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Recommending COVID-19 vaccination for adolescents in primary care

Peyton Thompson[1,†,*], Lauren McCormick[2,†], Qian Huang[3], Melissa B. Gilkey[3,4], Susan Alton Dailey[3], Noel T. Brewer[3,4]

[1]Department of Pediatrics, Division of Infectious Diseases, School of Medicine, University of North Carolina, Chapel Hill, NC, United States
[2]Department of Biology, University of North Carolina, Chapel Hill, NC, United States
[3]Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina, Chapel Hill, NC, United States
[4]Lineberger Comprehensive Cancer Center, University of North Carolina, Chapel Hill, NC, United States

[†]Co-first authors.
*Corresponding author: Department of Pediatrics, Division of Infectious Diseases, School of Medicine, University of North Carolina, 2336 Molecular Biomolecular Research Building, CB 7036, Chapel Hill, NC 27599, United States. Email: peyton_thompson@med.unc.edu

Background: COVID-19 vaccines are available for adolescents in the United States, but many parents are hesitant to have their children vaccinated. The advice of primary care professionals strongly influences vaccine uptake.

Objective: We examined the willingness of primary care professionals (PCPs) to recommend COVID-19 vaccination for adolescents.

Methods: Participants were a national sample of 1,047 US adolescent primary care professionals. They participated in an online survey in early 2021, after a COVID-19 vaccine had been approved for adults but before approval for adolescents. Respondents included physicians (71%), advanced practice providers (17%), and nurses (12%). We identified correlates of willingness to recommend COVID-19 vaccination for adolescents using logistic regression.

Results: The majority (89%) of respondents were willing to recommend COVID-19 vaccination for adolescents, with advanced practice providers and nurses being less likely than paediatricians to recommend vaccination (84% vs. 94%, aOR 0.47, 95% CI 0.23–0.92). Respondents who had received at least one dose of a COVID-19 vaccine were more likely to recommend adolescent vaccination (92% vs. 69%, aOR 4.20, 95% CI 2.56–6.87) as were those with more years in practice (94% vs. 88%, aOR 2.93, 95% CI 1.79–4.99). Most respondents (96%) said they would need some measure of support in order to provide COVID-19 vaccination to adolescents, with vaccine safety and efficacy information being the most commonly cited need (80%).

Conclusion: Adolescent primary care professionals were generally willing to recommend COVID-19 vaccination. However, most indicated a need for additional resources to be able to administer COVID-19 vaccines at their clinic.

Key words: adolescents, COVID-19, immunization, paediatrics, primary care

Background

Mass vaccination of adults against COVID-19 combined with seasonal changes reduced infection rates in the United States in the first half of 2021.[1,2] However, given that about a quarter of the US population is currently under the age of 18 years and a substantial proportion of adults have not received the vaccine, vaccinating adults alone is insufficient. With US approval of a COVID-19 vaccine for use among those ages 12 years and older in May 2021,[3] understanding how amenable the public is to vaccinating adolescents is essential. As of the end of November 2021, adolescent COVID-19 vaccination coverage in the United States remained lower than adult coverage (61.5% vs. 83% had received at least one vaccine dose, respectively).[4,5] This low coverage, combined with vaccine hesitancy among parents, underscores the necessity of investigating drivers of adolescent vaccination.

Surveys of US parents have found substantial vaccine hesitancy (up to 35%) surrounding adolescent COVID-19 vaccination.[6–12] However, fewer studies have examined the willingness of adolescent primary care professionals to recommend COVID-19 vaccination for their patients. In pre-pandemic research, healthcare professionals' recommendations strongly influenced parental perceptions of acceptability and uptake across a broad range of vaccines, including those recommended for adolescents.[3–17] A July 2021 poll found that nearly three-quarters of parents said the recommendation of their child's healthcare provider would be an important factor in their COVID-19 vaccine decision-making.[18] Thus, understanding primary care professionals' willingness to recommend COVID-19 vaccination for adolescents is essential as vaccine availability increases for younger populations. Before COVID-19 vaccination was approved for adolescents in the United States, we surveyed a national sample of primary care professionals about their willingness to recommend COVID-19 vaccines for adolescents. In presenting data from that survey, we hope to inform ongoing efforts to improve adolescent vaccination rates in the United States.

