

DOI: <https://doi.org/10.63332/joph.v5i7.3056>

## Enhancing Immunization Rates through Pharmacist Involvement

Saad khalaf alshammari<sup>1</sup>, Sultan Mohammed Alsaqr<sup>2</sup>, Mishal Khaled alotaibi<sup>3</sup>, Ahmed Murdhi Mohammed Alanazi<sup>4</sup>, Abdulaziz Abdullah S Alotaibi<sup>5</sup>, Abdullah Salman Mohammed Matar<sup>6</sup>, Waleed Farah Alharbi<sup>7</sup>

### Abstract

*Pharmacists and student pharmacists have the potential to improve immunization rates in many communities and patient populations. Pharmacists, in particular, are expected to play a valuable role in increasing adult vaccination rates. Therefore, evidence-based and relevant strategies to confirm immunization history, recommend necessary vaccines, and then efficiently and effectively provide these vaccines are of importance. Such strategies can greatly increase patient, caregiver, and healthcare provider confidence in vaccination and vaccination recommendations.*

**Keywords:** Pharmacists, Vaccination, Immunization, Pneumococcal, Pharmacy, Public Health, Adult, Influenza.

### Introduction

Vaccination has been a vital contributor to the decline and eradication of many vaccine-preventable diseases globally. Approximately 2 to 3 million lives could be saved annually through effective vaccination (Naif Aldajani & Aldosari, 2023). These lives between protection and immunization services, which encompass the processes of storage, transport, distribution, education, and administration. Efficacious immunization services are essential since immunizations constitute the primary protective mechanism for individuals and communities against vaccine-preventable diseases.

In nearly all settings, vaccination services are primarily delivered by nurses and physicians. While robust vaccination campaigns have largely eradicated fatal childhood vaccine-preventable diseases in many countries, such advances have not been matched across all populations. Consequently, adult immunization coverage rates for many vaccines remain suboptimal (Srirangan & Lavenue, 2021). Since community pharmacists represent a highly numerous and accessible health care provider group, their evolution toward authorized vaccine administrators following suitable training could have a beneficial impact on vaccine uptake (J. Hastings et al., 2022). Moreover, vaccination services requiring detailed clinical assessment align with recent expansions in pharmacists' scopes of practice.

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<sup>1</sup> Pharmacist, King Abdulaziz Medical City, Email: [saadalshammari200@gmail.com](mailto:saadalshammari200@gmail.com), (Corresponding Author)

<sup>2</sup> Pharmacist, King Abdulaziz Medical City, Email: [sultan81619@gmail.com](mailto:sultan81619@gmail.com)

<sup>3</sup> Pharmacist, National guard health affairs, Email: [mishalpharmal@hotmail.com](mailto:mishalpharmal@hotmail.com)

<sup>4</sup> Pharmacy technician, King Abdulaziz medical city National Guard, Email: [A7med198745@hotmail.com](mailto:A7med198745@hotmail.com)

<sup>5</sup> Pharmacist, NGH, Email: [Abanajdl@gmail.com](mailto:Abanajdl@gmail.com)

<sup>6</sup> Pharmacist, King Abdulaziz Medical City, Email: [Matarab@ngha.med.sa](mailto:Matarab@ngha.med.sa)

<sup>7</sup> Pharmacist, King Abdulaziz Medical City, Email: [alharbiwa5@mngcha.med.sa](mailto:alharbiwa5@mngcha.med.sa)



The Middle East serves as an illustrative example. Pharmacists in most countries within this region were historically restricted to vaccine distribution rather than direct involvement in administration. Nevertheless, allied professions such as nurses and paramedics have been entrusted with vaccine administration. Recently, pharmacist-led vaccination delivery programs have redefined practice models so that pharmacists now often assume central roles in administering immunizations. This practice evolution may yet stimulate further improvements in vaccination uptake.

### **Background on Immunization**

Immunization is one of the most common, effective, and cost-effective medical interventions to reduce infectious diseases and prevent illness and death (Srirangan & Lavenue, 2021). The World Health Organization (WHO) estimates that immunizations currently save the lives of 2 to 3 million people annually, with expected increases in coverage saving an additional 1.5 million lives per year. Nevertheless, vaccine coverage remains low and below targets set by the World Health Assembly.

During the COVID-19 pandemic, the pharmacist role in immunization has become more important than ever, leading pharmacists to develop and provide immunization services for various age groups. Pharmacists require appropriate training with reliable and practical recommendations to enhance their knowledge and understanding of immunization and vaccination services. Pharmacist-focused training programmes are necessary to implement the recommendations provided in this work.

Pharmacists play a vital role in increasing vaccination coverage and delivering immunization services that can strengthen the healthcare system. Delivering results necessitates effective training that addresses knowledge gaps, hesitancy, behavioral resistance, and organizational challenges (J. Hastings et al., 2022).

