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# Roadmap to recovery: Implemented and attitude toward school reopening strategies during the COVID-19 pandemic, a scoping review

Mehrdad Askarian, Mohammad Movahedi<sup>1</sup>, Hossein M. Vardanjani<sup>2</sup>, Ardalan Askarian<sup>3</sup>, Zahra R. Ghotbabadi<sup>4</sup>

Department of Community Medicine, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran, Health Behavior Science Research Center, Shiraz University of Medical Sciences, Shiraz, Iran, <sup>1</sup>Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Ontario, Canada, <sup>2</sup>MPH Department, School of Medicine, Research Center for Traditional Medicine and History of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran, <sup>3</sup>Student, College of Arts and Science, University of Saskatchewan, Saskatoon, Canada, <sup>4</sup>MPH Department, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

## Address for correspondence:

Dr. Zahra R. Ghotbabadi, Sibouye St, Shiraz, Iran. E-mail: rostamiz1010@gmail.com

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## Abstract:

The novel coronavirus disease 2019 (COVID-19) has had various financial and life impacts on the world's population. Schools' regular activity and function during the pandemic require balancing the repercussions of suspending in-person education versus health threats. Furthermore, children are one of the prominent victims of the restricted quarantine strategies' effects, which may make them vulnerable to various mental health problems. In this study, we reviewed previously reported strategies and roadmaps regarding the reopening of schools during the COVID-19 pandemic. The following databases were searched from October to December 2021, via multi-step search strategies for "COVID-19," "coronavirus," "school reopening," "roadmaps," "reopening," and "reopening strategies": Google Scholar, PubMed, Scopus, and Web of Science. A total of five papers with roadmaps focusing on reopening schools were included in this study. Fundamental issues and principles of these reviewed roadmaps were: 1) protecting the high-risk students and staff physically and mentally, 2) accelerating the vaccination of essential workers, staff, parents, and students, and 3) improving the COVID-19 testing capacity. Roadmaps for the reopening of the schools should describe some phases and steps for their strategies. Current roadmaps have not mentioned any phases and timelines for this process. Describing some health metrics in the roadmaps for progressing to the next step or returning to the previous ones is also necessary for all roadmaps and should be considered in further studies.

## Keywords:

COVID-19, pandemic, schools, students, vaccination

## Introduction

In November 2019, a newly emerged coronavirus, also known as Coronavirus disease 2019 (COVID-19) was detected, which was associated with a severe respiratory infection in humans.<sup>[1]</sup> The 2019-novel coronavirus (2019-nCoV) is an RNA virus that spreads from human to human through respiratory droplets and aerosols. The pandemic COVID-19 has had major consequences on daily life's structures and imposed a heavy burden on the countries' economy and public

finances, along with its diagnostic and management dilemmas. The mental and physical health was also adversely affected by this virus, which may be due to the isolation and restriction of people in their households.

Although the COVID-19 virus is sensitive to routine disinfectants, it can live on the surfaces and environments for hours. Thus, a set of instructions was developed for the prevention of COVID-19 transmission. Maintaining a safe physical distance from others, wearing a mask, using alcohol-based hand rub and more importantly, vaccination

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are some of these instructions.<sup>[2-4]</sup> These restrictions diminished the incidence of COVID-19 transmission and its detrimental effects such as hospitalization and death.<sup>[2,3,5-12]</sup>

Moreover, regarding the highly contagious potential of this virus, the Center for Disease Control and Prevention (CDC) recommended schools shut down to slow the spread of the disease.<sup>[13]</sup> During the early stages of the pandemic, it was thought that the disease seemed to be less severe in children and young people, and they could be asymptomatic carriers and reservoirs for transmission of COVID-19 to their family and household members.<sup>[14,15]</sup> However, with the emergence of new variants of the disease, such as the delta and omicron variants, severe forms of the disease have been reported among children.<sup>[10,12,16-19]</sup>

