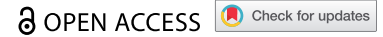





RESEARCH PAPER



Community pharmacists' willingness and barriers to provide vaccination during COVID-19 pandemic in Jordan

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ABSTRACT

Providing vaccination in community pharmacies could increase the vaccination coverage rate as well as help reducing the workload of the healthcare system. The current study was conducted to evaluate community pharmacists' willingness and barriers to provide vaccination in community pharmacy setting. A validated questionnaire which included eight items to evaluate willingness and eleven items to evaluate the barriers to provide vaccines was distributed online. Binary logistic regression was conducted to explore the factors that are significantly associated with willingness and barriers to provide the vaccine. Among the 201 participating pharmacists, 174 (86.6%) had a high willingness level. Lack of authorization (91.6%), lack of collaboration with other healthcare professionals (85.6%), and lack of space for storage (74.1%) were the most recognized barriers to vaccinate. Pharmacists with BSc degree demonstrated less willingness (OR = 0.18 (0.07–0.46)), and increased barriers (OR = 4.86 (1.56–15.17)) to provide the vaccine when compared with Pharm D and postgraduate pharmacists $P < .01$. Factors including male gender (OR: 6.10), working in chain pharmacy (OR: 8.98) and rural areas (OR: 4.31), moderate income (OR: 19.34) and less years of experience (OR:0.85) were significantly associated with increased barriers to provide the vaccine ($P < .05$). Despite the high willingness of the community pharmacists to vaccinate, several barriers were present. Enhancing pharmacists' authorization and collaboration with other healthcare professionals and providing space for storage along with providing training courses and workshops should be considered to enhance pharmacist's engagement in vaccination service.

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Introduction

According to the World Health Organization, vaccination has substantially decreased the burden of certain infectious diseases and was responsible for preventing nearly 2.5 million deaths annually.^{1–4} The incidence, prevalence, morbidity and mortality associated with vaccine-preventable diseases have considerably diminished since vaccinations became available.^{3,4} Despite the existence of efficacious vaccines, the burden of vaccine-preventable diseases is still an issue, and the potential health benefits of vaccination are not being achieved due to suboptimal vaccine-coverage rates for different age groups.⁵ After the emergence of COVID-19 pandemic, enormous challenges and threats were posed impact to the human lives and health systems globally.^{6,7} More than 200 million COVID-19 cases have been reported globally, from which more than 800000 cases were reported in Jordan. Furthermore, more than 4 million COVID-19 induced-deaths have been reported worldwide, from which more than 10000 deaths were reported in Jordan.⁸ Due to the high contiguity of COVID-19, preventative measures should be implemented to reduce its transmission such as lockdown, social distancing and vaccinations.^{9,10} Despite the seriousness of the disease and its ability to spread rapidly, people still have low readiness for getting the COVID-19 vaccines.^{11,12}

Community pharmacists are perceived as a highly qualified and accessible professional group.¹³ Providing vaccination in community pharmacies, not only for COVID19, but also for any other infectious disease, could increase the vaccination coverage rate and help reducing the workload of the healthcare system.¹⁴ Earlier studies reported that only half of the community pharmacists were willing to provide vaccination services in Canada and Saudi Arabia.^{15,16} Furthermore, several barriers to provide vaccination in the community pharmacy setting are reported in the literature. An earlier Saudi study showed that lack of training, lack of patients' demand, lack of private area to provide vaccines and lack of reimbursement were the barriers for vaccination provision.¹⁶ A Poland study reported that lack of reimbursement, lack of training, lack of time and concerns about patients' safety were the barriers for the vaccination service.¹⁷ On the other hand, lack of space, lack of support staff, poor knowledge about vaccines, lack of training on indications and contraindications of vaccines, lack of authorization, lack of reimbursement, lack of physician support and lack of time were the barriers to provide the vaccines at the community pharmacy setting in Canada.¹⁵ A study conducted in the United State reported that lack of time, poor level of knowledge and training and lack of authorization were the most recognized barriers to provide the vaccines in community pharmacies.¹⁸ There are limited data about community

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pharmacists' willingness to provide vaccination services and what barriers they could face to provide the vaccines at their work place in Jordan.