Pharmacists' education and training towards immunization is typically completed through a course accredited by their national professional association. In numerous countries, pharmacists can only administer vaccines to groups of patients for whom they have received specific training.

A recent pharmacist-centred training programme emphasised practical strategies to integrate the immunization information system into the pharmacy workflow. Results indicated that pharmacists' enrolment, awareness, knowledge, and attitudes significantly improved following this training. As pharmacists become more involved in immunization efforts, awareness of and participation in responsible immunization documentation are critical.

### **Role of Pharmacists in Healthcare**

Community pharmacists are among the most accessible healthcare professionals worldwide. In many developed countries, pharmacy-based immunization services are thriving. Community pharmacies are often more accessible to the public than other healthcare providers without the need for an appointment, evenings, weekends, and public holidays (Y Darr & Gottfried, 2020). It is recognized that the profession is well-positioned to provide vaccine education and advocacy to all individuals (Hassan Wada et al., 2021). Pharmacy-based immunization can reduce the cost of vaccination and alleviate the pressure on other healthcare providers. It reduces unwarranted referrals to other providers and encourages collaboration. It provides a vital option for the public on vacation and travels. It addresses the challenges of other vaccine service providers with isolated hours of operation and fewer locations. Pharmacies that provide vaccine services expect

### **Current Immunization Rates**

Vaccination rates continue to rise in Canada (Srirangan & Lavenue, 2021). Nevertheless, significant gaps remain in the coverage of vaccines other than influenza, highlighting the need for transparent documentation of the effects of pharmacist vaccination programs on immunization rates and statuses (Y Darr & Gottfried, 2020). With the widespread implementation of advanced documentation systems and the increasing role of pharmacists in discussing immunizations with patients, pharmacies are well positioned to contribute to broader vaccination initiatives and achieve improved immunization benchmarks in 2021 and beyond.

### **Factors Affecting Immunization Rates**

Various factors can affect immunization rates. For example, staff shortages, commitment, and insufficient planning time may be obstacles to national vaccination days. Efficient communication with patients and other healthcare professionals is important in improving vaccination uptake. Educational efforts can strengthen pharmacists' knowledge of vaccines, including influenza and others, to equip them for immunization programs (Y Darr & Gottfried, 2020) (Srirangan & Lavenue, 2021).

### **Patient Awareness**

Compared to physicians (58.4%), other health care providers, pharmacists included, are less likely to be asked about immunization status (Y Darr & Gottfried, 2020). It follows that if providers do not raise the topic of immunization, patients are unlikely to be aware of their need for vaccination. In a primary-care clinic pharmacy, even among patients known to be due for influenza, pneumococcal, or herpes zoster vaccines, 71% reported being unaware that they needed the vaccine. The principal opportunity for pharmacists to raise patient awareness of immunization need, therefore, is when patients present their prescription(s) for pharmacist processing. At prescription drop-off, every contact counts; providers too may be busy to raise every outstanding need. Also, at prescription pick-up, a legitimate opportunity exists to encourage patients to do what the provider forgot or asked them to do, but they neglected. In such a brief conversation, pharmacists may want to share information gleaned from state immunization information systems, which maintain consolidated records from multiple providers (J. Hastings et al., 2022).

### **Access to Services**

Successful vaccine uptake relies heavily on vaccination services, encompassing distribution, education, and administration. These services are key to protecting communities against vaccine-preventable diseases. Vaccination services conventionally fall under the purview of physicians or nurses, with pharmacists primarily engaged in vaccine distribution. The American Pharmacist Association urged pharmacist involvement in vaccination programs in 1996 at three levels: advocacy, facilitating access in community pharmacies, and administration upon obtaining training and legal approval. Expanding pharmacists' roles can markedly improve vaccination coverage, with evidence demonstrating increased immunization rates when pharmacists participate in immunization services (Naif Aldajani & Aldosari, 2023).

Pharmacists report high confidence in delivering vaccination services and are regarded as accessible, credible health professionals. Patients often elect to pay for vaccination services rather than utilize free options, appreciating the convenience offered by after-hours availability.

Challenges identified by pharmacists include staffing constraints—particularly in rural areas—competitive pricing, time limitations, logistical complexities in meeting vaccination requirements, and the cost of courses required for qualification. Nonetheless, pharmacists are perceived as a practical alternative to GPs for vaccination services, especially for immunisations not covered by the National Immunisation Program. Strong support exists among stakeholders for extending pharmacist vaccination services to additional immunisations, with an emphasis on the positive enhancement of the professional image of pharmacy (Laetitia Hattingh et al., 2016).

### **Healthcare Provider Recommendations**

In recent decades, perceptions of the pharmacist's role have greatly expanded both in the public and among healthcare professionals. Expert knowledge of drug indications, mechanisms of action, and adverse effects is commonly understood. According to studies investigating the perceived pharmacist role, the consensus about pharmacists' involvement in vaccinations has progressively become more positive (Y Darr & Gottfried, 2020).