With the global COVID-19 lockdown and nationwide school districts currently performed in 191 countries, nearly 54 million affected learners (3.4% of total enrolled learners) have been estimated to be out of primary, secondary, and tertiary education.<sup>[20]</sup> Despite the emergence of the highly infectious COVID-19 variants, if schools had closed and people restricted their social activity and travel, those mitigation measures would have prevented many hospitalizations and deaths even in the absence of vaccination.<sup>[21-23]</sup> With the recent omicron outbreak in the United States, hospitalizations in children infected with COVID-19 have increased, both in absolute numbers and as a fraction of total COVID-19 hospitalizations.<sup>[24]</sup> However, it is unclear whether these hospitalizations are due to severe disease or are the result of children being treated for other causes and then being discovered to be COVID-19 infected by chance. Aside from the direct repercussions, the omicron surge's indirect effects, such as school closures and economic fallout, may exacerbate physical, emotional, and social health issues in children around the world.<sup>[25]</sup> It is impossible to say how the omicron surge has affected cases of multisystem inflammatory syndrome in youngsters (MIS-C).<sup>[26,27]</sup> According to recent advances in the control of the disease using prevention instructions and vaccination, determining a proper time for school reopening remains a fundamental issue in all countries. Several studies were conducted to identify factors diminishing the rate of COVID-19 transmission in schools and introduce a logistic roadmap in this regard.<sup>[20]</sup>

In this study, we reviewed previously reported strategies and roadmaps regarding the reopening of schools during the COVID-19 pandemic to consider a comprehensive roadmap for school reopening after the COVID-19 lockdown. Another aim of this study was to summarize the approaches that are employed to reopen the schools based on the experience of other nations. Many databases were searched by Google Scholar, PubMed, Scopus, and

Web of Sciences for any strategy for easing the lockdown and restrictions exemption program. As research on children's mental and physical health in relation to the adoption of school reopening after a long time is urgently needed, the results of this study could be helpful in explaining the appropriate instructions for the safe reopening of the schools.

## Research Question

What are the instructions and foundations of roadmaps assigned in previous studies by health systems in the world to ease the restrictions and reopen the schools?

## Materials and Methods

This study was a scoping review study conducted regarding the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PCC) statements.

All roadmaps conceived in previous literature to reopen the schools were included in the current study. Studies with irrelevant abstracts, those not in English, or unavailable as full texts were excluded. Studies focused on reopening strategies for certain activities such as university reopening and restaurant reopening were also excluded.

We conducted a multi-step search strategy via the Google search engine and valid databases including Google Scholar, PubMed, Scopus, and Web of Science to find studies considering school reopening roadmaps.

After the initial search, we discussed the keywords, title, and context of retrieved studies meeting eligibility criteria to recognize the most related terms and articles. The full text of studies whose abstracts did not provide enough data for the decision was also evaluated. Searching the databases and reviewing the full text were carried out by two investigators; Zahra Rostami Ghotbabadi and Mehrdad Askarian, independently. The databases were searched for different combinations of the following Medical Subject Headings (MeSH) and related non-MeSH terms, including "COVID-19," "coronavirus," "school reopening," "roadmaps," "reopening," and "reopening strategies." References in the retrieved studies were also hand-searched to identify further relevant literature. Any disagreements between the authors in the study selection were resolved via discussion and consensus.

The following items were extracted from included roadmaps and recorded in a standardized evaluation form: country or state, time of publishing, principals, general recommendations for individuals, health key

metrics, number of phases, the time considered for each phase, criteria of progressing to next phase or returning to the previous phase. The senior author resolved discrepancies.

## Results

A total of 3,220 articles were retrieved and after removing duplication 2,710 remained [Figure 1]. After the initial abstract and title screening the review articles, books, and conference papers were removed.

A total number of 29 articles were chosen for further consideration. About 20 documents were not related to roadmaps, three documents focused on the reopening of other activities such as the reopening of restaurants, and gyms, and one was not in English.

Eventually, a total of five papers that had roadmaps and focused on reopening the schools were included in this study [28-32][Table 1].

### Principles in roadmaps

The review of reopening roadmaps focused on several principles including 1) the mental health of students and staff, 2) staff wellness, 3) vaccination, and 4) improving the COVID testing capacity.