Aim of the study

The aim of the present study was to evaluate community pharmacists' willingness to provide the vaccine for COVID-19 and other infectious diseases. The study also aimed to explore the barriers to provide the vaccine at the community pharmacy setting and its associated factors.

Materials and methods

Study design and subjects

The present cross-sectional online survey study was conducted anonymously on community pharmacists at community pharmacy setting across different regions in Jordan in the period from February through June 2021. The study included registered community pharmacists who are licensed to work by the Jordanian Pharmaceutical Association. Pharmacy technicians were excluded from the study.

Study instrument

The survey was adopted from a study conducted in Saudi Arabia with some rewording and sentence rephrasing.¹⁶ The first draft of the questionnaire was reviewed by clinical experts and modifications were implemented based on their recommendations. The survey was piloted on a small sample of ten community pharmacists to receive feedback on the appropriateness, clarity and length of the study instrument. Piloted sample was not included in the final analysis of this study. The questionnaire was distributed via social media websites and closed pharmacists' groups. The cover page included a brief introduction which informed the participants that the study tends to explore their willingness and barriers to vaccinate for COVID-19 or any infectious disease, how the data will be used, and a statement that ensure the confidentiality of the study findings. Pharmacists were informed that the consent to participate in the study was attained once they completed the survey. The survey took an average of ten minutes to complete. The first part of the survey collected information about pharmacists' socio-demographics including age, sex, academic degree, university of a bachelor degree, years of experience, monthly income, employment status, type of pharmacy, and pharmacy location. The second part included eight items that evaluated pharmacists' willingness to provide vaccination service in community pharmacies. The last part included eleven items which explored the barriers that pharmacists face to provide the vaccine. For parts two and three, each item was answered on a 5-point Likert scale from strongly disagree (score 1) to strongly agree (score 5). Two scores were calculated, willingness to provide vaccination and barriers for providing vaccination scores. The pharmacists were classified to have low or high willingness and barriers to provide the vaccine according to the scores'

mean. The Cronbach's alpha results showed good internal consistency in the willingness and barriers domains (0.86 and 0.78 respectively) and removing any item will not improve the internal consistency of the instrument.

Ethical approval

The study received ethical approval from the Institutional Review Board (IRB) and ethics committee at Jordan University of Science and Technology.

Statistical analysis

Data analysis was conducted using SPSS version 27. Categorical variables were presented as frequencies and percentages while continuous variables were presented as means and standard deviations (SD). Cronbach's alpha was computed to evaluate internal consistency of the barriers and willingness to provide vaccines domains. Two Stepwise forward binary regressions were conducted to identify the variables associated with willingness and barriers levels. The models included age, sex, degree, years of experience, pharmacy type, monthly income, and pharmacy location.

Results

A total of 201 pharmacists completed the survey. The mean age of the participants was 28 years (SD = 6.22). The majority of the participants were staff pharmacists (90.5%). Nearly half or more of the participants were females (50.7%), had a PharmD degree (56.2%), working in a single pharmacy (52.2%) and working in pharmacies in urban areas (69.2%). Less than half of the participants had a monthly income of less than 250 JD (44.3%). The demographic characteristics of the participants are presented in [Table 1](#).

As shown in [Table 2](#), only 61.7% of the pharmacists agreed that providing vaccines in community pharmacies reduces the cost to the patients. On the other hand, 92% of the participating pharmacists agreed that community pharmacists are more accessible to the patients than other healthcare professionals and confirmed their willingness to support the healthcare system by providing the vaccine to the patients (90.6%). As shown in [Table 3](#), lack of authorization (91.6%), lack of collaboration with other healthcare professionals (85.6%), and lack of space for storage (74.1%) were the most common barriers to provide the vaccine. More than half of the pharmacists indicated that lack of ongoing training and workshops (53.2%), lack of time (55.7%), lack of private area to provide the vaccine (56.8%) and lack of reimbursement (61.1%) as additional barriers. Some pharmacists believed that concerns about patients' safety (40.3%) and lack of patients' demand (48.3%) could hinder the process of vaccination in community pharmacies. Regarding pharmacists' willingness to provide vaccination, pharmacists were categorized into low or high willingness level based on the mean value (32.9, SD = 4.77). Regarding barriers to vaccinate, pharmacists were divided into high or low barriers level depending on the mean score (39.29, SD = 5.98).