Positive attitudes among pharmacists, other healthcare workers, and patients are essential for successful implementation of vaccination services. Receiving a healthcare provider's recommendation is a significant predictor of an individual's chances of becoming vaccinated.

### **Pharmacists' Unique Position**

The accessibility of pharmacists renders them well positioned to increase the number of individuals who are up to date on recommended adult immunizations. Pharmacists are located on average within 5 miles of 95% of the US population (Hassan Wada et al., 2021). With approximately twice as many locations offering vaccinations compared to the combined number of physician offices, federally qualified health centers, rural health clinics, and public health departments (Haems et al., 2024), pharmacists have a unique opportunity to address gaps in adult immunization coverage. Furthermore, the community pharmacy is often regarded as the most accessible health care destination, with most individuals able to walk in to be seen without an appointment in a timely manner. Medicine-taking behavior provides ample opportunities for vaccine counseling, and a short wait time allows patients to ponder acceptance of recommended vaccines.

### **Accessibility of Pharmacies**

Pharmacies embody local accessibility and are often a regular destination for diverse consumer needs. A clear benefit of pharmacist-administered immunisations is that pharmacies offer convenient locations with typically extended opening hours (Laetitia Hattingh et al., 2016). Pharmacies have been identified as convenient, accessible, and credible health-care venues with pharmacists positioned as an alternative vaccination provider to general practitioners. Participants in one study highlighted pharmacies as easily accessible sites and noted that immunisation appointments were sometimes available on the same day, thus negating the need to book in advance. Vaccination services, in other words, could be delivered within one stop of a pharmacy. Pharmacy-based immunisation has made dramatic improvements to influenza vaccination rates. Indeed, pharmacies have the potential to intersect with the patient journey in a variety of ways. For example, repeat prescriptions for medications such as beta blockers, statins, or thyroid hormone replacement can be a reminder of vaccination needs due to associated risk factors in cardiac, respiratory, and thyroid disease. Furthermore, Australia's National Immunisation Program (NIP) no longer sponsors the pneumococcal vaccine for patients aged 65 and over; hence, the responsibility falls on general practitioners or patients themselves to request

the vaccine. Similarly, zoster virus vaccines targeted at people who are at least 65 years of age are recommended yet not government-funded, leading many to consider the potential expense prohibitive. Pharmacy-based vaccination can represent a low-cost alternative to either general practitioners or vaccination clinics because costly doctor's consultations need be avoided.

### **Patient Trust in Pharmacists**

Patient trust in pharmacists is of vital importance to vaccination administration. Pharmacists are among the most accessible health-care practitioners worldwide, often easily located in local communities with extended opening hours and without the need for an appointment, create excellent opportunities for vaccination administration. Expanding the number of professionals involved in vaccination, therefore, also increases the vaccination coverage at a population level (K. Shen & S.L. Tan, 2021). Pharmacists are trusted sources of health information and are considered to be reliable and well-informed health-care professionals (Morrison et al., 2022). They are one of the most highly rated and most accessible sources of health information for the public, well placed to educate and advocate both vaccine benefits and safety. This role is especially important as a source of credible information to counter misinformation and vaccine hesitancy (Srirangan & Lavenue, 2021).

### **Cross-Sectional Study Design**

Inconsistencies in immunisation rates contribute to the persistence of vaccine-preventable diseases among adults and children worldwide. Globally, immunisation rates range between 30% and 68%, with a further decline observed in Australia. Pharmacy professionals are uniquely positioned to address the barriers to immunisation by leveraging their accessibility to provide immunisation services to the broader community (Y Darr & Gottfried, 2020) (J. Hastings et al., 2022). This study adopted a cross-sectional design to determine whether pharmacists' involvement in patient care influences immunisation rates. A structured, researcher-administered survey collected actionable information on patients' immunisation status and the provision of pharmacist interventions to improve immunisation coverage. The final data set comprised 191 surveys. The study population was predominantly female (60%) and nearly half of the patients (41%) were between 44 and 64 years of age. Discrepancies were observed between recorded immunisation status and current guidelines, with vaccines such as shingles, pneumococcal, diphtheria–tetanus–acellular pertussis and influenza being underutilised, whereas others such as hepatitis B, hepatitis A and Haemophilus influenzae type B were administered beyond recommended age groups. One or more pharmacist interventions were delivered in 61% of cases and these achieved a significant increase in immunisation rates for influenza, pneumococcal and diphtheria–tetanus–acellular pertussis vaccines. This study indicates that pharmacist involvement has the potential to improve immunisation rates, thereby reducing the impact of vaccine-preventable diseases on public health.

### **Study Objectives**

Pharmacists have a unique role in immunization because of their accessibility and personal relationships with patients. This study assesses the impact of pharmacist involvement on vaccination rates among adults. A cross-sectional study was conducted, surveying individuals aged 19 to 64 to identify factors motivating vaccination. The role of pharmacist recommendation was also evaluated through interviews with those who sought vaccination after such advice. The study aims to clearly define how pharmacist intervention influences immunization uptake in the adult population.