### Mental health support of students and staff

As the parents, caregivers, students, and school staff experienced a challenge and stress while trying to

adapt to the lockdown and school districts for 2 years, reopening the schools could pose a heavy mental load on them. Schools should provide an eligible plan for the emotional support of students, parents, and staff.<sup>[22,23,33-40]</sup> A professional team including social workers, psychologists, and counselors is more necessary than ever to ensure the mental health of the students.<sup>[29,30,34,35,39,40]</sup>

Special attention to the psychosomatic symptoms of students was required, which can be due to mental problems including headache, abdominal pain, fatigue, dizziness, and nausea/vomiting.<sup>[36]</sup> Children who suffered from anxiety, depression, childhood adversity, and school stress may present with these symptoms and after ruling out the somatic diseases, psychiatric problems should be considered in such cases.<sup>[36]</sup>

### Staff wellness

Due to the staff responsible for providing and supporting the student's well-being, offering a suitable and safe environment for the school staff should be a priority in these communities.<sup>[29,30]</sup> Reducing staff stress, promoting their health, and supporting them morally will make staff more productive and efficient.<sup>[35,41]</sup> Asking for help from school nurses and councils can improve the lifestyle (including relationships, nutrition, exercise, and so on) and mental health of the school staff.<sup>[35,42]</sup> Only healthy staff can provide a proper space for students to adapt to their new challenges and experience positive personal growth in the school.

### Vaccination

The most important principle for the school reopening roadmap is the vaccination of students and school staff.<sup>[43,44]</sup> Based on the rapid and widespread of COVID-19, primary prevention by vaccination is vital to achieving immunity against this virus.<sup>[44,45]</sup> This approach is the most effective way to prevent the symptomatic form of the disease and its severe consequences including death.<sup>[46]</sup> Available vaccines for students developed using mRNA technology (Pfizer-BioNTech (BNT162b2), Moderna (mRNA-1273)), viral-vector platforms (AstraZeneca (ChAdOx1-S), Janssen (Ad26.COVS)), and protein-subunits. Although there are limited reports regarding the approval of vaccines for children,<sup>[46]</sup> some vaccines such as the Pfizer-BioNTech COVID-19 vaccine have been approved for children 5 to 11 years of age.<sup>[47]</sup>

In Canada, after the beginning of the vaccination program, COVID-19 infections have occurred in the unvaccinated population significantly higher than in vaccinated ones (89.4% versus 0.6%). Also, according to the studies reports, approximately 84.8% of hospitalized patients were unvaccinated and 82.1%

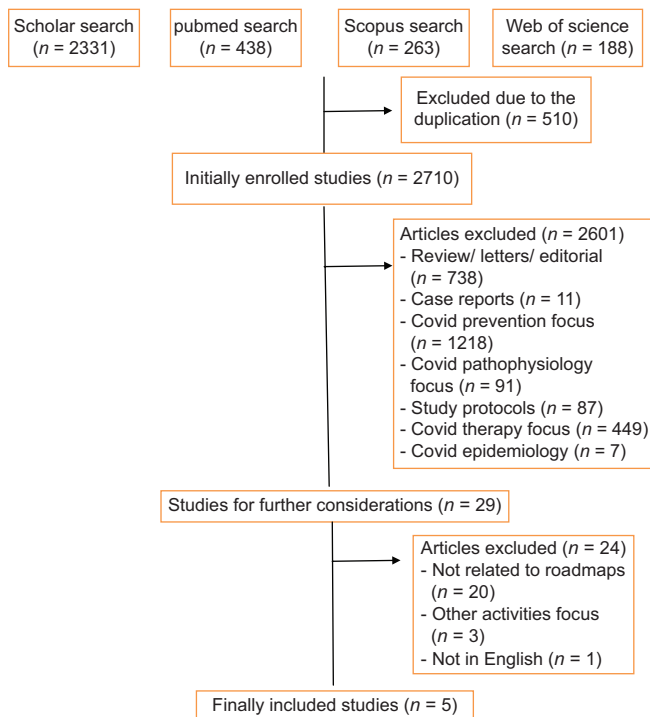


Figure 1: Study selection

**Table 1: A review of roadmaps reported by other studies regarding the reopening of schools regarding the COVID-19 pandemic**