Table 1. Demographics characteristics of the participating pharmacists (n = 201).

Characteristics	N (%)	Mean (SD)
Age		28 (6.22)
Sex		
Male	99 (49.3)	
Female	102 (50.7)	
Years of experience		4.18 (5.52)
Education level		
BSc Pharmacy	87 (43.3)	
Pharm D	110 (54.7)	
Master degree	3 (1.5)	
Master student	1 (0.5)	
Place of work		
Single pharmacy	105 (52.2)	
Chain Pharmacy	96 (47.8)	
University of bachelor degree		
Al Ahliyya Amman University	40 (19.9)	
Al Zaytoonah University	7 (3.5)	
Jordan University of Science and Technology	89 (44.3)	
Philadelphia University	4 (2.0)	
Sindh university	2 (1.0)	
The Hashemite University	4 (2.0)	
University of Jordan	18 (9.0)	
University of Petra	2 (1.0)	
Yarmouk University	34 (16.9)	
Damascus University	1 (0.5)	
Pharmacy location		
Rural area	62 (30.8)	
Urban area	139 (69.2)	
Monthly income		
Less than 250 JD	89 (44.3)	
250–500 JD	36 (17.9)	
More than 500 JD	76 (37.8)	
Employment status		
Staff pharmacist	182 (90.5)	
Pharmacy owner	19 (9.5)	

Table 2. Pharmacists' willingness to provide vaccination in pharmacies.

	Strongly agree/agree	Mean (SD)
Community pharmacists have a good knowledge of vaccines and immunization process	176 (87.5%)	4.29 (0.81)
Community pharmacists are more accessible to patients than other health care professionals	185 (92.0%)	4.32 (0.77)
Immunization in community pharmacies is more convenient to the patients	175 (87.0%)	4.17 (0.84)
Immunization in community pharmacies improves the therapeutic relationship between community pharmacists and patients	179 (89.0%)	3.99 (0.58)
Immunization in community pharmacies encourage people to get the vaccine and improve the vaccination coverage rate	173 (86.0%)	3.89 (0.67)
Vaccination in community pharmacies reduces the cost to patients	124 (61.7%)	3.65 (1.23)
I feel happy to expand the patient services to include immunization	177 (88.0%)	4.34 (0.88)
I am happy to support the health care system during COVID-19 through the administration of vaccine to the patients	182 (90.6%)	4.28 (0.81)

Among the 201 participating pharmacists, 174 pharmacists showed high willingness and 109 reported high barriers level. Pearson correlation test showed a positive strong correlation between willingness and barriers score ($R = -0.62$, $P \text{ value} < .01$).

The binary logistic regression results (Table 4) indicated that the level of willingness was significantly lower among

Table 3. Barriers to providing immunization in pharmacies.

	Strongly agree/agree	Mean (SD)
Lack of authorization	184 (91.6%)	4.50 (0.79)
Lack of collaboration with other healthcare professionals	172 (85.6%)	4.37 (0.92)
Poor quality of university education	53 (26.4%)	2.73 (0.89)
Lack of continuous training and workshops	107 (53.2%)	3.44 (1.31)
Concern about patients safety	81 (40.3%)	3.03 (0.93)
Pharmacists feel uncomfortable with needles	38 (18.9%)	2.74 (0.84)
Lack of time	112 (55.7%)	3.36 (0.90)
Lack of space for storage	149 (74.1%)	3.74 (1.01)
Lack of private area to provide the vaccination	114 (56.8%)	3.52 (0.83)
Lack of reimbursement (profitability)	123 (61.1%)	3.86 (0.94)
Low patients demand	97 (48.3%)	3.36 (1.38)

Table 4. Association between sample characteristics and willingness and barriers levels.

