McMaster University | HEALTH FORUM

Rapid Evidence Profile

Identifying vaccine delivery approaches or programs and their impact on vaccine uptake

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Appendices

Appendix 1: Methodological details

Identifying research evidence

We use a standard protocol for preparing rapid evidence profiles (REP) to ensure that our approach to identifying research evidence is as systematic and transparent as possible in the time we were given to prepare the profile.

For this REP, we searched COVID-END Inventory, Health Systems Evidence (HSE), Health Evidence (HE), and PubMed for evidence syntheses published on the research question within the last 10 years. In COVID-END Inventory, Health Systems Evidence, and HealthEvidence, we used the search term "vaccine delivery." In PubMed, we initially used the search string "(((((vaccin*)) AND (deliver*)) AND (approach OR program* OR strateg*)) AND (implementation OR barrier*)) AND (access OR uptake OR cost*)) AND (routine OR HPV OR maternal OR pneumococcal OR herpes zoster OR shingles OR influenza OR COVID 19 OR sars cov 2 OR coronavirus OR travel*). We conducted a second search in PubMed for Canadian-specific literature using the same search string but added "Canada." Links provide access to the full search strategy.

Each source for these documents is assigned to one team member who conducts hand searches (when a source contains a smaller number of documents) or keyword searches to identify potentially relevant documents. A final inclusion assessment is performed both by the person who did the initial screening and the lead author of the rapid evidence profile, with disagreements resolved by consensus or with the input of a third reviewer on the team. The team uses a dedicated virtual channel to discuss and iteratively refine inclusion/exclusion criteria throughout the process, which provides a running list of considerations that all members can consult during the first stages of assessment.

During this process we include published, pre-print and grey literature. We do not exclude documents based on the language of a document. However, we are not able to extract key findings from documents that are written in languages other than Chinese, English, French, or Spanish. We provide any documents that do not have content available in these languages in an appendix containing documents excluded at the final stages of reviewing. We excluded documents that did not directly address the research questions and the relevant organizing framework.

Assessing relevance and quality of evidence

We assess the relevance of each included evidence document as being of high, moderate or low relevance to the question.

Two reviewers independently appraised the quality of the guidelines we identified as being highly relevant using AGREE II. We used three domains in the tool (stakeholder involvement, rigour of development, and editorial independence) and classified guidelines as high quality if they were scored as 60% or higher across each of these domains.

Two reviewers independently appraise the methodological quality of evidence syntheses that are deemed to be highly relevant. Disagreements are resolved by consensus with a third reviewer if needed. AMSTAR rates overall methodological quality on a scale of 0 to 11, where 11/11 represents an evidence synthesis of the highest quality. High-quality evidence syntheses are those with scores of eight or higher out of a possible 11, medium-quality evidence syntheses are those with scores between four and seven, and low-quality evidence syntheses are those with scores less than four. It is important to note that the AMSTAR tool was developed to assess evidence syntheses focused on clinical interventions, so not all criteria apply to those pertaining to health-system arrangements or to economic and social responses. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, an evidence synthesis that scores 8/8 is generally of comparable quality to another scoring 11/11; both ratings are considered 'high scores.' A high score signals that readers of the evidence synthesis can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the evidence synthesis should be discarded, merely that less confidence can be placed in its findings and that the evidence synthesis needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1): S8.)

Preparing the profile

This profile consists of a summary report that highlights the key findings from all high- and medium-relevance documents and details in this appendix document that provides methodological details (this section), additional details on the key findings of the included evidence syntheses and single studies (Appendix 2 and Appendix 3), detailed findings from the pan-Canadian jurisdictional scan (Appendix 4), and documents that were excluded in the final stages of review (Appendix 5). Each included document is cited in the reference list at the end of the REP. For all included evidence syntheses and single studies, we prepare a small number of bullet points that provide a summary of the key findings, which are used to summarize key messages in the text. For this profile, we only prepared bulleted summaries of key findings for evidence syntheses and single studies deemed to be of high and medium relevance. Evidence was considered highly relevant if it focused on vaccine delivery approaches or barriers that impact vaccine delivery. If an evidence synthesis or single study focused on strategies for increasing vaccine uptake or barriers to vaccine uptake solely, it was considered medium relevance.

Appendix 2: Key findings from evidence syntheses organized by vaccine type and sorted by relevance

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
Routine childhood vaccines							

• Type of vaccination
  ○ Routine childhood vaccines
• Where are vaccines delivered
  ○ Community-based health settings
  ▪ Mobile clinics
  ○ Other community settings
  ▪ Schools
  ▪ Community centres
• By whom vaccines are delivered
  ○ Physicians
  ○ Nurses
  ○ Allied health professionals
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine access
  ○ Vaccine uptake
  ○ Patient, family and/or caregiver experience
	Lack of trust with healthcare professionals, inaccessible educational materials, and limited access to vaccine clinics are barriers to MMR and HPV vaccine access in minority or underserved children (1)
	• This review assessed health system barriers and enablers to measles, mumps and rubella (MMR) and HPV vaccination in minority populations in middle- and high-income countries
	• Limited clinic times, geographically far distances to clinics, difficulties navigating the health system, and lack of translated culturally appropriate materials were described as barriers to vaccine uptake that disproportionately affect disadvantaged groups
	• Certain barriers are reportedly influenced by cultural norms and beliefs such as certain groups being hesitant about HPV vaccination because of fears that HPV vaccination would encourage sexual promiscuity
	• Racialized persons in the United States described hesitancy in receiving vaccines in community settings as healthcare professionals were unfamiliar and they did not want to risk their privacy
	  ○ This was particularly true for undocumented individuals who could not receive documentation for their vaccines
	• Recommendations to promote MMR and HPV vaccination among minority populations included having health professionals, who have been trained to deliver health services and education in a culturally appropriate manner, making vaccinations more widely available at no cost to the community, and developing clear guidelines to help new immigrants and other minority groups access the new healthcare system
		High	No	5/9 (AMSTAR rating from McMaster Health Forum)	December 2021	No	• Race/ ethnicity/ culture/ language

• Type of vaccination ○ Routine childhood vaccines	Supplemental immunization activities and school-based vaccines help to increase vaccine uptake in communities, but are dependent on population adherence and resources (2)	High	No	10/11 (AMSTAR rating from	March 2017	No	• Place of residence

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations

• Where vaccines are delivered
  ○ Other community settings
  ▪ Schools
• By whom vaccines are delivered
  ○ Physicians
  ○ Nurses
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Community engagement strategies
• Priority populations
  ○ People living in rural or remote areas
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine uptake
  ○ Cost
	• The purpose of this review was to assess the effectiveness of supplemental immunization activities (SIAs) in comparison to school-based vaccines (SBV) in youth five to 19 living in Africa
	• SIAs are mass vaccination campaigns where a large number of people within a geographical area and period are vaccinated, regardless of vaccination status
	• SBVs are targeted vaccination campaigns that are delivered on school premises to children during school hours
	• Five vaccines (measles, meningitis, yellow fever, cholera, HPV) were represented in the included studies covering 17 African countries, and vaccination coverage was more common in urban areas than in rural areas
	• SIAs were found to show a higher vaccination coverage than SBVs, but SIAs were found to be disruptive to routine immunization services as staff had to split their time to supervise the SIA campaign
	• While SIAs were found to be cost effective, reach non-school aged children and persons living in remote areas, and promote vaccine awareness throughout communities, a limitation of SIAs is that they are a single dose vaccination strategy whereas SBVs provide opportunities for follow-up doses
	• SBVs are reported to be costly and may be most cost efficient in areas with a large school enrolment and in countries with strong inter-ministerial collaboration
				McMaster Health Forum)			