Methods

Participants

Participants were a national sample of U.S. adolescent healthcare professionals. Eligible healthcare professionals

Key messages

- Parents turn to primary care professionals in navigating adolescent vaccination.
- US surveys do not address perceptions of COVID-19 vaccine among paediatric primary care professionals (PCPs).
- PCPs were generally willing to recommend COVID-19 vaccination for adolescents.

included physicians (paediatricians and family physicians), advanced practice providers (nurse practitioners and physician assistants), and nurses who provided primary care to adolescents (ages 11–17 years) and had a role in providing adolescent vaccines. The survey company Sermo recruited participants from a standing national panel that they created through online registration, emails, referrals, and digital advertising. Sermo emailed the active study link and two reminders to invitees, allowing 2 weeks for responses after each email. The survey company also verified licensure information for all physicians who took part in the survey and excluded residents of Vermont in compliance with state policies governing primary care professionals' survey participation. More information on participant recruitment is available at this website.[19]

In total, 1,055 invitees accessed the survey. We excluded responses from eight respondents who did not see any adolescent patients in a typical week, making the final sample size 1,047. The response rate was 61% among physicians and 41% among advanced practice providers and nurses, calculated using the American Association for Public Opinion Research (AAPOR) Response Rate Calculator 4.1.[20]

Procedures

Participants took the survey online between 2021 February 22 and 2021 March 15. All respondents provided informed consent to participate in the survey and received up to $80 in compensation for their participation—compensation varied by regional market rates. We obtained approval from the University of North Carolina Institutional Review Board before initiating the study. See Supplemental File 3 for more information about the survey company's pre-testing process and survey confidentiality/anonymity.

Measures

Eight survey items addressed communication about COVID-19 vaccination for adolescents. The survey first introduced the topic of COVID-19 vaccines for adolescents by asking respondents to answer questions assuming "the vaccine is eventually approved for adolescents ages 11–17". We assessed willingness to recommend a COVID-19 vaccine for adolescents on a 5-point response scale ranging from "definitely not willing" (coded as 1) to "definitely willing".[5] The survey then asked which health conditions would prompt respondents to prioritize vaccination for an adolescent. Subsequent questions addressed practice-level considerations related to providing COVID-19 vaccination for adolescents: what support would be needed to vaccinate adolescents and where respondents would be comfortable with adolescents being vaccinated.

The survey then asked healthcare professionals to estimate the proportion of parents who would be likely to accept COVID-19 vaccination for their adolescent children, when given the opportunity. We recoded this as a binary variable for regression analyses, with responses of "none", "1–24%", and "25–50%" recoded as "fewer than half" and responses of "50–74%" and "75–100%" recoded as "more than half". This was done to increase the power of our regression analyses. The survey also assessed whether COVID-19 vaccines were increasing or decreasing parents' trust in routine vaccines for adolescents on a 5-point response scale ranging from "reducing trust a lot" (coded as 1) to "increasing trust a lot".[5]

The survey assessed respondents' sociodemographic and professional characteristics, including gender, race, number of adolescents seen in a typical week, and number of years in practice (Table 1). The survey also included questions about the following practice characteristics: rurality of the population served, US census region of the practice, specialty, whether the clinic is part of a healthcare system or network, and how much financial strain the practice has suffered due to COVID-19. The full survey instrument is available online at https://noelbrewer.web.unc.edu/hpv/ (Supplemental File 1).

Statistical analysis

We used bivariate logistic regression to identify correlates of willingness to recommend COVID-19 vaccination for adolescents, modelling the outcome as "willing to recommend" ("definitely willing" or "probably willing") versus "not willing to recommend" ("definitely not willing" and "probably not willing"). We then entered statistically significant correlates simultaneously into a multivariable model. We conducted these analyses using the Stats package in R (4.0.2). Statistical tests were two-tailed with an alpha of 0.05. There were no missing data, as the survey company (Sermo) required answers to all questions.