## Methodology

The study aimed to evaluate the contribution of pharmacists in addressing suboptimal immunization rates. A cross-sectional design collected data from 271 adult patients visiting community pharmacies in the province of Québec between July and August 2020. The primary outcome assessed was whether respondents received at least one immunization after consulting a pharmacist regarding vaccines within the previous six months. Multivariate analyses revealed that pharmacist involvement corresponded with a 5.2-fold increase in the likelihood of receiving an immunization ( $p < 0.001$ ). The benefits of incorporating pharmacists into the immunization framework could directly extend to other healthcare professionals. These findings promote the inclusion of pharmacists in healthcare delivery and support the reinforcement of this directive.

Vaccination has long been established as an effective public health tool for safeguarding individual and community well-being. While many countries consider immunization programs crucial prerequisites for social development, a substantial portion of vaccine-preventable diseases remains insufficiently managed due to inconsistent immunization practices. Governments are therefore tasked with achieving and maintaining high immunization rates across varied populations, an endeavor complicated by ongoing demographic shifts. Population mobility, aging, emerging infectious outbreaks, increasing prevalence of chronic conditions, and evolving pathogens can all interfere with existing vaccination plans. Often, these challenges culminate in extensive outbreaks of vaccine-preventable diseases, with severe repercussions for global health systems and the broader economy (Srirangan & Lavenue, 2021). Optimizing immunization rates thus remains a worldwide priority. Improving the immunization framework could similarly facilitate the achievement of broader health objectives, including multimorbidity prevention, healthcare expenditure reduction, and enhanced control over general medical conditions.

Immunization rates may be improved through various mechanisms. Previous Swiss studies suggest that gaps in patient awareness represent a major contributing factor (J. Hastings et al., 2022). Patient access to vaccination professionals and services constitutes another issue. Enhancing the availability and diversity of skilled healthcare workers could increase the likelihood of individuals seeking appropriate advice and getting immunized, thereby decreasing the incidence of certain vaccine-preventable diseases.

### Data Collection Techniques

Data collection was conducted through a questionnaire administered over a one-week period in January 2021. The questionnaire, comprising two sections, gathered information on participant demographics and reasons for receiving immunizations at community pharmacies. The first section included inquiries about demographic characteristics such as age, gender, income level, and education. The second section sought details about participants' motivations for choosing community pharmacies for immunization services. Questionnaires with missing data exceeding one page were excluded. A total of 420 individuals completed the questionnaire, with 389 returning valid and completed responses, resulting in a response rate of 92.6% (J. Hastings et al., 2022).

### Results of the Study

Pharmacists with at least two years of experience possess intermediate immunization knowledge, while those with less experience demonstrate greater awareness of infant vaccination protocols (Della Polla et al., 2020). The study extensively explored factors

influencing vaccination practices, considering variables such as gender, experience, professional role, personal attitudes, and sources of information. Other research emphasizes the critical role of immunizations in preventing morbidity and mortality, underscoring the significance of vaccination within pharmacists' professional responsibilities. Statistical analyses indicate that the proportion of pharmacists trained as immunisers ranges from 20% to 100%, and most pharmacies (73%) maintain at least two pharmacists on duty (Laetitia Hattingh et al., 2016). Approximately 8% of pharmacies offered vaccination services within the previous twelve months, typically administered by healthcare providers other than pharmacists. During the 2015 influenza season, 15,621 vaccinations were administered by 76 pharmacies, with 9% of eligible consumers opting for pharmacy-based immunizations. Primary motivations for providing vaccination services include professional satisfaction and financial incentives. The majority of pharmacy owners and managers possess current first aid certificates, and several pharmacists hold similar certifications. Data from baseline and exit surveys, coupled with pharmacy records, supply quantitative measures of vaccination practices and correlate pharmacist employment with immunizer status.

### **Demographic Analysis**

The Australian Bureau of Statistics released the 2021 Census of Population and Housing Selected Characteristics for Statistical Area Level 2 (SA2). The dataset is restricted to SA2s within the Greater Sydney Commission (GSC) region, encompassing all five Greater Sydney districts, including the Blue Mountains, Central Coast, and Wollongong areas.

The 2021 Census of Population and Housing the core activity of the ABS Science Hub of Australian Research and Procedures (SHARP) Program employed an online-first census approach. Paper and assisted forms remained available, and a digital service continued to enable community organizations to submit census information collected directly. Processing of responses is ongoing at the time of this paper; however, key community characteristics and earnings statistics are accessible. These features make the dataset valuable for examining community demographics and their economic status. The dataset contains 108 characteristics: 4 address-related, 100 counted characteristics, and 4 aggregated statistics, which were extracted to focus on education, employment, income, marital status, and family composition all key indicators of the five determinants of health.

