




Rapid Review: What is the effectiveness of interventions to get school-aged children and youth caught up with routine vaccinations in the context of the COVID-19 pandemic?



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Executive Summary

Background

The administration of routine childhood vaccinations has been disrupted, worldwide, due to the coronavirus disease 2019 (COVID-19) pandemic. Rates of vaccination dropped by anywhere from 2% (e.g., for diphtheria, tetanus, and pertussis) to more than 15% (e.g., for human papillomavirus). The World Health Organization estimates that 25 million children were un- or under-vaccinated in 2021, which is six million more than in 2019; the number of zero-dose children – those who have never received any routine childhood vaccination – increased by 37% (UNICEF, 2022).

Pandemic restriction measures (e.g., school and school-based program closures, social distancing, quarantining), prioritization of COVID-19 vaccinations, restricted access to health care providers (e.g., due to health service reorganization and health provider redeployment), and parental fear of contagion are some of the documented reasons behind this disruption. Missed vaccinations increase the likelihood of serious outbreaks and leave vulnerable individuals at greater risk of contracting entirely preventable diseases, further burdening overwhelmed healthcare systems. National and international health organizations, advisory committees, and infectious disease experts have issued guidance statements, action plans, and recommendations stressing the time-sensitive importance of getting children caught up and back on schedule with routine vaccinations (Bonanni et al., 2021; CDC, 2022; WHO, 2020). Many of these recommendations are based on expert opinion and/or studies conducted prior to the COVID-19 pandemic.

This rapid review includes evidence available up to August 25, 2022 to answer the question: **What is the effectiveness of interventions to get school-aged children and youth caught up with routine vaccinations in the context of the COVID-19 pandemic?**

This rapid review was produced to support public health decision makers' response to the COVID-19 pandemic. It seeks to identify, appraise, and summarize emerging research evidence to support evidence-informed decision making.

Key Points

- Identifying unvaccinated children from a regional vaccination registry and sending notifications to their parents, which included information about the importance of vaccines and an invitation to schedule an appointment (i.e., education and action), increased diphtheria-tetanus-acellular pertussis and poliomyelitis and measles-mumps rubella vaccination rates in children aged 6 years by up to 20%. The certainty of the evidence is very low (GRADE); findings are likely to change as more data become available.
- A community-based education and school-based vaccination intervention increased human papillomavirus vaccine initiation rates 1.29-fold and completion rates 1.47-fold among male and female children aged 11-12 years. The certainty of the evidence is very low (GRADE); findings are likely to change as more data become available.

- Components of interventions that have been shown to increase rates of children caught up on routine vaccinations include identification of unvaccinated children or missed appointments, parental notification, vaccine education and promotion, use of trusted sources (e.g., physician), dedicated “catch up” clinics, and convenient clinic locations (e.g., school-based). The certainty of the evidence is very low (GRADE); findings are likely to change as more data become available.

Overview of Evidence and Knowledge Gaps

- There is extremely limited evidence on the effectiveness of interventions to get *school-aged* children and youth (i.e., aged 5 – 18) caught up with routine vaccinations, specifically in the *context of COVID-19* (i.e., studies that reported on outcomes from interventions that took pandemic-related measures, such as school closures, into consideration). Only two observational studies were identified for inclusion in this review; the routine childhood vaccinations studied in this evidence were limited to diphtheria-tetanus-acellular pertussis and poliomyelitis, measles mumps rubella, and human papillomavirus. The lack of available evidence may be due to our restrictive context (i.e., studies conducted *during* COVID-19 pandemic); it is likely relevant studies had not been published as of our search date (August 25, 2022). Another key factor was studies not reporting outcomes separately for our target age group (i.e., children and youth aged 5-18 years); rather, studies reported outcomes for their whole sample which included children under five or over 18 years old. Given the potential for interventions to produce different results for different age groups, these studies were excluded.
- In addition to the body of evidence being limited to two studies, there is also considerable variation across studies in the interventions implemented. As such it is unclear if certain activities (e.g., identification, notification, education, or convenient administration) are more effective than others, or which combination of activities will yield the greatest improvements in vaccination rates.
- Citizen representative input further endorsed the positive impact of convenient administration (e.g., school- or nearby community-based clinics, pairing “catch up” clinics with school events) and parental notification (e.g., email reminders, consent forms sent home with children) for increasing vaccination rates. They also noted that regional vaccine registries may not capture children who moved during the pandemic and school-based activities (e.g., communications, clinics) may not reach children who are homeschooled.
- The studies included in this review do not provide evidence for the experiences of populations who live with social and structural inequities, such as Indigenous or racialized communities. Further research is required to ensure representation of these populations for decision making.

