




VIEWPOINT

School closure, COVID-19 and lunch programme: Unprecedented undernutrition crisis in low-middle income countries

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The coronavirus disease 2019 pandemic has affected nearly 70% of children and teenagers around the world due to school closure policies. School closure is implemented widely in order to prevent viral transmission and its impact on the broader community, based on preliminary recommendations and evidence from influenza. However, there is debate with regard to the effectiveness of school closures. Growing evidence suggests that a child's SARS-CoV-2 infection is often mild or asymptomatic and that children may not be major SARS-CoV-2 transmitters; thus, it is questionable if school closures prevent transmission significantly. This question is important as a majority of children in low- and middle-income countries depend on free school meals; unexpected long-term school closure may adversely impact nutrition and educational outcomes. Food insecurity is expected to be higher during the pandemic. In this viewpoint, we argue for a more thorough exploration of potential adverse impacts of school closures in low- and middle-income countries and recommend actions to ensure that the health and learning needs of vulnerable populations are met in this time of crisis.

As of 21 May 2020, in response to the novel coronavirus disease 2019 (COVID-19) pandemic, 153 countries have implemented national school closures as part of social distancing policies to curb transmission, although many have recently reopened schools. The United Nations Educational, Scientific and Cultural Organization estimated that school closures have affected 1.2 billion learners including children and teenagers – approximately 68% of students around the world.¹ School closures are based on a preliminary recommendation derived from influenza and hand-foot-and-mouth disease that suggest transmission disruption by limiting contact between students affords broader community protection.^{2,3} However, the effectiveness of this measure is as yet uncertain. This raises three key questions: (i) Are children the major spreaders of SARS-CoV-2? (ii) How many children could get SARS-CoV-2? and (iii) What are the negative impacts of school closure policies on the young?

As in other low- and middle-income countries (LMIC), on 18 March 2020, Thailand announced its closure of local and international schools, universities and children care facilities to impede the spread of SARS-CoV-2. This closure was in fact, just 1–2 weeks before schools would have been closed under normal circumstances; therefore, it only slightly impacted educational, life-style or nutritional aspects of most children and learners. This

has affected 15 million learners – mostly enrolled at pre-primary, primary and secondary levels of education.¹

Based on past experience, children are perfect vectors for transmission of some respiratory viral infections such as influenza, measles and hand-foot-and-mouth disease,⁴ capable of spreading rapidly among young children in the crowded environments of daycare centres and nurseries.^{3,5} A number of studies modelling influenza or hand-foot-and-mouth disease demonstrate that 'reactive school closures' in response to a viral pathogen can reduce the rate of infection by a quarter and peak infection rates by half among susceptible individuals.^{6–8} However, the benefits of school closure in the COVID-19 outbreak are unproven; it is suggested that hygiene and environmental precautions such as hand washing, public education on hand sanitising, wearing masks, eating cooked food, and using clean serving spoons are more effective than school closure and play a fundamental role in reducing the number of cases and effectively controlling disease outbreaks.^{9,10}

In the case of COVID-19 in Thailand and most countries, federal authorities have practiced 'proactive school closures', by closing schools prior to confirming infection transmission on school campuses. This strategy is not just about keeping the children safe, but rather, to keep the whole community safe. School closures result in a marked reduction of contacts associated with schooling.^{11,12} Some studies confirm that transmission of influenza was reduced during school closures, especially among school-age children.^{8,13} Nevertheless, during the H1N1 influenza pandemic, many students in western countries continued to mix with others during school closures in spite of social distancing policies.^{11,14,15} Without clear scientific guidance about the risks of triggering waves of COVID-19 spread in schools, it is uncertain whether the policy of school closure is effective and necessary for

