School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review

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In response to the coronavirus disease 2019 (COVID-19) pandemic, 107 countries had implemented national school closures by March 18, 2020. It is unknown whether school measures are effective in coronavirus outbreaks (eg, due to severe acute respiratory syndrome [SARS], Middle East respiratory syndrome, or COVID-19). We undertook a systematic review by searching three electronic databases to identify what is known about the effectiveness of school closures and other school social distancing practices during coronavirus outbreaks. We included 16 of 616 identified articles. School closures were deployed rapidly across mainland China and Hong Kong for COVID-19. However, there are no data on the relative contribution of school closures to transmission control. Data from the SARS outbreak in mainland China, Hong Kong, and Singapore suggest that school closures did not contribute to the control of the epidemic. Modelling studies of SARS produced conflicting results. Recent modelling studies of COVID-19 predict that school closures alone would prevent only 2–4% of deaths, much less than other social distancing interventions. Policy makers need to be aware of the equivocal evidence when considering school closures for COVID-19, and that combinations of social distancing measures should be considered. Other less disruptive social distancing interventions in schools require further consideration if restrictive social distancing policies are implemented for long periods.

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Introduction

WHO declared the coronavirus disease 2019 (COVID-19) outbreak, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), to be a pandemic on March 12, 2020.[1] On March 18, 2020, the UN Educational, Scientific and Cultural Organization estimated that 107 countries had implemented national school closures related to COVID-19, affecting 862 million children and young people, roughly half the global student population. This situation had rapidly escalated from 29 countries with national school closures a week before.[2] School closures are based on evidence and assumptions from influenza outbreaks that they reduce social contacts between students and therefore interrupt the transmission.[3]

School closures can affect deaths during an outbreak either positively, through reducing transmission and the number of cases, or negatively, through reductions in the health-care workforce available to care for those who are sick. Studies of UK children and young people report that the mean number of daily social contacts during school holidays are approximately half that of school term days;[4,5] however, contacts continue and mixing between children and adults and between children at different schools actually increases during holidays and school closures.[4–7] The evidence for the effectiveness of school closures and other school social distancing measures comes almost entirely from influenza outbreaks, for which transmission of the virus tends to be driven by children. It is unclear whether school measures are effective in coronavirus outbreaks—for example, due to severe acute respiratory syndrome (SARS), or Middle East respiratory syndrome (MERS) and, most specifically, COVID-19, for which transmission dynamics appear to be different.

Four systematic reviews[8–11] of the effects of school closure on influenza outbreaks or pandemics suggest that school closure can be a useful control measure, although the effectiveness of mass school closures is often low. School closure strategies might be national, regional, local, or reactive closure of individual schools in response to student infection rates. A systematic review,[8] commissioned by the UK Department of Health in 2014, to inform influenza pandemic preparations, included 100 epidemiological and 45 modelling studies and concluded that school closures can reduce transmission of pandemic influenza if instituted early in outbreaks. School closures result in greater reductions in peak than in cumulative attack rates and, according to modelling studies, are likely to have the greatest effect if the virus has low transmissibility (reproductive number [R] <2) and if attack rates are higher in children than in adults. A second review[9] of modelling studies by the same authors drew similar conclusions.

A 2018 review[10] of 31 studies that addressed whether school closure had a quantifiable effect on influenza transmission reported that school closure reduced the peak of the related outbreak by a mean of 29·7% and delayed the peak by a median of 11 days. They also reported that earlier school closure predicted a greater reduction in the outbreak peak, although these estimates did not come from formal meta-analyses.[10] A 2015 systematic review[11] of social distancing practices, including school closures, for influenza pandemics reported a wide variation in the reduction of transmission (range 1–50%) but noted that up to 70% of students might shift social contacts to other non-school sites during closures, reducing the effect of closures. A 2020 systematic review[12] of school closures and other social distancing measures during influenza outbreaks also found compelling evidence that closures reduced transmission, particularly among school-aged children (5–17 years). However, there was substantial evidence that transmission surged again once schools reopened, and there was little consensus on the appropriate timing of closures, let alone reopening of schools.