August 2020

One teacher and two pupils tested positive [23].

10. 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 a positivity rate of circa 1% [24].

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.” [24].

The University of North Carolina at Chapel Hill cancelled in-class instruction after positive cases of COVID-19 shot up dramatically. [24]

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 twice a week with quick, inexpensive saliva test. Students could not enter campus buildings unless an app vouched a negative test. But these plans failed to account for students partying [25].

The New York Times summarises 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.” [26].

11. 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 [27].

12. 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 [28].

13. 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 [29].

Countries and regions are thus far inconsistent in their prevention guidelines [30]. but the concept of “bubbles” (large groups of students who although presumably socially distanced, only risk intra-bubble exposure) is increasingly mooted.

13.1. France

- There will not be a 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 will be compulsory indoors for staff and students over the age of 11, even if they manage to stay more than 1 m apart.
- Schools are no longer required to prevent different classes and groups of students from mixing.
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Three

related to the risk of infection in school settings, despite the insistence of

13.6. Denmark
- Students will be seated 1 m 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 as theatres or museums.
- Distance learning will be available for secondary school students who live with vulnerable family members.

13.3. 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.

13.4. Spain
- Students will maintain a distance of at least 1.5 m 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 1.5 m cannot be maintained, except for children in bubbles.
- School facilities will need cleaning at least once a day, with toilets cleaned thrice daily.

13.5. 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.

13.6. 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 handwash regularly.
- Children are kept in small groups with as little contact with others as possible.

13.7. Children

These school outbreaks once more 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 superspreaders of COVID-19 [31]. 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 open or to remain open [20].

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 [32]. 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 to control the driver for any particular outbreak [20].

A very recent modelling study based on UK data assumed that:

- People aged under 20 transmit COVID-19 equally to older age groups.
- 30% of onward-transmitted infections are asymptomatic.
- Any reopening of schools would occur alongside other lifted social distancing measures such as <30% of adults working from home.
- 68% of contacts of infected people can be reached.
- Only 18% of symptomatic adults are tested and isolated.

Under these conditions, fully reopening schools in September could lead the UK into a second wave of infections up to 2.3 times the size of the epidemic earlier in 2020, with a peak in December. Efficient tracking, tracing and isolation (TTI) will be crucial. The model showed that this wave could be avoided if 75% of symptomatic individuals were tested and isolated [33].

Guidelines by the World Health Organization and others have attempted to minimise risks of school reopenings [8,34]. 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].

13.8. Adolescents

The pandemic situation may be exacerbated by irresponsible behaviour at any age [35]. Adolescents seem to be particularly troublesome globally, with their propensity to party [36-40]. For this reason parties (such as “rave parties”) are to be targeted with hefty fines in an effort to dampen these events [41]. It is almost as if youths ignore the possibility that they may suffer serious morbidity from COVID-19 [42], including multisystem inflammatory syndrome [43], 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 hefti parties where the media that health and safety rules were mostly ignored [24].

Incidentally, adolescents studying abroad have had educational experiences curtailed, postponed or cancelled by COVID-19 [44].
13.9. 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 crises [46].

14. 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. Reopenings should clearly be done slowly and cautiously so as to control potential COVID-19 outbreaks before they get out of hand.

Declaration of competing interest

The authors have no conflict of interest to declare.

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