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the COVID-19 pandemic for students and communities.^{4,10} A thorough systematic review of 16 studies of previous coronavirus outbreaks, including the 2003 SARS virus in China, Hong Kong and Singapore suggests that school closures play insignificant roles in transmission control and others' school activities. For example, temperature screening did not contribute to effective case detection especially in asymptomatic individuals during incubation period.^{4,9,10} As of May, only 5.8% out of a total of 3037 confirmed COVID-19 cases in Thailand occurred in individuals fewer than 20 years of age. Recent studies show that a child's SARS-CoV-2 infection is often mild or asymptomatic^{16,17} with low prevalence of infection, 2–6.7%.^{18–20} In Iceland, researchers found that at-risk populations or in contact with infected persons, no child under 10 years of age had a positive test, as compared with 0.8% of those 10 years of age or older.¹⁸ A retrospective observational study in China, Singapore, Japan, Iran and South Korea of recorded SARS-CoV-2 household transmission clusters demonstrated that children were identified as the index case in only 3 (9.7%) out of 31 households.¹⁰ Evidence supports that most children infected with SARS-CoV-2 have a known household contact whose symptoms precede that of the child,^{10,19} indicating children are less likely to be the primary source of household SARS-CoV-2 infection. School outbreaks are rare to date. A school cluster of COVID-19 reported in New Zealand, for instance showed that it was caused by infected school staff who transmitted to others.²⁰ To date, about 23% of schools world-wide have reopened locally, regionally or nationally, according to United Nations Educational, Scientific and Cultural Organization¹ following a gradual decline in the rate of new infections with no reports about potential spread of COVID-19 in school settings.

However, schools that are closed for a long period of time could inevitably have detrimental educational, social and health ramifications for children who live under vulnerable circumstances, such as children in marginal communities or in poverty who are faced with malnutrition and interruption of their education. Considering experiences from Thailand, we discuss two major threads and suggest opportunities during COVID-19 school closures and how these may affect children at-risk in LMIC settings such as Thailand (see Table 1 for key recommended actions).

First, 300 000–500 000 Thai children, most of whom reside in rural areas, suffer from malnutrition, compared to 250 million malnourished school children world-wide. According to the World Health Organization data from 2016, 10.5% of children under 5 years of age were stunted with 60% of these children living in households with insecure income, with an additional 28–30% of children aged 5–19 years classified as underweight.^{24,25} In contrast, the prevalence of obesity increases. Rundle *et al.* postulate that COVID-19 school closures may exacerbate the epidemic of childhood obesity in high-income households because they are likely to purchase ultra-processed, calorie-dense foods.^{26,27} However, in LMIC and in Thailand specifically, stunting and wasting as indicators of long-term inadequate nutrition are especially prevalent in low-income households. We argue that these populations are much more prone to malnutrition due to school closures. The national school breakfast and lunch programmes serve nearly 6.3 million children daily (60% of all students in Thailand) at pre-primary and primary school levels,

providing essential nutrition for growing children. Many children rely on these free meals for healthy nutrition. When schools close, nutrition is compromised. It is estimated that school feeding programmes provide up to 30–50% of a child's daily nutritional requirements through meals healthier than those prepared at home at the same price. The true cost for household food preparation is plausibly much higher when considering time spent purchasing, preparing foods, and higher retail food prices. From our experience, many children consume only two meals a day and one meal at school is considered high value for children's growth and development. In Thailand, schools have tentatively been scheduled to reopen on 1 July, which would result in an extra 43 days of school closure than expected. This would result in almost 270 million missed meals nationwide; for a child who misses school meals this may lead to a 1–2 kg weight loss over these 43 days – close to 5–10% of a child's total body weight. In addition, school closures can bring added financial pressures and risk of child undernutrition for poorer families given the now larger costs of childcare.²⁸

It is unclear how long school closures will last. If applied to the COVID-19 situations in Hong Kong, Taiwan, and Singapore, 'the hammer and the dance' theory proposed by Tomas Pueyo²⁹ would suggest that social distancing orders such as work from home (WFH) and school closures risk disease flare ups if eased too quickly. However, each country has different measures depending upon how the COVID-19 situation evolves after the reopening of schools. The World Health Organization recommends that the transition from lockdown be 'evidence-based' and implemented gradually to prevent the risk of new outbreaks.²¹ Therefore, even though children are less likely to spread SARS-CoV-2, redesigning classrooms on hygiene policies and new physical distancing rules more intensively will help schools open sooner and at a reduced risk of disease spreading and school re-closure (Table 1). On 18 March, Thailand's decree for school closures also came with restrictions that resulted in closure of the restaurant and bar industries as well as other common sports and entertainment business sectors, restricted movement between provinces, and subsequently placed a curfew on its citizenry that began on 3 April. These aggressive restrictions have resulted in curbing the rate of daily new infection from 30% to an average 0–1.9% in the 4 weeks prior to 26 May.³⁰ Figure 1 proposes essential additions to the current health-care surveillance and nutrition delivery systems during COVID-19 to mitigate the burden of malnutrition in high-risk children that can be managed at primary health-care centres or schools.²² Weight measurement is used to minimise direct or invasive contact when conducting child assessments in screening for malnutrition. Administering vaccines are also recommended, as preliminary data shows that once there is 14-day home quarantine for suspected individuals, children in the same household tend not to get scheduled vaccinations due to a concern of social distancing and disease awareness at clinics. Vaccination is the only service that is to be performed under direct medical supervision in line with COVID-19 emergency guidelines.