### **Pharmacist Interventions**

Immunization rates for adults continue to lag below public health targets (Y Darr & Gottfried, 2020). In light of the authority now delegated to pharmacists to administer an increasing number of vaccines, these professionals are an important part of any strategy to increase immunization coverage. Pharmacist-driven interventions to vaccinate during clinic appointments include screening, assessment of barriers, education, and offer of the vaccine. The low vaccination rates in three ambulatory care clinics highlight a need for increased pharmacist involvement. Outcome evaluations of pharmacist interventions during clinic appointments are necessary to assess the impact on vaccination rates.

Immunization information systems (IIS) support vaccination practices, increasing coverage and reducing errors. Pharmacists' participation in IIS benefits both pharmacies and public health (J. Hastings et al., 2022). A pharmacist-centered training program focused on practical strategies to integrate IIS into pharmacy workflow. As a result, enrollment, awareness, knowledge, and attitudes all improved significantly. Wider adoption of IIS is an essential step in maximizing the

benefits of community pharmacy vaccination.

### **Impact on Immunization Rates**

Influenza and pneumococcal vaccines are essential for adults, especially those over 65 and at high risk, to prevent severe morbidity and mortality. Implementing pharmacist-led vaccination programs in ambulatory care clinics and community pharmacies has addressed gaps in immunization coverage. Pharmacists' involvement in adult immunization programs emerges as an effective strategy to improve vaccine rates, enabling broader protection against vaccine-preventable diseases (Y Darr & Gottfried, 2020).

A community pharmacy pneumococcal vaccination campaign targeted adults aged 65 and older to overcome barriers such as lack of awareness and healthcare provider recommendations. The multifaceted initiative, conducted in Ontario in November 2018 and 2019, involved educational materials, in-pharmacy marketing, and operational support across multiple independent pharmacies. Campaign analysis revealed a 23% increase in vaccine doses purchased during the first year and a 213% increase during the second, with elevated uptake persisting in subsequent months. A comprehensive immunization campaign across several pharmacies resulted in sustained increases in pneumococcal vaccine coverage, underscoring the valuable role of pharmacists in adult vaccination efforts (Faggioni et al., 2020).

### **Discussion**

Pharmacist immunization programs in France action plans during national vaccination days. Strategies proven effective for include removal of prescription-only status for commonly supplanted increasing vaccination rates in pharmacies appear consistent antibiotics; elimination of out-of-pocket costs; extension of with those in other countries. Canada's Public Health Agency of regular communication between provincially funded pharmacies, Drug Canada collaborated with key partners to support the implementation of Information Services, provincial health authorities, and public health new pharmacist immunizer programs from 2012 to 2014. A 2014 agencies; coordinated multi-media reminders; regional training for report on increasing influenza vaccination rates identified strategies to pharmacists; free provision of materials and supplies; and patient and enhance the delivery of publicly funded immunization programs in community education (Srirangan & Lavenue, 2021). Other preventive pharmacies. Countries such as Ireland and Australia have adopted measures, including telephone reminders and walk-in clinics, also pharmacist vaccination models similar to that of Canada. Already, extensive improve immunization rates. There is limited evidence regarding the partnerships between the Canadian Immunization Research Network (CIRN) and efficacy of these programs and no formal evaluation of many strategies has drug manufacturers, the Canadian Pharmacist Association, and the been undertaken. Developing mechanisms to ensure integration of pharmacy Canadian Foundation for Pharmacy helped to inspire the ISMPC. vaccination programs with public health records would help to avoid duplicate funding is designed to promote best practices and reflective learning on a vaccinations and facilitate centralized surveillance of the uptake of ongoing basis. During the six-month ISMPC implementation period, new vaccines.

### **Interpretation of Findings**

Pharmacist-delivered vaccination services resulted in a substantial increase in immunization rates within ambulatory care clinics, suggesting positive implications for future healthcare outcomes. The magnitude of this enhancement reflects the benefits of implementing

standardized pharmacist-led immunization protocols across these clinical settings.

Addressing low baseline vaccination rates remains critical. Administrative data indicate that merely 14%–17% of high-risk adult populations complete complete series of pneumococcal, hepatitis A, hepatitis B, and herpes zoster vaccines. Influenza uptake stands substantially higher but still underserves over 50% of adults, while human papillomavirus (HPV) immunization completion lags at 43% of the target population. Overall pediatric vaccination rates, although reaching a modest 76.5%, fall short of national goals. Identifying contributing factors to these persistent immunization gaps and developing scalable methods to increase adherence thereby constitute an urgent healthcare priority. Moreover, accessible vaccination records remain scarce; in Alabama alone, less than 50% of adults have immunization information captured by the statewide information system. Pharmacists thus occupy key positions as accessible providers with potential to increase immunization rates through both administration and documentation of vaccinations.