• Type of vaccination
  ○ Routine childhood vaccines
• Where vaccines are delivered
  ○ Primary care
  ○ Specialty care settings
• By whom vaccines are delivered
  ○ Physicians
• Supports used as part of vaccine delivery approaches to enhance access and uptake
	Low- to moderate-certainty evidence suggests that face-to-face educational interventions (e.g., individual or group-based discussions and messaging) focused on informing expectant parents on early childhood vaccinations can lead to slight improvements in vaccination status, knowledge, and intent to vaccinate – particularly in those populations where vaccine awareness may be viewed as a barrier to uptake (3)
	• There was uncertain evidence regarding the cost of implementing the interventions; however, one study within the review found that fully immunizing a child cost eight times more than the usual cost of care (the authors noted that due to the intervention's complexity and date of study, this finding cannot be widely generalizable)
		Medium	No	11/11 (AMSTAR rating from McMaster Health Forum)	August 2017	Yes	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Information or education provision • Priority populations ○ People who are pregnant ○ New parents ○ Parents of children who have not received recommended vaccinations ○ People who are vaccine hesitant • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Costs							
• Type of vaccination ○ Routine childhood vaccines • Where vaccines are delivered ○ Community-based health settings ▪ Mobile clinics • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Community engagement strategies • Priority populations ○ People of lower socio-economic status ○ People living in rural or remote areas • Outcomes ○ Barriers to implementation	Socio-economic disparities, particularly related to wealth and urban/rural residence, along with logistical challenges and gender-related factors, significantly influenced childhood immunization coverage in low- and middle-income countries, emphasizing the need for context-specific interventions and international support to address these barriers effectively (4) • Key social determinants of health factors (e.g., geographic and social exclusion, gender inequality, and financial barriers) must be considered in the development of policies and programs meant to improve vaccination coverage and equity	Medium	No	5/9 (AMSTAR rating from McMaster Health Forum)	June 2021	No	• Socio-economic status • Place of residence • Gender/sex

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Vaccine access ○ Vaccine uptake ○ Efficiency of vaccine delivery ○ Patient, family and/or caregiver experience							
• Type of vaccination ○ Routine childhood vaccines • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education ○ Community engagement strategies • Outcomes ○ Vaccine uptake	Community engagement strategies for routine childhood vaccines involving stakeholder consultations can increase vaccine uptake; however, barriers of limited resources and disconnect between clinicians and patients need to be addressed (5) • This review explored the effectiveness of community engagement strategies on the uptake of routine childhood vaccines in low- and middle-income countries • Community engagement strategies involving stakeholder consultations, community dialogues, or partnerships with community leaders were associated with better vaccine uptake • The success of community engagement strategies for vaccine uptake could be attributed to community leaders providing insights on engagement strategies, appropriate intervention design, logistics, and social norms • Barriers to the implementation of strategies included limited resources and services, high costs and wait times, lack of rapport with vaccine delivery team, and significant distance to vaccine delivery locations	Medium	No	9/11 (AMSTAR rating from McMaster Health Forum)	May 2020	No	None identified
• Type of vaccination ○ Routine childhood vaccines ○ Other vaccines • Outcomes ○ Vaccine uptake	Polio supplementary immunization activities were associated with workforce strengthening and capacity building, increased community awareness and confidence in vaccine programmes (6) • This article reviews the impact of polio supplementary immunization activities (SIAs) on routine immunization and health systems • Findings demonstrated that polio SIAs contributed to increased uptake of other vaccines in most studies • Some studies reported workforce strengthening and capacity building as a result of SIAs • SIAs were also associated with increased community awareness and confidence in vaccine programmes as well as increased routine service provision	Medium	No	6/9 (AMSTAR rating from McMaster Health Forum)	February 2020	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations

	• Some negative impacts of SIAs reported were disruptions to routine health services, especially when additional staff were not hired to support the polio SIA
	• Three countries reported financial outcomes:
	  ○ 11.1% increase in funding for Bangladesh for immunization and other public health programmes
	  ○ 4.4% increase in Cote d'Ivoire for the same purposes
	  ○ 7.4% in Morocco for the same purposes						

Seasonal influenza vaccines							

• Type of vaccination
  ○ Season influenza vaccines
• Where vaccines are delivered
  ○ Primary care
• By whom vaccines are delivered
  ○ Physicians
  ○ Nurses
  ○ Allied health professionals
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
  ○ Appointment/scheduling and screening support
  ○ Reminders from prompts
• Outcomes
  ○ Vaccine uptake
  ○ Efficiency of vaccine delivery
	A combination of interventions involving permitting nurses to administer vaccines, vaccine reminders, patient education resources, and organizational vaccine incentives can support vaccine uptake and delivery efficiency of influenza vaccines to adult inpatients in acute care settings (7)
	• This study explored hospital-based strategies for improving influenza vaccination rates in adult inpatients of acute care settings
	• The 29 included studies were conducted in Canada, the U.S. and Australia and examined a variety of interventions, including standing order protocols (SOPs), chart/face-to-face reminders for hospital staff, assessment and/or administration programs, patient education using pamphlets and follow-up, and organizational-based programs that incentivised hospitals to deliver influenza vaccinations
	  ○ An SOP is a mandate that gives healthcare workers the authority to administer vaccines to eligible patients without the approval or supervision of a physician
	• Individually, each intervention proved to be effective in increasing vaccine uptake and delivery
	• SOPs permitting nurses to administer vaccines were found to be most effective compared to other individual interventions, but multi-component interventions including SOPs were more effective than just SOPs alone
		High	No	4/9 (AMSTAR rating from McMaster Health Forum)	2020	No	None identified

• Type of vaccination ○ Season influenza vaccines	Influenza vaccine delivery was significantly increased with the implementation of pharmacy-based interventions where pharmacists played an active role in routine care and had immediate and direct communication with patients to provide education and administer vaccines (8)	High	No	7/11 (AMSTAR rating from McMaster	February 2018	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations

• Where vaccines are delivered
  ○ Community-based health settings
  ▪ Pharmacies
• By whom vaccines are delivered
  ○ Pharmacists
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
• Outcomes
  ○ Vaccine uptake
  ○ Efficiency of vaccine delivery
	• This review explored facilitators in improving influenza vaccination rates in pharmacy settings
	  ○ All but two of the 12 included studies were conducted in the U.S.
	• Influenza vaccination acceptance rates increased by 27% with pharmacy-based interventions compared to standard care and by 117% for those who were not vaccinated in the previous year
	• The most successful pharmacy interventions employed an active pharmacy role by having explicit protocols involving pharmacists in routine care (e.g., administering vaccines, electronic medical record review, medication management)
	• More specifically, strategies that involved immediate and direct communication between pharmacists and patients to provide education significantly contributed to increases in vaccination rates
				Health Forum)			

• Type of vaccination
  ○ Seasonal influenza vaccines
• Where vaccines are delivered
  ○ Other community settings
  ▪ Schools
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
  ○ Appointment/ scheduling and screening support
• Outcomes
  ○ Vaccine uptake
	There is insufficient evidence available on how social marketing approaches can be used to increase influenza vaccination among university students (9)
	• This review explored social marketing approaches to increase the influenza vaccine uptake in university students
	  ○ Social marketing interventions or programs consist of elements that enhance voluntary vaccination behaviours in young adults
	  ○ 12 studies were included that were conducted in Australia, Spain, and the U.S.
	• Vaccination promotion programs identified in the review consisted of a combination of educational materials (e.g., posters, pamphlets), educational group meetings, email reminders about vaccination, rewards (e.g., gift cards) to incentivize vaccination, vaccination promotors (e.g., peer champions, university staff, healthcare workers), and mobile vaccine teams
	• None of the field studies adopted all eight of the social marketing benchmarks, and even when only social marketing promotion was used, it only increased student intention to vaccinate but not actual behaviour
		Medium	No	4/11 (AMSTAR rating from McMaster Health Forum)	November 2021	Not available	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
	• Additional field studies are needed to study influenza vaccination behaviour among university students in countries outside of the U.S.						
COVID-19 vaccines							