Results

Respondents were physicians from family medicine (44%) or other non-paediatric specialties (4%), paediatricians (23%), advanced practice providers (17%), and nurses (12%, Table 1). All said that they were involved in either prescribing or delivering vaccinations as part of routine care for adolescents. Nearly half (49%) of respondents were women, and about two-thirds were white (69%). The majority of respondents (87%) had received at least one dose of a COVID-19 vaccine. Respondents were from all regions of the United States and more often served urban (35%) or suburban (50%), rather than rural (15%), populations. Over half (56%) of practices operated within healthcare systems. Two-thirds of respondents (66%) reported that their clinic experienced moderate to severe financial strain on their practice during the pandemic.

Recommending COVID-19 vaccination for adolescents

Most respondents (89%) were willing to recommend COVID-19 vaccination for adolescents. Overall, 63% were

Table 1. Sample characteristics (n = 1,047).

Characteristics	n (%)
Respondent	
Training	
Paediatrician	238 (23)
Family physician	462 (44)
Other physician	47 (4)
Physician assistant or nurse practitioner	177 (17)
Nurse	123 (12)
Adolescent patients seen per week	
1–9 adolescents	283 (27)
10–24 adolescents	431 (41)
25+ adolescents	333 (32)
Years in practice	
0–9	252 (24)
10–19	395 (38)
20+	400 (38)
Gender	
Female	515 (49)
Male	492 (47)
Other[a]	40 (4)
COVID-19 vaccine uptake	
None	139 (13)
One dose	80 (8)
Two doses	828 (79)
Clinic	
Vaccine doses provided through VFC programme	
0% of doses	177 (20)
1–49% of doses	613 (59)
50%+ of doses	257 (25)
In a healthcare system	
No	457 (44)
Yes	590 (56)
Practice type	
Solo practice	127 (12)
Group practice	569 (54)
Hospital/academic institution	254 (24)
Other[b]	97 (9)
Financial strain due to pandemic	
None or a little	360 (34)
A moderate amount	489 (47)
A lot	198 (19)
Rurality	
Urban	363 (35)
Suburban	525 (50)
Rural	159 (15)
Region	
Midwest	247 (24)
Northeast	265 (25)
South	333 (32)
West	202 (19)

VFC, Vaccines for Children programme.
[a]Other n = 8; prefer not to say n = 32.
[b]Federally qualified health centre or community health centre n = 56; state or local department of public health, n = 7; local, community, or non-profit organization, n = 31; other n = 3.

definitely willing and 26% were probably willing. In a multivariable analysis, participants with 20 or more years in practice were more likely to be willing to recommend adolescent COVID-19 vaccination than those with fewer than 20 years of experience (94% vs. 86%, aOR 2.93, 95% CI 1.79–4.99). Willingness to recommend was also higher among those who had received at least one dose of a COVID-19 vaccine (92% vs. 69%, aOR 4.20, 95% CI 2.56–6.87) or perceived greater parental acceptance of COVID-19 vaccination (94% vs. 79%, aOR 3.65, 95% CI 2.38–5.66) (Table 2). Additionally, non-physician respondents were less likely to be willing to recommend adolescent vaccination than paediatricians (84% vs. 94%, aOR 0.47, 95% CI 0.23–0.92; Fig. 1). In bivariate but not multivariable analyses, family medicine physicians were less likely to recommend vaccination than paediatricians (90% vs. 94%, OR 0.54, 95% CI 0.28–0.96).

Primary care professionals reported they would prioritize COVID-19 vaccination for adolescents with underlying medical conditions: asthma or other respiratory diseases (75%), immunocompromising conditions (74%), diabetes (71%), heart problems (68%), and obesity (60%, Supplemental File 2). Most (62%) would also prioritize vaccinating adolescents who live in a household with a family member at high risk for COVID-19.