Methods

A description of the development of the National Collaborating Centre for Methods and Tools' Rapid Evidence Service has been published (Neil-Sztramko *et al.*, 2021). This paper provides an overview of the review process with rationale for methodological decisions.

Research Question

What is the effectiveness of interventions to get school-aged children and youth caught up with routine vaccinations in the context of the COVID-19 pandemic?

Search

On August 25, 2022, the following databases were searched using key terms child*, school*, teen*, adolescen*, vaccin*, immuniz*, program*, schedule*, record*, system, milestone*, mandatory, required, routine:

- [MEDLINE](#) database
- [ERIC](#) database
- [Ovid Healthstar](#)
- [Ovid Global Health](#)
- [COVID-19 Living Overview of the Evidence \(L·OVE\)](#)
- [COVID-19 Evidence Alerts](#) from McMaster PLUS™
- [McMaster Health Forum](#)
- NCCMT [COVID-19 Rapid Evidence Reviews](#)
- [Prospero Registry of Systematic Reviews](#)
- [Uncover \(USHER Network for COVID-19 Evidence Reviews\)](#)
- [Morbidity and Mortality Weekly Report \(MMWR\)](#)
- [Institute national d'excellence en santé et en services sociaux \(INESSS\)](#)
- [BC Centre for Disease Control \(BCCDC\)](#)
- [Public Health England](#)

A copy of the full search strategy is available in [Appendix 1](#).

Study Selection Criteria

English-language, peer-reviewed sources and sources published ahead-of-print before peer review were included. Sources reporting surveillance of disease prevalence, expert opinion, and modelling studies were excluded.

	Inclusion Criteria	Exclusion Criteria
Population	School-aged children and youth; ages 5-18	High-school aged teenagers who have dropped out of school Children and youth with underlying medical conditions or needs Children aged less than 5 years and participants older than 18 years
Intervention	Interventions to get children and youth caught up with routine vaccinations, as per local guidelines and schedules	Interventions to promote COVID-19 vaccination
Comparisons	N/A	
Outcomes	Effectiveness of interventions, including: <ul style="list-style-type: none">• Vaccination status*• Becoming caught up with vaccinations <i>*i.e., up-to-date and current with all vaccinations, as appropriate to the individual's age and jurisdictional recommendations</i>	Vaccine efficacy Vaccine safety Cost-effectiveness Data not reported for those aged 5-18 years, separately (i.e., outcomes for other age groups, outside the 5 to 18-year range, pooled together)
Context	Focus on efforts during COVID-19 pandemic (i.e., > 2019)	

Data Extraction and Synthesis

Data relevant to the research question, such as study design, setting, location, population characteristics, interventions, and outcomes were extracted, when reported. We synthesized the results narratively due to the variation in methodology and outcomes for the included studies.

Data Requested from Study Authors

Our search yielded several studies that explored the effectiveness of routine vaccination “catch up” interventions in the context of the COVID-19 pandemic, but that did not report results separately for children aged 5 – 18 years. We contacted authors of these studies directly requesting additional data, however, none provided outcome data specific to this age range.

Appraisal of Evidence Quality

We evaluated the quality of included evidence using the critical appraisal tools listed below, per study design. Quality assessment was completed by one reviewer and verified by a second; conflicts were resolved by a third reviewer.

Study Design	Critical Appraisal Tool
Case Report	Joanna Briggs Institute (JBI) Checklist for Case Reports
Quasi-experimental	Joanna Briggs Institute (JBI) Checklist for Quasi-Experimental Studies

Completed quality assessments for each included study are available upon request.

The Grading of Recommendations, Assessment, Development and Evaluations ([GRADE](#)) (Schünemann *et al.*, 2013) approach was used to assess the certainty in the findings based on eight key domains.

In the GRADE approach to certainty of evidence, **observational studies**, as included in this review, provide **low certainty** evidence, and this assessment can be further reduced based on other domains:

- High risk of bias
- Inconsistency in effects
- Indirectness of interventions/outcomes
- Imprecision in effect estimate
- Publication bias

and can be upgraded based on:

- Large effect
- Dose-response relationship
- Accounting for confounding.

The overall certainty in the evidence for each outcome was determined considering the characteristics of the available evidence (e.g., observational studies, some not peer-reviewed, unaccounted-for potential confounding factors, different tests and testing protocols, lack of valid comparison groups, etc.). A judgement of '**overall certainty is very low**' means that the findings are very likely to change as more evidence accumulates.