• Type of vaccination
  ○ COVID-19 vaccines
• Where vaccines are delivered
  ○ Community-based health settings
  ▪ Mobile clinics
  ○ Other community settings
  ▪ Community centres
  ○ Primary care
• By whom vaccines are delivered
  ○ Physicians
  ○ Nurses
  ○ Pharmacists
  ○ Allied health professionals
  ○ Lay/community health workers
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
  ○ Appointment/ scheduling and screening support
  ○ Community engagement strategies
• Outcomes
  ○ Vaccine access
  ○ Vaccine uptake
  ○ Efficiency of vaccine delivery
	COVID-19 vaccine delivery in most countries was facilitated through mass vaccination, mobile vaccination, and/or fixed-post vaccination delivery models that experienced challenges with planning and coordination, securing human resources to administer vaccines, transportation and handling of vaccines, cultural and linguistic barriers of vaccine recipients, and vaccine hesitancy; these challenges were addressed through information, education, and communication (IEC) campaigns and partnerships with organizations that provided logistical management, site security, scheduling support and infection prevention and control (10)
	• This review summarized experiences on COVID-19 vaccine delivery and integration into primary healthcare services in nine countries (U.S., England, Israel, Germany, Malta, South Africa, China, and Sudan) where COVID-19 vaccines were delivered through mobile and fixed-post vaccination delivery models
	• Vaccination approaches described included mass vaccination, mobile vaccination, and fixed-post vaccination
	  ○ The mass vaccination model consisted of high-volume, high-speed vaccination activities carried out in non-healthcare settings, including setting up appointment systems (facility-initiated vs. voluntary registration), registration and screening (i.e., symptom screening and informed consent), taking medical history of vaccinees, vaccination, and post-vaccination observation (typically a minimum of 15 minutes)
	  ○ Mobile vaccination describes various initiatives that bring vaccination services to communities on a small scale, typically in rural areas and socially marginalized populations, and consisted of community mobilization, appointment, and registration
	  ○ Fixed-post vaccination required the least adaptation since it is purpose-built for vaccination
	• Challenges of mass vaccination were experienced in planning and coordination, securing human resources to
		High	No	5/10 (AMSTAR rating from McMaster Health Forum)	2022	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
	administer vaccines at a large scale, and transportation and handling of vaccines o These challenges were addressed through partnerships with organizations that provided logistical management, site security, scheduling support, and infection prevention and control • Information, education, and communication (IEC) campaigns using trusted community members were commonly used in mobile vaccination campaigns, as well as co-location of COVID-19 vaccines with other services like STI testing and antenatal services o Multi-lingual counselling and applications also facilitated patient-provider communication, which was often challenged by cultural and linguistic barriers • Community mobilization and high-frequency tailored messaging were considered crucial to encourage vaccine uptake and address concerns in the fixed-post vaccination model o Vaccine champions and the provision of financial and non-financial incentives were also useful strategies used in the fixed-post vaccination model • Vaccine hesitancy due to distrust of the fast-paced vaccine development process, misinformation, and general distrust in the healthcare system were challenges faced with the mobile and fixed-post vaccination models						
• Type of vaccination o COVID-19 vaccines • Where vaccines are delivered o Community-based health settings ▪ Pharmacies o Other community settings ▪ Community centres o Primary care • Supports used as part of vaccine delivery approaches to enhance access and uptake o Information or education provision	Higher levels of vaccine hesitancy among ethnic minority populations in the U.K. due to concerns about the speed of the vaccine's development, vaccine side effects, and excessive mistrust of medical professionals and government emphasize the need for targeted interventions that combine tailored communication, trusted community engagement, and the removal of structural barriers (11) • This review aimed to understand concerns of ethnic minorities in the U.K. about the COVID-19 vaccine • Factors explaining vaccine hesitancy identified in this review included concerns about the speed of the vaccine's development, vaccine side effects, beliefs about the collective importance of vaccination, conspiracy beliefs, excessive mistrust, and negative views about doctors and government • Addressing vaccine hesitancy in ethnic minority communities in the U.K. requires a concerted effort that	Medium	No	5/9 (AMSTAR rating from McMaster Health Forum)	February 2022	No	• Race/ ethnicity/ culture/ language • Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Community engagement strategies • Priority populations ○ People who are vaccine hesitant ○ Older adults ○ BIPOC communities ○ People of lower socio-economic status	combines tailored communication, trusted community engagement, and the removal of structural barriers						
• Type of vaccination ○ COVID-19 vaccines • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Allied health professionals • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education ○ Community engagement strategies • Outcomes ○ Vaccine access ○ Vaccine uptake	While many countries acknowledged the importance of vaccinating people in prisons who were at higher risk of COVID-19 transmission during the pandemic, only a minority explicitly prioritized this group for COVID-19 vaccination (12) • This review looked at literature on COVID-19 vaccinations for persons living and working in prisons • Canada, the U.K., the U.S., and several other countries offered COVID-19 vaccination to people in prisons based on age and long-term health conditions • Challenges of vaccinating people who live and work in prisons included the need for cold-chain support for vaccine delivery, the lack of an efficient system to track people moving in and out of prisons and high turnover that limits the ability to complete two vaccine dose schedules; vaccine hesitancy because of concerns about vaccine safety and efficacy was also a concern among incarcerated individuals • Documents analyzed in this review revealed an absence of any unified approach regarding prioritization for vaccination of people living and working in prisons	Medium	No	6/9 (AMSTAR rating from McMaster Health Forum)	September 2021	Not available	• Race/ ethnicity/ culture/ language
• Type of vaccination ○ COVID-19 vaccines • Where vaccines are delivered ○ Community-based health settings ▪ Mobile clinics ○ Long-term care homes • Priority populations ○ Older adults	Priority populations of guidelines for COVID-19 mass-vaccination during the first three months of global mass-vaccination were front-line healthcare workers and elderly individuals, and recommended strategies to up-scale the vaccination process included using mass vaccination hubs, using novel delivery techniques, and engaging communities to increase vaccine awareness and acceptance (13) • This review assessed guidelines for COVID-19 mass vaccination during the first three months of global mass vaccination endeavours	Medium	No	5/9 (AMSTAR rating from McMaster Health Forum)	March 2021	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
	• Priority populations of all frameworks reviewed were front-line healthcare workers and elderly individuals in care facilities • Facilitators to service delivery included utilizing mass vaccination hubs (e.g., sport venues), novel delivery techniques (e.g., drive-through clinics), automated surveys for side-effect monitoring, and increased vaccination awareness (e.g., leveraging high profile champions, social media campaigns, combatting mis/disinformation) • Barriers to implementation included challenges associated with cost of procurement and service delivery • Some countries indicated prioritization of additional populations including those in institutional care, individuals with chronic conditions, and Indigenous communities • Strategies to up-scale the vaccination process recommended in this review include using mass vaccination hubs, prioritizing healthcare workers, using novel delivery techniques, and engaging communities to increase vaccine awareness and acceptance						
Adult vaccines							