Sufficient and good-quality nutrition is critical for continued development, health, and survival of current and succeeding generations. Ultra-high temperature milk is generally provided to children in most areas because of convenience, long shelf-lives, and no need for refrigeration. It was previously determined that

Table 1 Recommended approaches to addressing food and learning insecurity in school children at-risk or in low- and middle-income countries during the Covid-19 Pandemic^{21–23}

Measures	
Personal hygiene	<ul style="list-style-type: none"> Reinforce hand hygiene among students and staff throughout the day; scheduled times for handwashing Wear a mask at all time whenever away from home Not share cups, eating utensils, food or drinks with others
Detection and isolation	<ul style="list-style-type: none"> Use active COVID-19 screening measures when appropriate Schools should be reopened as soon as possible, children and families must avoid making close contact with the elderly and people at risk for getting COVID-19 and if there are suspected symptoms in accordance with the Communicable Diseases Act, one shall be quarantined at home for 14 days and receive medical surveillance immediately
Public decontamination	<ul style="list-style-type: none"> Routinely clean surfaces and objects that are touched often, such as desks, countertops, door, window handles, lunch tables, etc. Avoid using shared learning equipment in close spaces such as computer keyboards, footballs, basketballs
Health-care resources	<ul style="list-style-type: none"> Seasonal influenza is approaching. To differentiate between fever from flu or COVID-19 related symptoms, flu vaccination is suggested for everyone 6 months of age and older unless they have specific contraindication to flu vaccine Perform the health assessment and flu vaccine delivery at the primary health-care centre for children Build mechanisms for families and communities to guarantee food security based on the Thai sufficiency economy philosophy proposed by King Bhumibol Adulyadej
Children health	<ul style="list-style-type: none"> Maintain social distancing while reducing logistical burden for families by receiving food supply by providing rice, UHT milk and eggs for multiple days' worth of meals, allowing drive-through meal pickup at government facilities such as the primary health-care centre, schools and supplied by local farms and small to medium-sized enterprises when possible
Social distancing	<ul style="list-style-type: none"> Keep a child home from school when sick and notify the school and seek medical advice Split-team working arrangements for school staff to help minimise the risk of an entire workforce being unavailable to perform teaching
Stop non-essential classes	<ul style="list-style-type: none"> Space out desks 1–2 m apart and limit student interactions in hallways and classrooms Stop non-essential classes and close contact, extra-curricular activities that create crowded conditions such as playing football, basketball Consider to play badminton, ping pong, jumping rope
Minimise school closure	<ul style="list-style-type: none"> Minimise negative impacts on children by considering local or regional school closure strategies for each area based on an infection rate, as the route of infection, or reactive closure of individual areas in response to community or confirmed infections among students
Fruit and vegetable community gardening	<ul style="list-style-type: none"> Use empty space to grow fruits and five-colour vegetables according to season Use community participatory approaches to ensure food security in long term Encourage to grow herbs and vegetables at home for local supply
Education	<ul style="list-style-type: none"> Integrate information about COVID-19 and related issues in health educational classes Use of online/e-learning/ satellite learning strategies

UHT, ultra-high temperature.

an additional three eggs per week at school is enough to stabilise normal serum protein levels.³¹ However, our recent work demonstrates that up to 10 whole eggs a week can enhance children's weight and height by 30–60% as compared with students with a conventional school lunch programme in 1 year (K Mayurasakorn, unpubl. data, 2020). Therefore, we recommend that eggs and milk be provided as essential raw protein sources. According to a letter by Mr Anan Suwannarat (Permanent Secretary of the Minister of Agriculture and Cooperatives, Thailand) on 13 April 2020, the Milk and Food Board for Children and Youth of Thailand announced its distribution of ultra-high temperature milk to students from 18 May to 30 June 2020, typically schools open under normal circumstances. On 30 April 2020, the childcare from Ministry of Interior, Thailand were tasked with providing food and nutrition service to and nutrition in their

areas in preparing meals and delivering to household in accordance with COVID-19 precautions (written communication, 30 April 2020). Food insecurity also has an impact upon all members of the household. It is associated with mental illness, poor physical health and reduced school participation in children. The United Nations Children's Fund's 'guidance for COVID-19 prevention and control in schools' proposes that teachers canvass their students for any effects from COVID-19, and coordinate with social service agencies and local organisations to identify and help children in distress.²³ Additionally, a symptomatic child should be in school unless school is suspected.