Willingness to provide vaccination level			
Variable	Odds ratio (OR)	P value*	95% C.I
BSc pharmacy degree	0.18	<0.0001	0.07–0.46
Barriers against providing vaccination level			
Variable	Odds ratio (OR)	P value*	95% C.I
BSc pharmacy degree	4.86	0.007	1.56–15.17
Years of experience	0.85	0.002	0.77–0.94
Male sex	6.10	<0.0001	2.29–16.22
Chain pharmacy	8.98	<0.0001	3.19–25.24
Rural areas	4.31	0.004	1.61–11.53
Income (250–500 JD)	19.34	0.001	3.41–109.83

*Significance level is $P \text{ value} < 0.05$.

pharmacists with a bachelor's degree in pharmacy when compared to those with Pharm D degree (OR = 0.18 (0.07–0.46), $P \text{ value} < .01$). Male pharmacists, pharmacists working in chain pharmacies or rural areas, pharmacists receiving salaries between 250 and 500 JD and those with less years of experience reported a significantly higher barriers level (OR: 6.10, 8.98, 4.31, 19.34 and 0.85 respectively). Pharmacists with pharmacy background reported a significantly higher level of barriers than Pharm D participants (OR = 4.86 (1.56–15.17), $P \text{ value} < .01$).

Discussion

Vaccination played a crucial role to prevent some diseases from spreading in the community for hundreds of years. After the pandemic of COVID-19, the immunization process becomes even more important to decrease the spread of the infection. Hence, expanding the scope of practice of pharmacists to include vaccination could be streamlined to potentially allow optimal opportunities for the community to receive the required vaccination. Several studies reported that providing vaccination service in the community setting could help increasing the availability of the vaccines, accelerating the

vaccination process, increasing the number of vaccinated people, and reducing the risk of developing complications and new infectious diseases in addition to cost-saving.^{19–22} Therefore, it is essential to investigate community pharmacists' willingness to vaccinate and the associated barriers to provide the vaccination service.

The study results showed that 86.6% of the study pharmacists had high willingness level which was higher than the percentage reported in Saudi¹⁵ (55%) and Canadian¹⁷ (51%) studies.^{16,18} The difference in willingness to vaccinate by Jordanian pharmacists compared to those from other countries could be explained by that the other studies were conducted earlier in the pandemic, where pharmacists were less certain about what was required to support public health and they might were fearful of contracting COVID-19 themselves. Despite the high willingness, many pharmacists in the present study disagreed that providing vaccines in community pharmacies reduces the cost to the patients. A study published in 2017 revealed that administrating vaccines in community pharmacies can provide cost saving up to \$2.8 billion to third-party payers and \$99.8 billion to society.¹⁹

Consistent with earlier studies' findings,^{15,17,18} lack of authorization was the most common barrier to provide vaccination service in the present study. According to the national guidance, pharmacists are not authorized to provide the vaccination service in Jordan, which is allowed in many European countries such as United Kingdom, Norway, Greece and Portugal.¹⁴ Consistent with the findings from Canada,¹⁴ lack of collaboration with other healthcare professional and lack of space for storage were identified as barriers to vaccine administration in the present study.¹⁵ Another study reported that collaboration between pharmacists and other healthcare centers is necessary for the implementation of vaccination services in pharmacies.¹⁷ In the current study, around half of the pharmacists identified lack of training and workshop as a barrier to provide vaccines in community pharmacies, which is consistent with findings from Saudi study where lack of training workshops was reported as a barrier to vaccinate by the majority of the pharmacists.¹⁶ A Polish study reported that pharmacists who completed the training workshop had significantly higher willingness and lower barriers to provide the vaccination service. The study also recommended the development of specific guidelines for vaccination administration in pharmacies to prepare well-trained pharmacists to implement this service.¹⁷

When investigating pharmacists' willingness to provide vaccines in community pharmacies and its associated barriers, we must put into consideration the patient-related barriers which could influence the vaccination process. Nearly half of the pharmacists in this study and 90% of the pharmacists in Saudi study¹⁶ believed that low patient demand on the administration of vaccines in community pharmacies could be a barrier. Hence, further studies should be carried out to investigate the readiness of the patients to receive vaccination in community pharmacies. Literature reported poor patient knowledge, concern about vaccination safety, difficulties in transportation to vaccination facilities and waiting for long time to receive the vaccine were associated with lower

vaccination coverage rate.^{13,23,24} Therefore, providing vaccination services in community pharmacies could overcome these barriers and increase vaccination coverage rate.