Implementing COVID-19 vaccination for adolescents

Respondents reported needing the following support in order to provide COVID-19 vaccination to adolescents (Table 3): information about efficacy and safety (80%), answers to common questions (70%), a mechanism to report doses in the state registry (57%), training for staff (55%), information about billing (50%), and a mechanism to report doses in the electronic health record (49%). Respondents reported feeling comfortable with adolescents receiving a COVID-19 vaccine at primary care clinics (83%), health department clinics (78%), mass vaccination clinics (58%), a mass vaccination day at school (54%), or a pharmacy (51%) (Fig. 2).

COVID-19 vaccination and parents of adolescents

The majority of respondents (65%) reported that greater than half of parents at their clinic would likely accept COVID-19 vaccination for their children, nearly a third (32%) responded that less than half would likely accept, and the remaining 3% were unsure. When asked how COVID-19 vaccines are likely to impact parents' trust in the safety of routine vaccines for adolescents, nearly half (49%) of respondents said that COVID-19 vaccines would likely have no effect. Of the remaining respondents, more reported that the arrival of COVID-19 vaccines was likely to increase parental trust in vaccine safety rather than reducing trust (30% vs. 21%, respectively).

Conclusions

In our national survey of adolescent primary care professionals, almost all were willing to recommend COVID-19 vaccines to their patients and the majority believed that most parents would accept vaccination for their children. Healthcare professionals indicated a willingness for adolescents to be

Table 2. Correlates of willingness to recommend COVID-19 vaccines for adolescents after approval.

	Willing to recommend[a]/total respondents in category (%)	Bivariate OR (95% CI)	Multivariable aOR (95% CI)
Respondent characteristics			
Training			
Paediatrician	224/238 (94)	Ref.	
Family physician or other physician	456/509 (90)	0.54 (0.28–0.96)*	0.55 (0.28–1.04)
Physician assistant, nurse practitioner, or nurse	252/300 (84)	0.33 (0.17–0.60)*	0.47 (0.23–0.92)*
Adolescent patients seen per week			
1–9 adolescents	248/283 (88)	Ref.	
10–24 adolescents	387/431 (90)	1.24 (0.77–1.99)	
25+ adolescents	297/333 (89)	1.16 (0.71–1.91)	
Years in practice			
0–19	542/629 (86)	Ref.	
20+	366/389 (94)	2.55 (1.61–4.21)*	2.93 (1.79–4.99)*
COVID-19 vaccine uptake			
Never received a dose	96/139 (69)	Ref.	
Received at least one dose	836/908 (92)	5.20 (3.36–8.00)*	4.20 (2.56–6.87)*
Clinic characteristics			
Vaccine doses provided through VFC programme			
0% of doses	159/177 (90)	Ref.	
1–49% of doses	547/613 (89)	0.94 (0.53–1.59)	
50%+ of doses	226/257 (88)	0.83 (0.44–1.51)	
In a healthcare system			
No	404/457 (88)	Ref.	
Yes	528/590 (89)	1.12 (0.76–1.65)	
Practice type			
Solo/group practice	618/696 (89)	Ref.	
Hospital/academic/other institution	314/351 (89)	1.07 (0.71–1.64)	
Financial strain due to pandemic			
None or a little	311/360 (86)	Ref.	
A moderate amount or a lot	621/687 (90)	1.48 (1.00–2.19)	
Rurality			
Urban	325/363 (90)	Ref.	
Suburban	464/525 (88)	0.89 (0.58–1.36)	
Rural	143/159 (90)	1.05 (0.57–1.98)	
Region			
Northeast	240/265 (91)	Ref.	
Midwest	217/247 (88)	0.75 (0.43–1.32)	
South	298/333 (89)	0.89 (0.51–1.52)	
West	177/202 (88)	0.74 (0.41–1.33)	
Perceived proportion of vaccine-accepting parents			
Less than half	267/337 (79)	Ref.	
More than half	641/681 (94)	4.20 (2.79–6.40)*	3.65 (2.38–5.66)*

[a]Healthcare professionals categorized as being willing to recommend responded that they were either probably willing or definitely willing to provide COVID-19 vaccines to adolescents upon approval.
*$P < 0.05$.

vaccinated in a variety of settings. Most respondents also expressed an intention to prioritize vaccination for adolescents with underlying conditions, an approach that mirrors that taken with adults.[21] In order to provide COVID-19 vaccines for adolescent patients, the majority of respondents stated that they would need some level of informational support, most commonly information about vaccine safety and efficacy. This survey provides important baseline information as COVID-19 vaccines become available to younger children.