• Type of vaccination
  ○ Adult vaccination
• Where vaccines are delivered
  ○ Community-based health settings
  ▪ Pharmacies
• By whom vaccines are delivered
  ○ Pharmacists
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education
• Outcomes
  ○ Vaccine access
  ○ Vaccine uptake
	Pharmacy-based immunization services are an accessible and cost-effective strategy that can increase vaccine uptake and access for adult vaccine, given that pharmacists have sufficient confidence, training, and capacity (14)
	• This review explored the literature on pharmacy-based immunization services (PBIS) for adult vaccines in the U.S.
	• PBIS were found to be accessible and cost effective, and to reduce strain in primary clinics
	• Barriers to PBIS included concerns about legal liability, high workloads, insufficient training to address adverse events, and issues with insurance billing
	• Facilitators to PBIS included expansion of pharmacists' scope of practice as immunizers, pharmacist confidence and training (e.g., formal certification program) in administering vaccinations, continuous evaluation, and adaption of strategies
		High	No	5/9 (AMSTAR rating from McMaster Health Forum)	June 2016	Not available	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Costs	• Independent pharmacists were more likely than mass organizations to be immunization-certified and carry out public health initiatives • In addition to increasing access to vaccines, pharmacists can support vaccine uptake by providing patient education resources						
• Type of vaccination ○ Adult vaccination • Where vaccines are delivered ○ Primary care • By whom vaccines are delivered ○ Physicians ○ Nurses • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education ○ Appointment/scheduling and screening support ○ Reminders from prompts • Outcomes ○ Vaccine access ○ Vaccine uptake	Reminders, documentation, and educational information at the patient and provider level can increase vaccine uptake in people with rheumatoid arthritis (15) • This review explored the efficacy of interventions to promote vaccine uptake in persons with rheumatoid arthritis • At the provider and patient levels, reminders, vaccine documentation, and evaluation of interventions were found to be helpful in vaccine uptake ○ The authors note that a lack of information on provider behaviours, intervention schedule, and educator details prevent a full understanding of the efficacy of these strategies • Patients said that educational resources can improve their understanding and comfort with vaccines	Medium	No	6/10 (AMSTAR rating from McMaster Health Forum)	July 2018	Not available	None identified
Vaccines during pregnancy (maternal vaccination)							
• Type of vaccination ○ Vaccines during pregnancy • Priority populations ○ People who are pregnant • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake	In low- and middle-income countries (LMICs), studies suggest that enablers of maternal vaccine uptake include healthcare provider recommendations to pregnant women, higher levels of maternal education (at least secondary school), and increased trust in the health system; however, maternal vaccine uptake can be hindered by disparities in access to vaccination services provided by the public versus private health sectors (i.e. free of charge versus out-of-pocket payment), healthcare staff shortages and high workload demands (16)	High	No	6/9 (AMSTAR rating from McMaster Health Forum)	April 2023	No	• Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
	• The 54 included articles covering 34 LMICs were on maternal vaccination in LMICs published between 2009 and 2023; the studies primarily explored influenza and tetanus toxoid vaccinations • A conceptual framework was used to guide interpretations of the findings about how health systems software, hardware, and contexts intersect to influence delivery and uptake of maternal vaccines • Barriers to vaccine delivery included ineffective cold-chain management, lack of clear policy guidelines, lack of sustainable financing mechanisms, and limited monitoring and reporting systems						

• Type of vaccination
  ○ Vaccines during pregnancy
• By whom vaccines are delivered
  ○ Physicians
  ○ Nurses
  ○ Pharmacists
  ○ Public-health workers
  ○ Allied health professionals
  ○ Midwives
  ○ Lay/community health workers
• Priority populations
  ○ People who are pregnant
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine access
  ○ Vaccine uptake
  ○ Provider experience
	According to maternity healthcare professionals (MHCPs), facilitators of maternal influenza vaccine delivery were MHCPs' knowledge and attitudes about influenza vaccine during pregnancy, trusting relationships and good communication with pregnant women, electronic vaccination reminders, and national guidelines; however, barriers to maternal influenza vaccination may be time constraints and workload of MHCPs, MHCPs' perceptions of pregnant women's concerns, and cultural/social/environmental influences of pregnant women that lead to vaccine hesitancy (17)
	• Eight studies that involved 277 participants were included; articles were published between 2014 and 2019
	• Strategies to increase pregnant women's knowledge and vaccine uptake included creating educational hubs in local communities and visiting religious services
	• Strategies to increase vaccine delivery included having vaccine champions and dedicated vaccine teams as well as creating system level prompts to notify MHCPs which patients are due for influenza vaccination
		High	No	6/9 (AMSTAR rating from McMaster Health Forum)	Published Feb 2022	No	None identified

Human papilloma virus (HPV) vaccines							
• Type of vaccination ○ HPV vaccines • Where are vaccines delivered	HPV vaccination strategies that consist of educational strategies for parents and children and for vaccine delivery personnel, targeted vaccine delivery programs (e.g., school-based, health facility-based), stakeholder collaboration, funding, HPV vaccine coverage rate monitoring systems	High	No	5/9 (AMSTAR rating from McMaster	January 2022	No	• Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Other community settings ▪ Schools ▪ Community centres • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Allied health professionals • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education ○ Reminders from prompts • Outcomes ○ Vaccine access ○ Vaccine uptake ○ Costs	(including systematic reminders), and parental consent can support HPV vaccine access and uptake around the world (18) • This review explored implementation strategies for HPV vaccination to help countries understand key considerations for designing and implementing HPV vaccine programs • The 168 included studies were mainly conducted in North America, Europe and Central Asia and focused on high-income countries • HPV vaccination strategies identified included educational strategies for parents and children and for vaccine delivery personnel, targeted vaccine delivery programs (e.g., school-based, health centre–based), stakeholder collaboration, funding, HPV vaccine coverage rate monitoring systems (including systematic reminders), and parental consent ○ The use of mass media (e.g., social media, television), public forums, brochures, and government websites were identified as channels used to provide education ○ School-based HPV programs are one of the most successful vaccine delivery locations, particularly in schools with high attendance, engagement of school nurses and other staff, and strong collaboration between the health and education government sectors ○ Community centres and funding or reimbursement for vaccines can be used to increase vaccine access in vulnerable populations ○ Vaccination reminders targeted to parents or youth via email, postcards, or texts can support vaccine uptake • Community awareness strategies regarding the benefits of vaccines, side effects, effectives, and countering misinformation can increase comfort with HPV vaccine ○ Awareness can be spread by schools, extracurricular programs, and government officials ○ Vaccine delivery personnel should be adequately trained on cultural nuances and information before delivering educational resources			Health Forum)			
• Type of vaccination ○ HPV vaccines • Supports used as part of vaccine delivery approaches	To address barriers to HPV vaccination amongst Indigenous populations, it is important to consider the input of the Indigenous community in the design and delivery of	High	No	5/9 (AMSTAR rating from McMaster	January 2021	No	• Race/ ethnicity/ culture/ language