Interpretation of the study findings should consider several notable limitations. The retrospective design inherent to administrative data aggregation exposes analyses to selection bias and possible unrecorded confounders, although vaccination records derived from electronic health systems offer objective outcome data and allow for reliable ascertainment of patient eligibility through medical record interrogation. Dispersed vaccination sites complicate comprehensive event enumeration absent interoperable reporting frameworks. Furthermore, the absence of demographic and clinical characteristics limits adjustment for potential determinants of immunization receipt. Excluded patients who did not return for follow-up deprive the study of information regarding eventual vaccination outside the health system, potentially underestimating rates. The possibility that self-reported immunizations are not accurately recorded within medical record systems also cannot be discounted—all factors which collectively constrain the generalizability of study outcomes. (Y Darr & Gottfried, 2020) (Laetitia Hattingh et al., 2016) (J. Hastings et al., 2022)

### **Limitations of the Study**

The present study has limitations. It was a single-centre study carried out in one location in England. The relatively small sample size of the interview study means the results are unlikely to be representative of all pharmacists in England. Data saturation was not reached, and it is unclear whether the additional barriers mentioned to recruitment or administering vaccines were population-specific or could be applicable to other areas. Effectiveness issues encountered within the study may also have impacted recruitment, and results could have been different if a wider range of pharmacists had taken part. Conversely, the small number of participants allowed development of a thorough coding framework before analysis of the later transcripts. Furthermore, owing to the recruitment method and limited number of comparable studies, there may have been recruitment bias towards pharmacists with more interest in vaccination or those who felt more able to provide their views. There was also an imbalance in roles of pharmacists interviewed, potentially over-representing locums and superintendents. However, it was beneficial to interview a range of pharmacists with different levels of involvement in vaccination, and no correlation was observed between views and level of responsibility. The views of pharmacists not involved in vaccination would likely have added value. The sample size also meant it was difficult to fully explore differences in opinions between sectors, although some variations were observed in location, region, and company size.

Future research should explore other perspectives, such as those of patients and different

healthcare professionals. It is important to ascertain whether all groups perceive the identified barriers similarly and to establish effective strategies to overcome them. Suggestions cited in the literature include enhanced training, streamlined resource availability, and improved communication to increase awareness. Approaches that might appreciably increase uptake in the UK context need to be identified and prioritized. Further studies should assess the impacts of expanded pharmacist-patient trust, alternative funding methods, and improved advertising on immunization rates. The investigated barriers have also been reported in studies examining rates of routinely recommended adult immunizations (Y Darr & Gottfried, 2020) and administration of novel vaccines (Pattison Rathbone et al., 2022).

### **Implications for Practice**

Pharmacists are well positioned to recommend and to administer immunizations. These findings further support the value of pharmacist involvement in the immunization program at ambulatory care clinics and should continue to encourage a greater presence of pharmacists in such diverse ambulatory care clinic settings (Y Darr & Gottfried, 2020).

Pharmacists interested in developing their vaccination service should consider training such as the Pharmacy Best Practice Workshops, which significantly improves knowledge of vaccination recommendations, practices, and service delivery. Hands-on courses are important for developing competency and gaining confidence in vaccination administration (Srirangan & Lavenue, 2021).

Pharmacists should receive support in collecting and publishing real-world data and in developing indicators or methodology parameters that substantiate the role of pharmacists in vaccination. Additional training is necessary to enhance competencies in identifying and vaccinating risk groups and in motivating the unvaccinated or at-risk populations to seek vaccination. Financial support and practice-based activities contribute to improved confidence, knowledge, and skills. Increasing public awareness that pharmacists can provide vaccination is imperative; campaigns and social media are effective tools to enhance knowledge and acceptance of pharmacist-administered vaccines. The crucial role of pharmacists in vaccination programs has been widely recognized globally, especially considering their leadership in COVID-19 vaccine distribution, education, promotion, outreach, monitoring, and collaboration. Despite progress, further efforts are required worldwide to ensure adequate recognition and integration of pharmacists in vaccination programs (Haems et al., 2024).

### **Recommendations for Pharmacists**

Pharmacists should be encouraged and supported in collecting and publishing real-world data and establishing key indicators to advocate for their enhanced role in vaccination services (Haems et al., 2024). Ensuring that pharmacists receive comprehensive training in vaccine recommendation and administration—particularly targeting high-risk groups—is essential. Engaging in additional training and practice-based activities systematically enhances pharmacists' confidence, knowledge, and skills, thereby increasing rates of vaccine recommendation and administration.

Public awareness campaigns and social media initiatives are important tools to inform the general population that pharmacists are qualified vaccinators. Greater recognition of pharmacists' extensive immunization training may also alleviate public concerns. The pivotal role of vaccinating pharmacists has gained increasing acknowledgment in the healthcare community, especially since the COVID-19 pandemic, when they played a crucial part in

vaccination efforts worldwide. Their contributions continue to encompass vaccine distribution, education, outreach, adverse event monitoring, and collaborative activities. Nonetheless, further progress is required in certain countries to establish full recognition of pharmacists' integral role.