In this study, Pharmacists with PharmD degree had significantly higher willingness level and less barriers to vaccinate when compared with pharmacy graduates, which could be attributed to the more clinical-oriented Pharm D program. Pharmacists with less years of experience had significantly higher level of barriers than those with more experience years in this study. The increase in knowledge and awareness that can be gained with longer duration of pharmacy practice could help overcoming some of the barriers to vaccinate in the community pharmacy. The same explanation can be related to pharmacists who are earning more than 500 JD because they are often more qualified and tend to have more years of experience. On the other hand, pharmacists working in independent pharmacies significantly reported less barriers than those working in chain pharmacies, which is consistent with findings from an earlier study in Poland.²² The strong supervision in chain pharmacy could increase the concerns about the consequences of vaccine administration that might limit the vaccination service provision.

However, future qualitative work to obtain more in-depth information about pharmacists' barriers to vaccinate and the sources of such barriers is deemed necessary.

Limitations

A larger sample size would make the findings of this study more robust. The use of self-report method could make the obtained information prone to social desirability bias. Furthermore, the online questionnaire might only allow the participation of community pharmacists who have access to online resources to participate, which might enhance selection bias.

Conclusions

Despite the high willingness to provide vaccination in community pharmacies, several barriers to the vaccination process were identified in the present study. Implementation of training courses and educational programs, enhancing collaboration with other healthcare professionals and ensuring space for storage are factors that should be considered in future interventions designed to overcome modifiable barriers and to improve access to pharmacist-delivered vaccination services, particularly in communities with a low vaccination rate or limited access to pharmacy-based delivery of vaccinations. However, prior to developing such interventions, it is essential to expand the practice scope of community pharmacists by the national guidance and the private insurers to include the administration of vaccines and to enhance the pharmacy-based vaccination process, not only in Jordan, but also in other countries where lack of pharmacists' authorization is a barrier. Doing so would limit patients' referral to other sites for vaccination, make vaccination more convenient and less frustrating and increase access for those in rural communities and ultimately decreasing patients' vaccine hesitancy.