Second, unexpected school closures have forced schools to provide online learning lessons. Providing education during the COVID-19 outbreak poses a challenge to all countries who wish to reduce inequality. Evidence indicates that time outside of

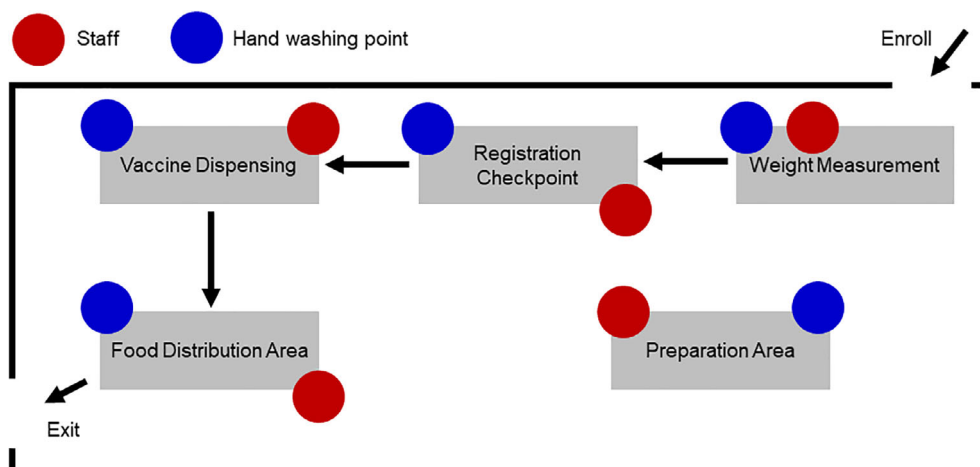


Fig 1 Health-care service delivery flow (modified from a guideline from the World Food Programme).²² The circuit demonstrates a one-way path for flow of health-care services within a facility and includes a weight station, registration point, essential vaccine delivery point and food distribution point provided by essential medical personnel, caretakers and volunteers.

school is a source of educational inequalities among families across a wide range of socio-economic status.²⁸ Youth from financially insecure households experience a greater degree of impediments to learning than their wealthier counterparts during a school break.³² The full extent of the COVID-19 crisis in causing disruption for child care, education, and financial insecurity due to parental unemployment, is still unknown. However, should parents continue with their ongoing commitments and responsibilities, the school closures and child care restrictions may leave children unattended at home, thereby curtailing children's learning capacity during school closure.³³ One observational study shows that all students regardless of income status lost an equal amount of 1.8 months of progress in mathematical skills and 4 months of spelling skill, while students of low socio-economic status experienced the largest learning deficit when it came to reading comprehensiveness.³² In addition, children facing social hardships have been shown to suffer greater societal disconnection. This separation, starvation, and passive sedentary behaviour experienced during the COVID-19 crisis may contribute to acute and subacute poorer health outcomes, including the mental health and wellbeing of the children.²⁸ Although the use of online learning is a key difference compared to regular, scheduled school closures, extended school closures may still lead to widening the learning, health, and nutrition gaps between youth from lower-income and higher-income households. Perhaps worse than educational impediment, an end to the pandemic is yet to be imagined, which will lead to grievous economic depression. This can exacerbate existing poverty and its association with children's nutrition and learning outcomes. In Thailand, the Ministry of Education is aware of the situation and hopes to use the distance learning television model developed during the reign of His Majesty King Bhumibol (King Rama IX), who established bridging the knowledge gap for underprivileged children and youth in rural areas.³⁴ Still, teachers should also consider how to modify their learning tools for students without digital access such as assigning students to review lessons and do homework,

contacting students via telephone or home visit while adhering to physical distancing restrictions.²³

Based on the current data indicating that children are less likely to be main vectors of SAR-CoV-2, the benefits of school reopening and continuing education far outweigh the risks. This is an unprecedented time in our lives when we must ensure the health and education of the next generation to prevent deepening inequalities, which will affect the health and learning potential among vulnerable households. We must do this through the use of real-time strategies that circumvent COVID-19 at every step, and share lessons learned with the global community to improve our support of our children, which in turn, supports us all.

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