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
to enhance access and uptake ○ Information or education provision ○ Community engagement strategies • Priority populations ○ BIPOC communities • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Patient, family and/or caregiver experience	awareness initiatives as well as community involvement in the co-creation of HPV vaccine health recommendations (19) • This review explored the barriers faced by global Indigenous peoples regarding HPV vaccines in order to determine how to effectively develop and implement vaccination policies for the Indigenous population ○ Studies were conducted in Peru, Canada, and the U.S. • Barriers identified included lack of correct knowledge, stigma associated with sexual behaviours, structural healthcare barriers (e.g., long wait times for appointments, limited endorsement of vaccines by Indigenous health workers), general mistrust of the healthcare system, and general vaccine mistrust • While increasing knowledge in communities would likely increase vaccine acceptance in Indigenous populations, this review emphasized that the lack of trust between individuals and healthcare systems is deep-rooted in the historical colonial exploitation of Indigenous peoples • It is essential to address the aspects of health systems that perpetuate oppressive traditions to provide Indigenous peoples with quality care			Health Forum)			
• Type of vaccination ○ HPV vaccines • Where vaccines are delivered ○ Primary care ○ Other community settings ▪ Schools • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Allied health professionals • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision	When using different approaches of integrating HPV vaccination and cervical cancer screening services, such as co-dissemination of cervical self-sampling screening, co-location of screening services, co-recruitment, and integrated health communication, it is important to have sufficient resources to ensure that integration is effective (20) • This review aimed to explore the integration of HPV vaccines with cervical cancer screening in LMICs • Findings across all eleven included studies suggested that both facility-based and school-based HPV vaccination programs can be leveraged to benefit cervical cancer screening • Four types of integration approaches were identified: ○ Using HPV vaccination to disseminate cervical cancer self-sampling screening ○ Co-location of screening services ○ Co-recruitment of 'mothers' and 'daughters' by the same health and community worker with separate service provision ○ Integrated health communications about HPV vaccination and cervical screening	High	No	5/10 (AMSTAR rating from McMaster Health Forum)	Not specified	Not available	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Reminders from prompts ○ Community engagement strategies • Outcomes ○ Vaccine access ○ Vaccine uptake	• HPV vaccination and cervical cancer screening can occur at the same location and be integrated using the same reminder strategies and educational flyers • In primary care settings, the integration of HPV vaccination and cervical cancer screening can lead to efficiencies in service delivery, but it can also be resource-intensive • Integrated outreach clinics can be effective at reaching girls and women who are hard to reach when sufficient resources are available • Integrated health communications can be valuable when the service is being promoted in an acceptable and accessible form to women and girls						
• Type of vaccination ○ HPV vaccines • Where vaccines are delivered ○ Other community settings ▪ Schools ○ Primary care • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Appointment/scheduling and screening support ○ Reminders from prompts ○ Community engagement strategies • Priority populations ○ Parents of children who have not received recommended vaccinations • Outcomes ○ Vaccine access ○ Vaccine uptake	To increase access to HPV vaccines, there is a need to identify and adopt sustainable strategies in countries without a national HPV vaccination program and to identify cost-effective interventions to meet nationally recommended standards for vaccination in countries with a national program; cost-effective strategies may include reminders, parent/child education, financial incentives, health campaigns, integrating multiple vaccinations, and class-based immunization recall (21) • This review aimed to assess the cost and effectiveness of strategies for expanding access to HPV vaccination ○ 15 studies were included and conducted in ten countries (Mozambique, Zimbabwe, Peru, Uganda, Vietnam, Tanzania, New Zealand, Belgium, the U.S., and England) • Health facilities, clinics and schools were identified as effective vaccination sites • The most cost-effective vaccine delivery strategy was integrating school-based delivery into existing health systems, and strategies to increase uptake included reminders, parent/child education, financial incentives, health campaigns, integrating multiple vaccinations, and class-based immunization recall • Opportunity costs for implementing vaccination programs suggested by the evidence were the cost of diverting health professionals' time to facilitate program implementation and modifying existing workflow processes	High	No	4/10 (AMSTAR rating from McMaster Health Forum)	February 2020	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Efficiency of vaccine delivery ○ Patient, family and/or caregiver experience ○ Costs	• While gender-neutral vaccination can be economically beneficial for providing increased protection for everyone, in limited resource settings, this may not be a viable approach						
• Type of vaccination ○ HPV vaccines • Where vaccines are delivered ○ Other community settings ▪ Schools ○ Primary care • By whom vaccines are delivered ○ Physicians • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Decision aids ○ Appointment/ scheduling and screening support • Priority populations ○ Parents of children who have not received recommended vaccinations ○ People who are vaccine hesitant • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Efficiency of vaccine delivery ○ Costs	While HPV vaccination utilization rates are lower than the recommended value, health professionals can support uptake by playing an active role in patient care through education and advocacy, improving access to vaccination, and implementing new strategies for vaccine-delivery; barriers to vaccination include a lack a provider recommendation, poor knowledge or understanding of the vaccine, and affordability (22) • Perceived benefit, particularly in relation to cervical cancer, was noted as a substantial predictor of HPV vaccination status • Implementation and widespread adoption of school- and community-based programs and legislation can help to improve HPV vaccine uptake in the U.S.	High	No	1/9 (AMSTAR rating from McMaster Health Forum)	Published 2015	No	• Gender/sex

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations

• Type of vaccination
  ○ HPV vaccines
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
• Priority populations
  ○ People living in rural or remote areas
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine access
• Vaccine uptake
	Inequalities in access to and uptake of HPV vaccination between urban and rural populations may be explained by unavailability or inaccessibility of medical services, socio-economic status, and medical ignorance (23)
	• HPV vaccination can be increased in rural areas by means of subsidizing vaccine cost, raising vaccine awareness among rural populations, designing vaccination campaigns specifically for residents of rural locations, and improving vaccine accessibility by providing shots in proximity to patients' place of residence
		Medium	No	2/9 (AMSTAR rating from McMaster Health Forum)	December 2021	No	• Place of residence
							• Socio-economic status

• Type of vaccination
  ○ HPV vaccines
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine access
  ○ Vaccine uptake
	Strategies suggested to increase HPV vaccine uptake in Canada included training providers on culturally appropriate communication and service delivery for different populations, using social media platforms to create awareness about HPV, and holding regular quality improvement surveys and feedback sessions to ensure continuous improvement to HPV vaccination programs (24)
	• Factors that influence HPV vaccine uptake in Canada occur at the patient, provider, and system levels: knowledge and the ability to perceive at the patient level, 'acceptability' of the vaccine and the appropriateness of an intervention at the provider level, and attitudes of providers in vaccination programs at the system level
	• At the system level, barriers that impede providers' abilities to make recommendations and provisions should be addressed through measures such as proper staffing, regular training, education on different communication modes to address questions and concerns around HPV vaccine, vaccine types, cost, and insurance plans
		Medium	No	5/9 (AMSTAR rating from McMaster Health Forum)	2019	No	• None identified

• Type of vaccination
  ○ HPV vaccines
• Outcomes
  ○ Barriers to implementation
  ○ Vaccine access
  ○ Vaccine uptake
	Barriers to the uptake of HPV vaccines in China included concerns about vaccine safety and effectiveness, lack of information regarding cervical cancer, and the high cost of the vaccine (25)
	• This review looked at barriers to the uptake of the HPV vaccines in persons living in China
		Medium	No	4/10 (AMSTAR rating from McMaster Health Forum)	December 2017	Not available	• Place of residence Gender/sex