	Hoffman et al. <sup>[28]</sup>	Moss et al. <sup>[29]</sup>	U.S. Department of education <sup>[30]</sup>	Askarian et al. <sup>[31]</sup>	Melnick et al. <sup>[32]</sup>
Health screening	+		+		+
Increase testing capacity	+	+	+		+
Group size and staffing				+	+
promote mental health	+	+	+	+	
Teacher and staff training	+	+			
Keeping social distance	+	+	+	+	+
Classroom space/physical distancing	+		+	+	+
Acting quickly and effectively		+	+		
Minimizing direct contacts	+		+	+	+
Support the preventive measures of physical distancing, especially for crowded places and time in school				+	+
Vaccination/in-place vaccination		+	+	+	
Customized school buses for transport				+	+
Hygiene, wearing masks, and hand sanitizers	+	+	+	+	+

of those who died did not receive the vaccine.<sup>[48]</sup> Although for the delta variant of COVID-19, studies reported a decrease in vaccine efficacy compared to the original strain, vaccination is still the only way to reduce the rate of hospitalization and death for all variants.<sup>[48]</sup> Omicron is the most mutated SARS-CoV-2 variation, with 50 mutations in its genome and 30 mutations in its spike (S) protein alone, resulting in greater transmissibility and partial resistance to COVID-19 vaccines and antibody-based therapy.<sup>[49-55]</sup> RT-PCR can detect the omicron variation, but genomic sequencing is required for confirmation.<sup>[56,57]</sup> Preliminary information also suggests that recovered patients have a higher risk of reinfection, as well as vaccination breakthroughs in those who have been vaccinated with this variation.<sup>[8]</sup> Overall, the high genomic modifications will have an impact on virus properties such as greater transmissibility, disease severity, immunological escape from the vaccine and immunotherapy-based protection, and diagnostic impediment. As a result, it is strongly suggested that global surveillance and sequencing efforts to better understand circulating SARS-CoV-2 variants, particularly Omicron, be increased.

In a recent roadmap designed by Moss *et al.*, prompt vaccination was declared necessary for the reopening of the schools.<sup>[29]</sup> The administration of the Pfizer BioNTech COVID-19 vaccine to school-aged children has been approved by the FDA (2021) for emergency use.<sup>[46,47,58]</sup> It was also endorsed by the CDC (2021e) and the American Academy of Pediatrics (AAP, 2021).<sup>[59,60]</sup>

AAP also recommended the administration of COVID-19 vaccines at the same time as routine childhood vaccinations.<sup>[60]</sup> CDC (2021g) confirmed that the efficacy of vaccines for immunization against diseases is the same when given alone or with others.<sup>[61]</sup> Thus, it seems that vaccination without regard to timing against COVID-19

is a fundamental principle in previously designed roadmaps for school reopening after lockdown.

Determining the high-risk students before reopening schools is necessary to prioritize them in the vaccination program. Moreover, CDC advises the school nurses and health care providers to find at-risk persons for betimes vaccination.<sup>[60]</sup>

The minimum vaccination rate required to ensure students' health and minimize the transmission of COVID-19 among them is not established yet; so, further experimental studies should be performed in this regard.

According to the National Association of School Nurses Framework for 21<sup>st</sup>-Century Nursing Practice (NASN, 2016), one of the most important duties of school nurses during the COVID-19 pandemic is to facilitate vaccination for students and staff.<sup>[62]</sup> Educating and encouraging vaccination among students, staff, and their families is another role of school nurses that special attention should be paid to it at the time of school reopening.