A lower willingness to recommend vaccination was associated with individual respondent characteristics, including type of training, years in practice, and respondent vaccination

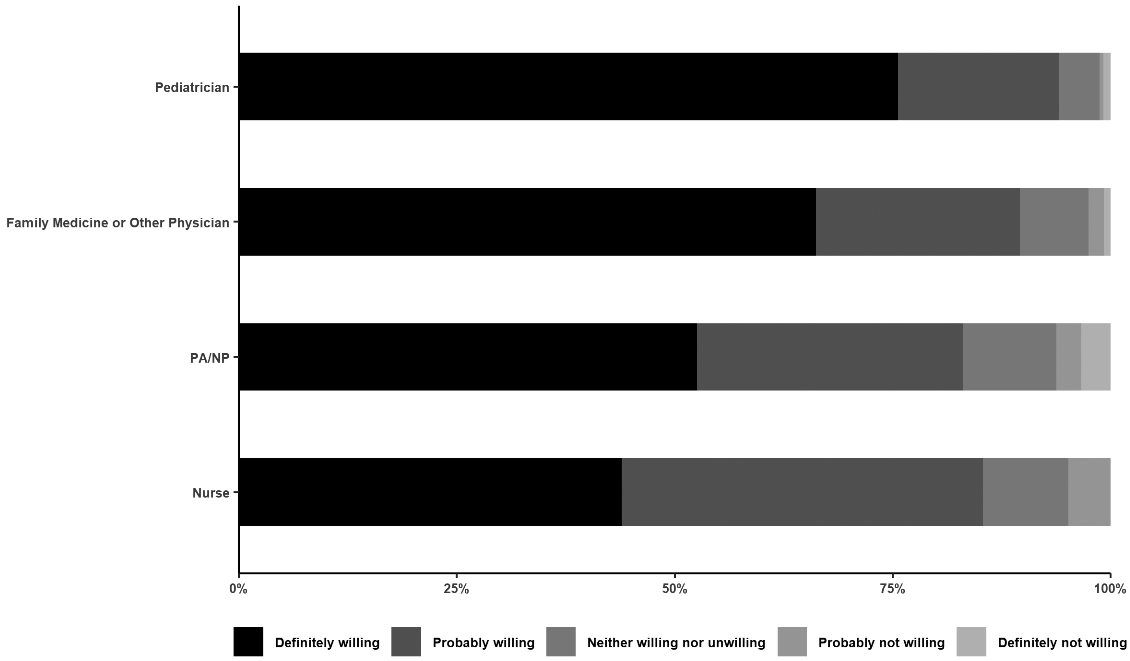

Fig. 1. Willingness to recommend COVID-19 vaccination for adolescents once approved by provider type.

Table 3. Support needed to provide COVID-19 vaccination to adolescents.

Requested support	%
Information about vaccine safety and efficacy	80
Answers to common questions	70
Mechanism to record doses in state vaccine registry	57
Training for staff	55
Information about billing	50
Mechanism to record doses in electronic health record	49

n = 1,047. 4.2% (n = 44) of respondents indicated that they would not require any of these supports to provide COVID-19 vaccinations to adolescents.

status. Paediatricians were more willing to recommend COVID-19 vaccination for adolescents than non-physicians. A bivariate analysis also suggested that paediatricians were more willing to recommend vaccination than family physicians. Prior studies both of universal birth dose hepatitis B vaccination of infants and HPV (human papillomavirus) vaccination of 11- to 12-year-old females found that paediatricians were more amenable to adopting new vaccine recommendations than family medicine physicians.[22,23] It is important to note, however, that the association between physician training and willingness to recommend vaccination did not hold in a subsequent multivariate analysis, indicating that other variables have a mediating effect on this relationship. Additionally, we found that healthcare professionals who had been practicing for at least 20 years were more willing to recommend vaccination than those with less experience, which is in line with data collected for other vaccines, such as HPV.[24] Our study also revealed a strong association between respondent COVID-19 vaccination status and willingness to recommend the vaccine for adolescents. This association is intuitive since unvaccinated healthcare professionals are more likely to be wary of currently available COVID-19 vaccines than their vaccinated counterparts. This finding suggests a need for in-depth exploration of providers' personal vaccine decision-making processes and subsequent education to mitigate hesitancy.