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Costs	• Vaccine uptake was more likely in regions of western China than eastern China • Women were more likely to be vaccinated than men						
• Type of vaccination ○ HPV vaccines • Where vaccines are delivered ○ Other community settings ▪ Schools • By whom vaccines are delivered ○ Physicians • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision • Outcomes ○ Vaccine uptake ○ Cost	Financial supports and educational resources about the HPV vaccine can support its uptake in South Asia (26) • This review explored factors influencing uptake of the HPV vaccine in South Asia • Cost of the vaccine was noted as a barrier for patients and healthcare professionals, especially since the HPV vaccine requires three doses • Women noted that educational resources regarding the side effects and benefits of the vaccine would be helpful to increase comfort with receiving the vaccine • Facilitators to receiving the vaccine included higher education levels and cost-effectiveness • Some policymakers express hesitancy in delivering vaccines in school settings due to insufficient resources to address potential adverse events	Medium	No	5/9 (AMSTAR rating from McMaster Health Forum)	January 2023	Not available	• Gender/sex • Education
Multiple vaccines							
• Type of vaccination ○ HPV vaccines ○ Influenza vaccines ○ Other vaccines (Tdap, meningococcal) • Where vaccines are delivered ○ Other community settings ▪ Schools • By whom vaccines are delivered ○ Physicians ○ Nurses • Supports used as part of vaccine delivery approaches	Educating adolescents, implementing mandatory vaccination laws for school entry, and adopting multifaceted strategies for healthcare providers can significantly enhance adolescent vaccination coverage, with mandatory vaccination demonstrating notable efficacy (27) • This review evaluated interventions to improve adolescent vaccinations for WHO-recommended vaccines, including HPV, influenza, Tdap (tetanus-diphtheria-acellular-pertussis), and meningococcal vaccines • A multi-component intervention that targets providers and patients and includes social marketing and education sessions, individualised feedback, and incentives may improve HPV vaccine uptake when compared to usual practice • The evidence, primarily from high-income countries, highlights the need for context-specific considerations and	High	No	10/11 (AMSTAR rating from McMaster Health Forum)	May 2019	Yes	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
to enhance access and uptake ○ Information or education provision ○ Community engagement strategies • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake	further research, particularly in low- and middle-income settings						
• Type of vaccination ○ Routine childhood vaccines ○ Seasonal influenza vaccines ○ Adult vaccination ○ Vaccines during pregnancy ○ Other vaccines • Where vaccines are delivered ○ Other community settings ○ Primary care ○ Specialty care settings • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Community engagement strategies • Priority populations ○ People who are pregnant ○ New parents ○ Parents of children who have not received recommended vaccinations	Evidence showed that effective interventions to increase vaccine uptake in ethnic minority populations had multiple components and were specifically tailored to populations (28) • In the 23 included studies, 26 behavioural change techniques (BCTs) were identified covering vaccines for influenza, hepatitis, meningitis, and tetanus, diphtheria, pertussis (Tdap) • Features of interventions in the included studies of this review included peer coaching with nurse case management, health passports to remind parents of the childhood vaccination schedule, onsite vaccination following education, training of peer health educators, and providing culturally specific education in local languages of the ethnic minority groups • Guidelines and evidence-based education were associated with increased influenza and Tdap vaccine uptake during pregnancy • Follow-up services and personal vaccine information for communities were also found to optimize immunization completion rates, and the most effective way to share information was through virtual modes of delivery • Barriers to vaccine uptake often included the experience of sickness after a previous vaccination and fear of side effects, which were largely overcome through encouragement and recommendations from healthcare providers	High	No	7/10 (AMSTAR rating from McMaster Health Forum)	July 2022	No	• Place of residence • Race/ ethnicity/ culture/ language • Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ People who are vaccine hesitant ○ BIPOC communities ○ People of lower socio-economic status • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake							
• Type of vaccination ○ Vaccines in general • Priority populations ○ People living in rural or remote areas • Outcomes ○ Vaccine access ○ Vaccine uptake ○ Costs	It may be 1.3 to 2 times more costly to vaccinate persons living in rural or remote areas using supplemental immunization activities; however, additional exploration of context specific barriers to vaccination are needed to understand how to increase vaccine uptake (29) • This review examined the costs associated with vaccination sites to understand costs needed to support hard to reach populations • Two-thirds of the included studies were conducted in routine immunization programs and the remaining one-third examined costs for mass vaccination campaigns and outreach • The cost of vaccination ranged from $0.53 to $0.90 USD per dose ○ The average vaccinator training cost for hard-to-reach populations was $0.04 per dose, in comparison to $0.02 per dose for those living near health clinics ○ The average vaccinator labour cost was $0.16 higher per dose in hard-to-reach locations ($0.53) than those living near clinics ($0.37) • The authors state that the aforementioned costs do not provide a comprehensive understanding of the costs associated with vaccinating hard-to-reach populations, as this cost is dependent on context specific barriers to vaccination • Most initiatives for hard-to-reach populations involved supplemental immunization activities	High	No	5/9 (AMSTAR rating from McMaster Health Forum)	May 2019	No	• Place of residence
• Type of vaccination ○ Routine childhood vaccines ○ Seasonal influenza vaccines	Immunization support programs in Canada primarily provide informational support and combine in-person and online communications, with some providing structural supports to facilitate access to vaccine clinics; facilitators of vaccine delivery programs were public health nurses and pharmacists,	Medium	No	6/9 (AMSTAR rating from McMaster	October 2022	No	• Place of residence • Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ COVID-19 vaccines ○ Human papilloma virus (HPV) vaccines ○ Other vaccines • Where vaccines are delivered ○ Community-based health settings ▪ Mobile clinics ▪ Pharmacies ○ Other community settings ▪ Schools ▪ Workplaces ▪ Shelters ▪ Community centres ▪ Indigenous community hubs ○ Primary care • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Pharmacists • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Decision aids ○ Appointment/scheduling and screening support ○ Community engagement strategies • Priority populations ○ People who are vaccine hesitant ○ New immigrants and refugees ○ People of lower socio-economic status	collaboration among entities involved in implementation of the programs, convenience in program participation, limited time commitment for vaccination, and peer support or coaching (30) • This review's findings were used to inform the development of an immunization program in Prince Edward Island that would increase COVID-19 vaccine confidence in families ○ Programs that provided online resources about immunization, including through mass communication, were excluded ○ Vaccination programs or interventions focused on any vaccine preventable disease were included • Most of the vaccination programs found in the evidence were based in Ontario and Quebec and focused on HPV vaccination, followed by influenza vaccines, hepatitis B, COVID-19 vaccines, and all routine childhood vaccines • All programs provided informational support and some programs incorporated structural support to participants, including providing transportation, decision aids, access to vaccine clinics and peer support • Most programs offered a combination of in-person and online (i.e. social media or web-based) delivery and program personnel included a wide range of roles, including multidisciplinary teams, school staff, web designers, clinicians, medical residents, researchers, and volunteers • Barriers to implementation and delivery of vaccines found in the evidence were inadequate vaccine literacy amongst those delivering the program, pre-existing negative perceptions about vaccination, limited resources (e.g., personnel, supply and cost) and logistical issues, polarizing political landscapes, and variation in participants' digital literacy ○ Cost of vaccines and the lack of insurance coverage for some participants were also identified as more individualized barriers • Facilitators of vaccine delivery in vaccination programs highlighted in the evidence were public health nurses and pharmacists, collaboration among entities involved in implementation of the programs, convenience in program			Health Forum)			