Citizen Engagement in the Review Process

COVID-END in Canada issued an open call for patient and public partners to be involved in COVID-19 evidence syntheses. Of 80 applicants, 20 partners from diverse backgrounds and with a variety of COVID-19 lived experiences joined research teams to provide their perspectives. The Strategy for Patient-Oriented Research (SPOR) Evidence Alliance, part of COVID-END's initiative, offers additional partnerships between researchers, members of the public, and policy-makers across Canada (SPOR Evidence Alliance, 2022).

One citizen representative, who is part of both the COVID-END and the SPOR Evidence Alliance teams, agreed to participate in this rapid review. They provided feedback on the initial draft and approved the final report. Their feedback was incorporated into the Executive Summary.

Findings

Summary of Evidence Quality

This review includes two single studies. The quality of the evidence included in this review is as follows:

Research Question	Evidence Included		Overall Certainty in Evidence (GRADE)
What is the effectiveness of interventions to get school-aged children and youth caught up with routine vaccinations in the context of the COVID-19 pandemic?	Single studies	2	Very low* ⊕000

*In the GRADE approach to certainty of evidence, observational studies, as included in this review, provide low certainty evidence. This assessment was further reduced to **very low** based on **high risk of bias**.

Table 1: Single Studies

Reference	Date Released	Study Design	Setting	Vaccination Type and Population	Intervention Details	Summary of Findings	Quality Rating
Mancarella, M., Natarelli, F., Bertolini, C., Zagari, A., Enrica Bettinelli, M., & Castaldi, S. (2022). Catch-up vaccination campaign in children between 6 and 8 years old during COVID-19 pandemic: The experience in a COVID hub in Milan, Italy. <i>Vaccine</i> , 40(26), 3664–3669.	May 13, 2022	Case study	Milan, Italy Sep 2021	Fourth dose of diphtheria-tetanus-acellular pertussis and poliomyelitis vaccination (DTaPP) and second dose of measles-mumps and rubella vaccination (MMR) Children aged 6 – 8	In July 2021, children without the DTaPP and MMR vaccines were identified from the regional vaccination registry. A letter was sent to the parents of all children identified as not vaccinated with an invitation to 4 catch-up vaccination days. The letter was accompanied by a leaflet explaining the importance of the vaccinations. Parents of children without any registered vaccination information were contacted by telephone and then sent the letter and leaflet if they had missed vaccinations.	Vaccination coverage increased for all ages and vaccines. Children born in 2015 (n=5879): <ul style="list-style-type: none"> • DTaPP +20.0 percentage points (from 53.1% to 73.1%) • MMR +20.0 percentage points (from 52.3% to 72.3%) Children born in 2014 (n=6098): <ul style="list-style-type: none"> • DTaPP +3.2 percentage points (from 82.5% to 85.7%) • MMR +3.1 percentage points (from 82.4% to 85.5%) Children born in 2013 (n=6741): <ul style="list-style-type: none"> • DTaPP +4.3 percentage points (from 82.1% to 86.4%) • MMR +4.4 percentage points (from 82.2% to 86.6%) Children born in 2014 and 2013 had been called several times and had higher vaccination coverage prior to the intervention than children born in 2015; this may account for the smaller rate increase in these two groups.	Moderate

Reference	Date Released	Study Design	Setting	Vaccination Type and Population	Intervention Details	Summary of Findings	Quality Rating
Rodriguez, A.M., Do, T., Jibaja-Weiss, M.L., Chen, L., Schmeler, K.M., Montealegre, J.R., & Kuo, Y. F. (2022). Human Papillomavirus Vaccinations During the COVID-19 Pandemic in Middle Schools in the Rio Grande Valley of Texas . <i>American journal of public health, 112</i> (9), 1269–1272.	Jul 21, 2022	Quasi-experimental	Rio Grande Valley, Texas, USA Jun 2019 - Mar 2021	Human papillomavirus (HPV) Female and male children aged 11–12	Baseline HPV vaccination data were collected from the vaccine vendor and school immunization records, and reconciled with the Texas Immunization Registry. Community-based education and school-based vaccination intervention, including: <ul style="list-style-type: none"> • Physician-led educational events • Vaccine series initiated and completed during the school year at back-to school events, progress report nights, and preview events • Catch-up vaccinations scheduled through nearby clinics and in subsequent events for missed doses. 	HPV vaccine initiation rates increased 1.29-fold and completion rates increased 1.47-fold between Jun 2019 and Mar 2021. (Statistical significance N.R.)	Moderate

***DTaPP**: diphtheria-tetanus-acellular pertussis and poliomyelitis; **HPV**: human papillomavirus; **MMR**: measles-mumps and rubella

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