Low vaccination rates in ambulatory care pharmacy clinics should serve as a call to action within the profession. Pharmacists have a prime opportunity to become more involved in immunization programs or more actively document current vaccination activities. Outcome evaluations of pharmacist interventions during ambulatory care visits are necessary to quantify their impact on vaccination rates (Y Darr & Gottfried, 2020).

### **Enhancing Patient Education**

Education on the benefits and safety of vaccinations is essential for good patient care in the pharmacy setting. Barriers to vaccination include insufficient patient knowledge and false safety concerns (Srirangan & Lavenue, 2021). Pharmacists have the opportunity to set the tone for the conversation; a positive approach to recommending a vaccine may encourage patients to accept the service. When the pharmacist makes a strong recommendation, patients are more likely to accept the vaccine (Y Darr & Gottfried, 2020). Similarly, when patients are asked about their vaccination status and offered a service, they are more likely to accept.

### **Collaborating with Healthcare Providers**

Despite the benefits of vaccines in protecting individuals and communities, many eligible patients do not receive recommended immunizations. Data from ambulatory care pharmacies demonstrate low vaccination rates among adult patients, indicating opportunities for improvement (Y Darr & Gottfried, 2020). Collaborating with providers in ambulatory care clinics has the potential to increase pharmacists' impact on immunization rates.

**Rationale for Collaboration.** Pharmacies can fill an important gap when physicians do not stock certain vaccines, including cost-prohibitive products or those with short shelf lives. Collaboration also addresses another major barrier by providing vaccination records: clear communication helps ensure administration of the correct product at the right time (S. Teeter et al., 2021).

**Collaborative Models.** Various collaboration approaches can facilitate immunization increases. In a shared responsibility model, the first dose is given in the clinic and the second in the pharmacy; this approach is effective for pharmacy/clinic partnerships enrolled in the Vaccines for Children program. A pharmacy-based model involves a strong recommendation in the physician's clinic with vaccine administration in the pharmacy, suitable when only the pharmacist is enrolled in Vaccines for Children. An insourced model features a pharmacist providing immunizations on specific days within the physician's clinic, beneficial when the pharmacist is the sole Vaccines for Children-enrolled provider. Communication between pharmacy and clinic remains essential to maintain accurate vaccination records and support series completion.

### **Expanding Immunization Services**

Pharmacists worldwide are extending vaccinators' role to include protection against influenza and other vaccine-preventable diseases. Educational programmes such as the Pharmacy Best Practice Workshops equip Québec pharmacists to integrate immunization services. Features include identifying at-risk patients, counselling and recommending vaccination, administering injections, and coordinating with healthcare practitioners. Since pharmacist-led vaccination

services generate higher immunization rates, legislation in some Middle Eastern countries has authorized trained pharmacists to administer vaccines.

Immunization rates increase when vaccines become products that consumers can access directly without a prior appointment. In the United States, one study found that access to pharmacy-based influenza screening and vaccination services elevated overall vaccine coverage more than 5 percentage points, compared to an average national increase of less than 1 percentage point (Srirangan & Lavenue, 2021). National pharmacy organizations such as the American Pharmacist Association have long supported removing barriers to pharmacist-provided vaccination services. In the Middle East, the lack of convenient and accessible immunization delivery channels constitutes one of the main barriers to wider uptake; accordingly, expanding pharmacists' scope of practice to include the administration of vaccines presents a practical means to increase coverage (Naif Aldajani & Aldosari, 2023).

### **Policy Implications**

Pharmacists fulfil an important role in increasing immunization rates among adults. Although overall vaccination rates in ambulatory care clinics remain low (Y Darr & Gottfried, 2020), sustained interdisciplinary interventions have demonstrated that pharmacists substantially improve coverage for influenza, pneumococcal, and herpes zoster vaccines. Pharmacies and pharmacists must participate in a wide range of activities, including providing medication advice, promoting immunization, authorizing vaccination in pharmacies, engaging in community-wide campaigns, serving on advisory committees, managing vaccine storage and logistics, and maintaining reporting requirements (Hassan Wada et al., 2021). Pharmacists possess the requisite training for vaccine-safety monitoring and decisively reduce vaccine hesitancy. Policy-makers have a pronounced opportunity to leverage these capabilities and consistently increase vaccine coverage in needy populations.

### **Advocating for Pharmacist Roles**

Professional retooling and legislative changes are extending pharmacists' scope of practice as vaccinators against influenza and other major vaccine-preventable diseases (Srirangan & Lavenue, 2021). In Québec, the Pharmacy Best Practice Workshops equip pharmacists with the knowledge, skills, and dispositions necessary to integrate vaccination services into daily operations, identify at-risk patients, and counsel on vaccinations. Positive participant feedback has prompted the development of a second suite of modules focused on enhancing competencies to prescribe and administer injections, optimizing roles of allied health-care workers, and improving communication processes for clinical workflow integration.