Moreover, some studies recommended school-located vaccination events for accelerating the COVID-19 vaccination.<sup>[29,59]</sup> This method could provide easier access and wider coverage for all families and all socioeconomic and age groups.<sup>[29]</sup>

### COVID-19 testing

The CDC recommends that viral testing should be available for students and staff in school. Having access to COVID-19 testing is a major part of the comprehensive prevention approach for reducing virus transmission along with other protocols for personal care.<sup>[29,57,63]</sup>

Two types of COVID-19 tests could be used in the schools including nucleic acid amplification tests (NAATs) and



antigen tests.<sup>[63,64]</sup> Both types are available in several countries and approved by the CDC.<sup>[29,65]</sup> School staff could be taught for using laboratory kits for rapid diagnosis of the disease.

Screening of asymptomatic students before entering the schools should be performed during times of moderate-to-high community transmission and for those participating in sports.<sup>[65]</sup>

Despite reporting negative results of these tests, the possibility of false-negative results must be considered especially in the presence of suspicious symptoms. Identifying infections at early stages among students prevent further transmissions in this population and seems to be necessary for school reopening.

## Discussion

The COVID-19 pandemic changed traditional education models. As schools prepare to reopen for the 2022–2023 school year, the educational team staff and policymakers must be equipped with the most up-to-date evidence-based knowledge and tools to promote the health and safety of the students. To promote a safe and healthy learning environment when students and staff return to school, schools will need to continue infection control measures and strategies that support the social–emotional needs of students and staff. School nurses, in collaboration with local health departments, are critical to preventative measures such as on-site viral testing and vaccination. In this study, we reviewed previously reported strategies and roadmaps regarding the reopening of schools after the COVID-19 pandemic to consider a comprehensive roadmap for school reopening after COVID-19 lockdown and to summarize the approaches that are employed in this regard based on the experience of other nations. A total of five studies and roadmaps were review studies.<sup>[28-32]</sup> Fundamental issues and principles of all these reviewed roadmaps were: 1) protecting the vulnerable and high-risk students and staff physically and mentally, 2) accelerating the vaccination of staff, parents, and students, and 3) improving the COVID-19 testing capacity.

In all aforementioned studies, social distancing, wearing a mask or facial covers for decreasing the spread of infected respiratory droplets, and washing hands are recommended for students as a personal preventive protocol.<sup>[28-32,66]</sup> Providing proper ventilation and one-side flow in classes and school environments could decrease personal contact and COVID-19 transmission.<sup>[31]</sup> Separate and multiple entrances and scheduling the arrival and drop-off times are other ways to minimize direct contact.<sup>[31]</sup> Creating small groups of students, and keeping them at a safe distance from others seem to be a good suggestion to control disease transmission.<sup>[31]</sup>

Some of the roadmaps did not mention personal health care protocols for students in schools. These recommendations should be mentioned in all roadmaps for school reopening due to the significant effect of personal care in reducing the risk of COVID-19 development. School staff plays a major role in protecting and supporting students from the COVID-19 infection and its consequences.

## Limitations and recommendation

This study faced a number of limitations. The small number of reviewed studies and the limited duration of the study are two major limitations of this study. Furthermore, previous roadmaps did not assess the impact of school reopening on transmission within the parents and thus the broader community. Another limitation of our study is that we did not evaluate the roadmaps by dividing the setting into primary and secondary schools, and also, we excluded studies on university reopening roadmaps.

Further studies should be performed to evaluate the impact of school reopening on other settings of the community and to determine the health key metrics, number of phases, the time considered for each phase, and criteria for progressing to the next phase or returning to the previous phases.

## Conclusion

In conclusion, the present study demonstrated that instructions and protocols for reopening the schools should pay more attention to two fundamental issues: 1) prevention of the disease and 2) diagnosis and management of suspected and confirmed cases.

Special attention to the health key metrics should be considered in all roadmaps such as availability of personal protective equipment, accessibility of vaccines, and capacity of diagnostic testing.

Roadmaps for the reopening of the schools should describe some phases and steps for their strategies. Current roadmaps have not mentioned any phases and timelines for this process.

Describing some health metrics in the roadmaps for progressing to the next step or returning to the previous ones is also necessary for all roadmaps and should be considered in further studies.

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### Conflicts of interest

There are no conflicts of interest.

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