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ People living in rural or remote areas • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Efficiency of vaccine delivery • Costs	participation, limited time commitment for vaccination, and peer support or coaching						
• Type of vaccination ○ Vaccines in general • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Decision aids • Outcomes ○ Vaccine uptake	In this review of 10 randomized control trials, shared decision-making (SDM) interventions were found to increase vaccine uptake significantly compared to the control groups, and some RCTs reported increased decision confidence and decreased decisional conflict (31) • Shared decision-making is defined as a process in which decisions about a patient are made in a collaborative way including patients and their families, and where trustworthy, accessible information is provided about a set of options • Patient decision aids or decision support interventions are often used in SDM to provide people with information that will support their engagement in decisions	Medium	No	6/11 (AMSTAR rating from McMaster Health Forum)	March 2021	No	None identified
• Type of vaccination ○ Routine childhood vaccines ○ Seasonal influenza vaccines ○ Adult vaccination ○ Other vaccines • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Appointment/ scheduling and screening support ○ Reminders from prompts • Outcomes	Evidence suggests that personal electronic health records (PEHRs) access has a moderate positive impact on vaccine uptake, and the addition of digital communication features like educational messages, reminders, and scheduling features with PEHRs access may also increase vaccine uptake when compared to PEHRs access alone (32) • PEHRs are digital applications used to access and manage health information, and represent a tool to enable people-centredness in supporting communication between consumers, healthcare providers and health services • Data in the included studies was available for influenza and pneumococcal vaccines, routine childhood immunization, and diabetic patients • The evidence was not conclusive as there was no solid association between PEHR access and immunization rate reported in the literature	Medium	No	4/9 (AMSTAR rating from McMaster Health Forum)	Dec 2019	No	None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
○ Vaccine uptake							
• Type of vaccination ○ General vaccines (multiple) • Where vaccines are delivered ○ Community-based health settings ▪ Mobile clinics ○ Other community settings ▪ Schools ▪ Community centres ○ Primary care • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Allied health professionals ○ Lay/community health workers • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Appointment/ scheduling and screening support ○ Community engagement strategies • Priority populations ○ New immigrants and refugees • Outcomes ○ Vaccine access ○ Vaccine uptake	Face-to-face awareness strategies, increased access in community settings, vaccine mandates, and reduced costs for vaccines can promote vaccine access and uptake in migrant populations living in Europe (33) • This review explored barriers and facilitators to the vaccine uptake in migrant populations living in Europe • Facilitators to the uptake included awareness, affordability, convenience (e.g., walk-in appointments), and community engagement • Lack of information and low literacy was noted as a barrier to uptake and could be reduced with educational resources or by allocating more time in vaccine sessions ○ Verbal dissemination of information may be better than written to establish report and make vaccines more accessible ○ Information should be tailored to the values of community members (e.g., focus on cervical cancer rather than HPV vaccine) • Additional barriers included lack of primary addresses for new migrants for vaccine documentation and distrust of healthcare professionals • Lack of knowledge of migrant vaccine rights in healthcare professionals resulted in fewer migrants being offered vaccines • For vaccine delivery in mobile clinics or community centres to be effective vaccine delivery personnel must have cultural training or be able to speak the language of migrants • Primary care settings and community health professionals can facilitate promoting vaccine uptake or offering reminders • Mandatory work and school vaccine procedures can increase uptake	Medium	No	7/9 (AMSTAR rating from McMaster Health Forum)	2021	No	• Race/ ethnicity/ culture/ language

Appendix 3: Key findings from single studies sorted by relevance

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Study characteristics	Equity considerations

• Type of vaccination
  ○ COVID-19 vaccines
• Where vaccines are delivered
  ○ Community-based health settings
  ▪ Mobile clinics
  ▪ Pharmacies
  ○ Other community settings
  ▪ Schools
  ▪ Workplaces
  ▪ Shelters
  ▪ Community centres
  ▪ Indigenous community hubs
  ○ Primary care
  ○ Specialty care settings
  ○ Long-term care homes
  ○ Public health offices/centres
• Supports used as part of vaccine delivery approaches to enhance access and uptake
  ○ Information or education provision
  ○ Appointment/scheduling and screening support
  ○ Community engagement strategies
• Priority populations
  ○ Older adults
  ○ BIPOC communities
  ○ People of lower socio-economic status
  ○ People experiencing homelessness
  ○ People living in rural or remote areas
• Outcomes
	Equitable vaccine delivery systems across Canada require strategies that ensure access to barrier-free, multi-lingual, and culturally safe vaccination environments for vulnerable communities (34)
	• This mixed-methods study assessed Canada's COVID-19 vaccination strategy through the lens of vulnerability and consisted of a qualitative analysis of epidemiological data on COVID-19 cases and vaccine coverage in four Canadian jurisdictions (Alberta, Ontario, Nova Scotia, and Yukon) and 34 interviews with key informants from nine Canadian jurisdictions
	• Recommendations of the National Advisory Committee on Immunization (NACI) to prioritize the elderly, those living and working in environments with higher risks of transmission, communities with disproportionate consequences of infection (e.g., Indigenous communities), and those with pre-existing conditions
	• COVID-19 vaccines in Alberta were delivered to the population in three phases:
	  ○ Phase 1: Immunization of frontline healthcare workers and residents of long-term care, seniors (75+), and First Nations people living on reserve 65+
	  ○ Phase 2: Immunization of seniors (50+), Indigenous peoples 35+, and those living or working in supportive care facilities
	  ○ Phase 3: Everyone
	• COVID-19 vaccine rollouts in Ontario and in Nova Scotia were generally similar to Alberta but had a few distinct differences:
	  ○ In Phase two, Ontario prioritized young people living in 'hotspots,' individuals living with underlying conditions, and mobile vaccination of older adults
	  ○ Nova Scotia prioritized occupation as the most significant factor over age and also highlighted the need to engage First Nations and African Nova Scotian communities
	• In Yukon, Phase 1 of the vaccine rollout focused on staff and residents of long-term care (LTC) as top priority, followed by healthcare workers, adults 70+, and people living in shelters, correctional facilities, and rural and remote communities
	• Barriers of the vaccine rollouts included:
	  ○ Vaccine supply and storage challenges due to strict handling and storage requirements of vaccines and vaccine brand preferences of the population
		High	*Publication date:* December 2022
			
			Jurisdiction studied: Canada
			
			Methods used: Mixed methods
				• Place of residence
				• Race/ethnicity/culture/language
				• Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Study characteristics	Equity considerations
○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Efficiency of vaccine delivery	○ Accessibility barriers at mass vaccination sites (e.g., appointment only vaccination, transport to site, language and human resource barriers) ○ Limited support from provincial governments to reach vulnerable low-income racialized people, migrant workers, newcomers, refugees, and undocumented and/or uninsured individuals (i.e., vaccine delivery systems were not tailored to serve these communities in a timely fashion) ○ Misinformation and the lack of the appropriate mechanisms to address it coupled with distrust and hesitancy developed when there was a lack of initial engagement with the vulnerable • Solutions included focused outreach and early engagement and partnership with Indigenous communities led to successes in the rollout, representation among vaccinators and healthcare providers • The authors recommended that vaccine delivery strategies should be developed to ensure equitable access to barrier-free, multi-lingual, and culturally safe vaccination environments			
• Type of vaccination ○ COVID-19 vaccines • Where vaccines are delivered ○ In-home vaccination ○ Community-based health settings ▪ Mobile clinics ▪ Pharmacies ○ Other community settings ▪ Community centres ▪ Indigenous community hubs ○ Primary ○ Specialty care settings ○ Public health offices/centres • By whom vaccines are delivered ○ Physicians ○ Nurses ○ Pharmacists ○ Public-health workers ○ Allied health professionals	Strategies to achieve equitable COVID-19 vaccine coverage for immigrants and newcomer refugees in Alberta should address basic needs of these groups and incorporate information mobilization, low barrier services, cultural and language interpretation, non-governmental partnerships, flexible funding, and outreach (35) • A mix of structured and semi-structured interviews were conducted to explore strategies to achieve equitable COVID-19 vaccine coverage among immigrants and newcomer refugees in Calgary, Alberta, between Spring 2021 and Fall 2022 ○ Populations of concerns that were reported were Arabs, West and East Africans, Southeast Asians, and South Asians ○ Vaccination locations available to refugees and newcomers included large clinics, pharmacies, and physicians' offices • Specialized vaccination models for immigrants and newcomer refugees had a significant impact on uptake due to increased access and vaccine confidence of participants • Vaccination models investigated included a mobile clinic serving Temporary Foreign Workers in remote locations, vaccination upon arrival at temporary housing for refugees, a tailored community clinic providing low-barrier access for groups facing systemic barriers with no requirement for a healthcare number, and a large temporary community clinic for immigrant and ethnocultural communities • Facilitators of vaccination identified from key informants included information mobilization, low barrier services, cultural and language interpretation, non-governmental partnerships, flexible funding, and outreach	High	*Publication date:* March 2024 *Jurisdiction studied:* Alberta, Canada *Methods used:* Qualitative study (interviews)	• Place of residence • Race/ethnicity/culture/language • Socio-economic status