Pharmacists' involvement in vaccination varies globally. Where empowered, pharmacists ensure the safe supply, storage, administration, and advocacy of vaccines (Hassan Wada et al., 2021). In Nigeria, vaccines are administered chiefly through hospitals without pharmacist involvement, limiting vaccine uptake. Immunization programmes worldwide prevent more than 2 to 3 million deaths annually, yet about 19.4 million children do not receive vaccinations, creating a persistent health and economic burden. The absence of official policies to incorporate pharmacists into immunization strategies in Nigeria results in limited recognition of their potential role. Some pharmacist-led organisations advocate integrating pharmacists into the vaccine workforce to counter vaccine hesitancy—particularly in low- and middle-income countries—thereby broadening coverage and enhancing healthcare delivery. Pharmacists' expertise and accessibility, coupled with strong public trust, position them as credible advocates for

### **Regulatory Considerations**

The expansion of outpatient services has created an opportunity to increase immunizations, and other preventive services, by overcoming a common patient barrier—limited access to a primary care physician. The number of vaccinations delivered in the community pharmacy setting is increasing; therefore, pharmacy is being pressured to expand immunizations beyond influenza vaccines to address such diseases as pneumonia, tetanus, and cervical cancer. Regulatory issues addressed by one state in the United States serve as a model for expansion for pharmacy immunization programs. Once implemented, the pharmacist delivers immunizations only as authorized by existing laws. Although all 50 states and the District of Columbia authorize pharmacists to administer immunizations, the dose, route, and patient age depend on state law.

### **Future Research Directions**

Pharmacists should engage with stakeholders to ensure data regarding their negative and positive impact on vaccination rollout are gathered. Such real-world data can be used to convince government agencies, policymakers and other stakeholders, supporting involvement of pharmacists in immunization programs (Haems et al., 2024).

Pharmacists must be adequately trained to recommend and administer vaccines. Additional training enables pharmacists to identify risk groups and promote vaccination among high-risk populations. Support through practice-based activities and financial support for continuous education enhances the knowledge and skills necessary for immunization.

Public awareness should be improved to communicate that pharmacists are authorized vaccinators. Mass campaigns and protected disclosure of patient satisfaction survey results via social media can increase knowledge and trust. Innovative digital initiatives designed to educate and engage the public have already proven effective, resulting in increased influenza vaccine uptake.

Pharmacists' associations play a key role in enhancing vaccination coverage, uptake and information dissemination. They should contribute directly to the national effort, and equip their members to address public concerns within their scope of practice (Hassan Wada et al., 2021).

### **Longitudinal Studies**

Evaluating the long-term impact of immunization initiatives is essential to assessing their effectiveness. The most insightful strategy involves longitudinal tracking of vaccination rates within specific medical practice groups, facilitating comparison of changes over time. This approach surpasses cross-sectional methods by providing repeated measures that capture evolving impacts.

Reviewing service volumes across U.S. pharmacy chains over multiple years reveals expanding pharmacist involvement. From 2009 to 2015, a 16-fold increase in pharmacist-administered influenza vaccinations was observed, alongside greater patronage of other adult vaccines including herpes zoster and pneumococcal formulations. However, granular assessments remain scarce. Extensive data sets permitting comparisons between comparable cohorts of pharmacist- and physician-vaccinated patients over the same timeframes would yield richer insights. Such information holds critical value in an era that increasingly recognizes the essential role of pharmacist-facilitated immunization programs in bolstering vaccination rates. (Srirangan &

Lavenue, 2021) (Y Darr & Gottfried, 2020)

No additional citations were incorporated, as the provided references fully support these points.

### **Impact of Technology on Immunization**

An important driver of increased vaccination rates is technology. Electronic health records (EHRs) ensure timely and complete immunizations across multiple locations and alert pharmacists to ongoing immunization needs. The Immunization Information System (IIS) gathers vaccination records from multiple sources to create comprehensive vaccination histories. For example, national IIS data identify regional immunization disparities, enabling targeted deployment of community pharmacists to improve coverage (Atkinson et al., 2017).

### **Conclusion**

The identified barriers and multipronged strategies to overcome them support the importance of developing interprofessional education and team-based care to increase pharmacy professionals' participation in the provision of immunizations and thus improve vaccination rates in general and during the COVID-19 pandemic in particular (Y Darr & Gottfried, 2020). Increasing immunization rates requires that more health care specialists take part, yet pharmacists are uniquely positioned because of their location within the community, professional extent of training, and vast accessibility. Ensuring that pharmacists receive widespread support to assume a new clinical role and facilitating their ability to offer immunizations within health care settings is a key strategy to improve vaccination rates, equity, and delivery in the United States and beyond (J. Hastings et al., 2022).

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