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References

- Andre FE, Booy R, Bock HL, Clemens J, Datta SK, John TJ, Lee BW, Lolekha S, Peltola H, Ruff TA, et al. Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bull World Health Organ.* 2008;86(2):140–46. doi:10.2471/blt.07.040089.
- Violette R, Pullagura GR. Vaccine hesitancy: moving practice beyond binary vaccination outcomes in community pharmacy. *Can Pharm J (Ott).* 2019 [Published 2019 Oct 9];152(6):391–94. doi:10.1177/1715163519878745.
- Centers for Disease Control and Prevention. Ten great public health achievements — worldwide, 2001–2010: Morbidity and mortality weekly report (MMWR). 2011 Jun 24 [accessed 2021 Oct 6]. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6024a4.htm>
- Poudel A, Lau ETL, Deldot M, Campbell C, Waite NM, Nissen LM. Pharmacist role in vaccination: evidence and challenges. *Vaccine.* 2019;37(40):5939–45. doi:10.1016/j.vaccine.2019.08.060.
- Ecarnot F, Crepaldi G, Juvin P, Grabenstein J, Del Giudice G, Tan L, O'Dwyer S, Esposito S, Bosch X, Gavazzi G, et al. Pharmacy-based interventions to increase vaccine uptake: report of a multidisciplinary stakeholders meeting. *BMC Public Health.* 2019;19(1):1698. doi:10.1186/s12889-019-8044-y.
- Barazzoni R, Bischoff SC, Breda J, Wickramasinghe K, Krznaric Z, Nitzan D, Pirlich M, Singer P. ESPEN expert statements and practical guidance for nutritional management of individuals with SARS-CoV-2 infection. *Clin Nutr.* 2020;39(6):1631–38. doi:10.1016/j.clnu.2020.03.022.
- Asakawa J, Mohrenweiser HW. Characterization of two new electrophoretic variants of human triosephosphate isomerase: stability, kinetic, and immunological properties. *Biochem Genet.* 1982;20(1–2):59–76. doi:10.1007/BF00484936.
- COVID live update: 232,027,107 cases and 4,753,640 deaths from the coronavirus - worldometer. [accessed 2021 Sep 25]. <https://www.worldometers.info/coronavirus/#countries>
- Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet.* 2020;395(10228):931–34. doi:10.1016/S0140-6736(20)30567-5.
- Hussein T, Hammad MH, Fung PL, Al-Kloub M, Odeh I, Zaidan MA, Wraith D. COVID-19 pandemic development in Jordan—short-term and long-term forecasting. *Vaccines.* 2021;9(7):728. doi:10.3390/vaccines9070728.
- Al-Qerem WA, Jarab AS. COVID-19 vaccination acceptance and its associated factors among a Middle Eastern population. *Front Public Health.* 2021 [Published 2021 Feb 10];9:632914. doi:10.3389/fpubh.2021.632914.
- Al-Qerem W, Jarab AS, Qarqaz R, Hayek MA. Attitudes of a sample of Jordanian young adults toward different available COVID-19 vaccines [published online ahead of print, 2021 Sep 6]. *Vacunas.* 2021. doi:10.1016/j.vacun.2021.07.008.
- Burson RC, Buttenheim AM, Armstrong A, Feemster KA. Community pharmacies as sites of adult vaccination: a systematic review. *Hum Vaccin Immunother.* 2016;12(12):3146–59. doi:10.1080/21645515.2016.1215393.
- An overview of current pharmacy impact on immunisation: a global report - UCL discovery. [accessed 2021 Aug 20]. <https://discovery.ucl.ac.uk/id/eprint/1519654/>
- Edwards N, Gorman Corsten E, Kiberd M, Bowles S, Isenor J, Slayter K, McNeil S. Pharmacists as immunizers: a survey of community pharmacists' willingness to administer adult immunizations. *Int J Clin Pharm.* 2015;37(2):292–95. doi:10.1007/s11096-015-0073-8.
- Balkhi B, Aljadhey H, Mahmoud MA, Alrasheed M, Pont LG, Mekonnen AB, Alhawassi TM. Readiness and willingness to provide immunization services: a survey of community pharmacists in Riyadh, Saudi Arabia. *Safety in Health.* 2018;4(1):2553. doi:10.1186/s40886-018-0068-y.
- Merks P, Religioni U, Bilmin K, Lewicki J, Jakubowska M, Waksmundzka-Walczuk A, Czerw A, Barańska A, Bogusz J, Plagens-Rotman K, et al. Readiness and willingness to provide immunization services after pilot vaccination training: a survey among community pharmacists trained and not trained in immunization during the COVID-19 pandemic in Poland. *Int J Environ Res Public Health.* 2021;18(2):599. doi:10.3390/ijerph18020599.
- Kummer GL, Foushee LL. Description of the characteristics of pharmacist-based immunization services in North Carolina: results of a pharmacist survey. *J Am Pharm Assoc (2003).* 2008;48(6):744–51. doi:10.1331/JAPhA.2008.07080.
- Bartsch SM, Taitel MS, DePasse JV, Cox SS, Smith-Ray RL, Wedlock P, Singh TG, Carr S, Siegmund SS, Lee BY, et al. Epidemiologic and economic impact of pharmacies as vaccination locations during an influenza epidemic. *Vaccine.* 2018;36(46):7054–63. doi:10.1016/j.vaccine.2018.09.040.
- Schwerzmann J, Graitcer SB, Jester B, Krahl D, Jernigan D, Bridges CB, Miller J. Evaluating the impact of pharmacies on pandemic influenza vaccine administration. *Disaster Med Public Health Prep.* 2017;11(5):587–93. doi:10.1017/dmp.2017.1.
- Isenor JE, Bowles SK. Opportunities for pharmacists to recommend and administer routine vaccines. *Can Pharm J (Ott).* 2019 [Published 2019 Oct 16];152(6):401–05. doi:10.1177/1715163519878473.
- Bacci JL, Hansen R, Ree C, Reynolds MJ, Stergachis A, Odegard PS. The effects of vaccination forecasts and value-based payment on adult immunizations by community pharmacists. *Vaccine.* 2019;37(1):152–59. doi:10.1016/j.vaccine.2018.11.018.
- Fournet N, Mollema L, Ruijs WL, Harmsen IA, Keck F, Durand JY, Cunha MP, Wamsiedel M, Reis R, French J, et al. Under-vaccinated groups in Europe and their beliefs, attitudes and reasons for non-vaccination; two systematic reviews. *BMC Public Health.* 2018;18(1):196. doi:10.1186/s12889-018-5103-8.
- Alici DE, Sayiner A, Unal S. Barriers to adult immunization and solutions: personalized approaches. *Hum Vaccin Immunother.* 2017;13(1):213–15. doi:10.1080/21645515.2016.1234556.