Our results highlight the importance of informational and programmatic support for healthcare professionals on multiple levels. First, respondents indicated a widespread need for sufficient information regarding vaccine safety and efficacy as well as answers to common questions in order to administer COVID-19 vaccines in their clinics. This need is best addressed at the national level as this type of information about COVID-19 vaccines should be transferable nationwide. Fortunately, COVID-19 informational websites curated by the US Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) already provide a wide range of vaccine information for parents and healthcare professionals alike.[25–27] Many respondents indicated a need for additional informational support, suggesting an opportunity for more extensive dissemination efforts to healthcare professionals. Further research is needed to understand healthcare professionals' knowledge of existing COVID-19 vaccination resources and specific additional needs. Second, more than half of respondents indicated that they would need a mechanism for reporting vaccinations in a state registry, highlighting the need for individual state health departments to provide clear communication about reporting systems and requirements. Given that adolescent vaccination has been preceded by adult vaccination and the majority of these concerns are not unique to vaccinating younger populations, much of this infrastructure has already been established.[28–30] Finally, about half of respondents noted a need for billing information and a mechanism for recording doses in electronic health records, which requires preparation at the clinic or health system level.

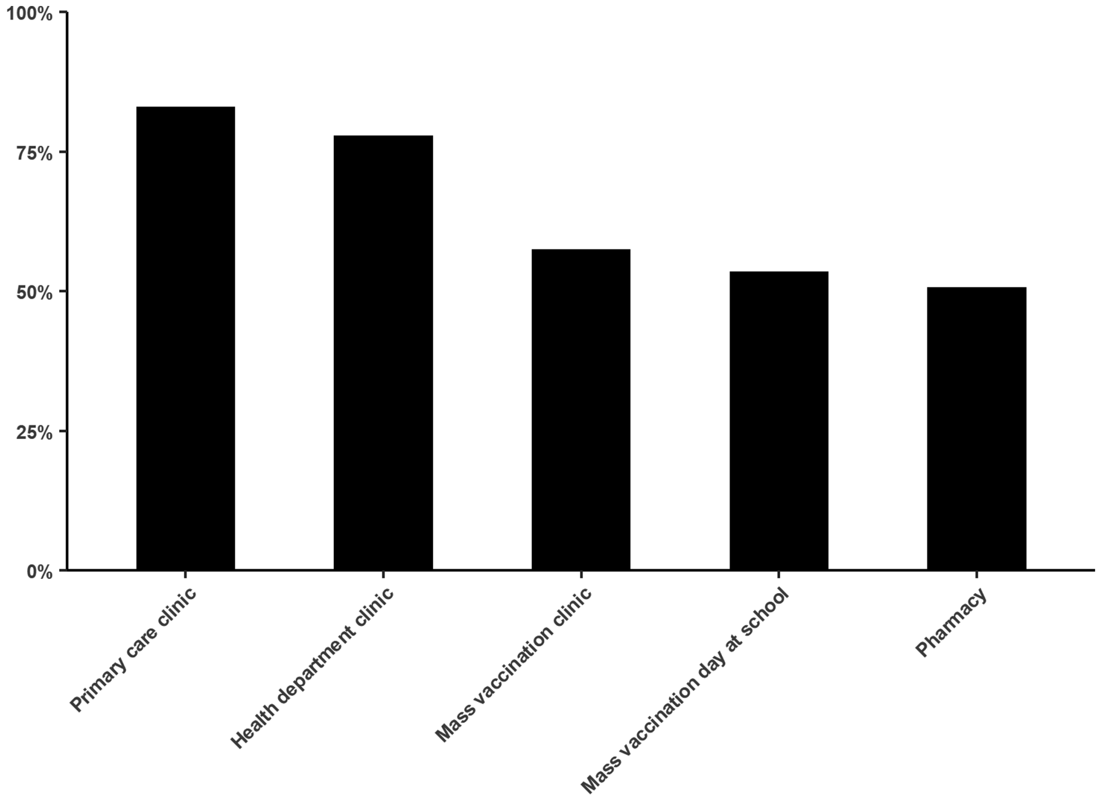

Fig. 2. Settings where primary care professionals would feel comfortable with adolescents receiving COVID-19 vaccination.

Respondents perceived heterogenous views among parents of their adolescent patients about vaccinating their children against COVID-19. The majority of respondents indicated they believed that more than half of the parents of their adolescent patients would likely have their children vaccinated. This roughly aligns with a March 2021 study of US parents, which found that just under half of respondents would be willing to vaccinate their children against COVID-19.[8] Importantly, however, about a third of respondents believed that less than half of parents at their clinic would likely accept a COVID-19 vaccine for their adolescent(s). This means that a substantial proportion of healthcare professionals in our survey believed that parents they interact with would react negatively to recommendations to vaccinate their children. Regardless of true parental attitudes towards adolescent COVID-19 vaccination, multivariable analyses revealed that healthcare professionals who perceived parents as being less likely to accept COVID-19 vaccines for their children were less willing to recommend COVID-19 vaccination. This finding mirrors those seen in prior studies of HPV vaccine recommendations in which perceived parental vaccine hesitancy dissuaded providers from recommending vaccination.[31,32] Based on this pattern, it is likely that primary care professionals would benefit from trainings focused on strategies for working with vaccine-hesitant patients and parents.