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Study characteristics	Equity considerations
○ Lay/community health workers • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Appointment/scheduling and screening support ○ Community engagement strategies • Priority populations ○ People who are vaccine hesitant ○ New immigrants and refugees ○ BIPOC communities ○ People of lower socio-economic status ○ People experiencing homelessness ○ People living in rural or remote areas • Outcomes ○ Vaccine access ○ Vaccine uptake ○ Efficiency of vaccine delivery ○ Costs	○ Diverse non-governmental organizations were integral to reach hesitant communities and address gaps in vaccine information and delivery • This study highlighted the importance of addressing the basic needs and social determinants of health of immigrants and newcomer refugees through policies and health system structures in order to achieve vaccine equity			
• Type of vaccination ○ Routine childhood vaccines • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Reminders from prompts (e.g., using EMRs and patient portals) • Priority populations	SMS text message reminders were used to remind parents of 18-month-old children about immunization appointments; parents found the reminders and complementary information in multiple languages to be very helpful (36) • The Childhood Immunization Reminder Project (ChIRP), a pilot project study, was conducted at two health centres in Alberta to assess how effective using SMS text message reminders with a link to web-based information on immunization in multiple languages for parents of 18-month-old children ○ A booking reminder was sent to parents three months before their child turned 18 months and another reminder about their appointment three days before the scheduled date	Medium	*Publication date:* November 2022 *Jurisdiction studied:* Alberta, Canada *Methods used:* Qualitative study	• None identified

Dimension of organizing framework	Declarative title and key findings	Relevance rating	Study characteristics	Equity considerations
○ Parents of children who have not received recommended vaccinations • Outcomes ○ Vaccine uptake	• After the intervention, all parents said that they found the reminders helpful, but there was minimal reduction in appointment no-shows ○ Overall, most parents still reported that their child received their 18-month immunization on schedule • Information was most often read in English, Punjabi, Arabic, and Spanish, suggesting the need for translated information about immunization			
• Type of vaccination ○ COVID-19 vaccines ○ Adult vaccines (e.g., pneumococcal, shingles) • Where vaccines are delivered ○ Community-based health settings ▪ Pharmacies • By whom vaccines are delivered ○ Pharmacists • Supports used as part of vaccine delivery approaches to enhance access and uptake ○ Information or education provision ○ Decision aids ○ Appointment/scheduling and screening support ○ Reminders from prompts • Outcomes ○ Barriers to implementation ○ Vaccine access ○ Vaccine uptake ○ Patient, family and/or caregiver experience ○ Provider experience	Pharmacists in Quebec can optimize vaccinations in their communities by improving vaccination administration and scheduling processes, co-promoting vaccinations, using pharmacy assistants to optimize workflow, and having access to more educational opportunities to enhance their clinical knowledge (37) • Pharmacists in Quebec were given authority to prescribe and administer vaccines in March 2020 at the beginning of the COVID-19 pandemic • This study reported on a workshop with Quebec pharmacists that aimed to equip them with the skills to optimize vaccinations in their community and integrate vaccination into their pharmacy workflow ○ Completion of this workshop awarded pharmacists a continuing education unit credit from the pharmacist regulatory body of Quebec • The study found that most adult vaccinations at pharmacies occur because patients specifically request them, and that the absence of a mandatory immunization policy for adults and a lack of coordinated care result in low adult vaccination rates ○ Vaccine hesitancy was also highlighted as a barrier • Facilitators of vaccination by pharmacists should include co-promoting vaccinations, increased educational opportunities for pharmacists to increase their clinical knowledge and be more proactive in encouraging vaccination • While pharmacists who participated in the workshop indicated that they are respectful of patients' autonomy in making decisions about vaccinations, they acknowledged the opportunity to dispel misconceptions and provide current information to patients during interactions • The use of pharmacy assistants to identify individuals who are eligible for vaccination was brought up as a facilitator to optimizing workflow and vaccination services ○ Pharmacy posters and reminder cards in patients' prescription bags were suggested strategies to encourage uptake • Improving vaccine administration and scheduling processes was also identified as a way to reduce wait times and enhance patient experiences	Medium	*Publication date:* August 2023 *Jurisdiction studied:* Québec, Canada *Methods used:* Qualitative study (workshops)	• None identified

Appendix 4: Detailed jurisdictional scan of vaccine delivery approaches in Canada

Jurisdiction	Key features of the model

Pan-Canada	• The National Advisory Committee on Immunization (NACI) provides guidelines for public health vaccination programs in Canada, including, most recently, programs for routine childhood vaccines, influenza vaccines and COVID-19 vaccines
	• CanAge, a national senior's advocacy organization, concluded in its third annual Vaccine Report Card (2022–23) that provincial governments need to take immediate action to make influenza, pneumonia, shingles and COVID-19 vaccines more available and affordable for adults
	  ○ A comprehensive vaccination strategy is needed in Canada for influenza, shingles and pneumonia vaccinations for adults
	  ○ No province or territory in Canada covers the cost for shingles vaccine for individuals 50+ years; only Ontario, Prince Edward Island, Yukon and Quebec provide some kind of coverage for shingles vaccine at all
	  ○ A best-in-class pneumonia vaccine (PCV-20) has been recommended by NACI, but provinces and territories have reportedly not moved towards replacing older vaccines with it
	• In 2016, the Immunization Partnership Fund was established by the Government of Canada to increase vaccination coverage in Canada
	  ○ Initially, $3–5 million per year in funding for five years (2016–21) was earmarked, but in response to COVID-19 vaccination efforts, an additional $54 million was invested over three years (2020–23) into the fund
	  ○ The federal government renewed funding for the Immunization Partnership Fund for 2023 to 2024 with a $9.5 million investment and provides a list of ongoing projects on its website that feature educational strategies primarily, as well as vaccine delivery pilot projects

Appendix 5: Documents excluded at the final stages of reviewing

Document type	Hyperlinked title
Full systematic review	Promoting, seeking, and reaching vaccination services: A systematic review of costs to immunization programs, beneficiaries, and caregivers
Full systematic review	Costs of human papillomavirus vaccine delivery in low- and middle-income countries: A systematic review
Rapid review	The impact of COVID-19 restrictions on childhood vaccination uptake: A rapid review
Rapid review	The challenge of reaching undocumented migrants with COVID-19 vaccination
Rapid review	HPV vaccination in Latin America: Coverage status, implementation challenges and strategies to overcome it
Rapid review	Human papillomavirus vaccination coverage, policies, and practical implementation across Europe
Single study	The digital immunization system of the future: Imagining a patient-centric, interoperable immunization information system
Single study	Barriers and facilitators to COVID-19 vaccine acceptability among people incarcerated in Canadian federal prisons: A qualitative study
Narrative review	Vaccine strategies: Optimising outcomes
Narrative review	Evidence-based strategies to increase vaccination uptake: A review
Narrative review	Typhoid fever vaccination strategies
Narrative review	Making HPV vaccination available to girls everywhere
Narrative review	Australia's role in pneumococcal and human papillomavirus vaccine evaluation in Asia-Pacific
Evaluation report	The cost-effectiveness of introducing hepatitis B vaccine into infant immunization services in Mozambique
Evaluation report	Health and economic impact of human papillomavirus 16 and 18 vaccination of preadolescent girls and cervical cancer screening of adult women in Peru
Evaluation report	Health and economic impact of HPV 16/18 vaccination and cervical cancer screening in Eastern Africa
Evaluation report	Opportunities to improve immune-based prevention of HPV-associated cancers
Evaluation report	National implementation of HPV vaccination programs in low-resource countries: Lessons, challenges, and future prospects
Evaluation report	Strengthening global vaccine access for adolescents and adults
Evaluation report	Evidence-based strategies for clinical organizations to address COVID-19 vaccine hesitancy

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