Since the time of this survey, one COVID-19 vaccine has been approved for emergency use in adolescents in the United States.[3] The data presented here offer important insights regarding healthcare professionals' willingness and ability to adopt new vaccine recommendations for their adolescent patients. Respondents' broad willingness to recommend COVID-19 vaccines for adolescents suggests that primary healthcare professionals' recommendations are unlikely to be a major barrier to vaccination. However, many parents have expressed concern about currently available COVID-19 vaccines given the unprecedented circumstances under which they were developed.[6,33] Thus, it is important that paediatric healthcare professionals are equipped with up-to-date vaccine information, the resources required for vaccine administration, and the communication skills necessary to allay fears.

The value of our study lies in its focus on the healthcare professionals who are responsible for both recommending and providing COVID-19 vaccinations to adolescents. While parental views on adolescent and paediatric vaccination have been widely studied, the views of adolescent healthcare professionals have received less attention despite the fact that their recommendations play a key role in vaccine uptake.[13–16,34] Although our focus on healthcare professionals was a strength, our results reflect an indirect measure of healthcare professionals' perceptions of parents' views. While it would have been ideal to align these results with the attitudes and beliefs of parents who interacted with respondents of our survey, the survey was not designed to accomplish this. Furthermore, our study evaluated adolescent primary care professionals' willingness to recommend COVID-19 vaccination, which may or may not reflect their future behaviour. Additional strengths of this study include our large, nationally representative sample, which contained a mixture of physicians, advanced practice providers, and nurses. The varied backgrounds represented in our sample provided a more robust understanding of healthcare professionals' views on adolescent vaccination than if we had only assessed physicians. That said, the underrepresentation of non-physician respondents in our study limited our ability to draw conclusions about the views of advanced practice providers and nurses. Additionally, our survey results may have been skewed by a self-selection bias given that only a fraction of those invited to participate actually completed the survey. Information on the demographic characteristics of survey non-respondents is unavailable. That said, while point estimates generated from convenience samples can have substantial bias, these samples typically yield accurate conclusions about associations.[35] We also note that the evolving nature of the COVID-19 pandemic makes any snapshot in time subject to limitations, which is not unique to our survey. Lastly, it is important to note that our survey was conducted just over 2 months after the first COVID-19 vaccine was granted an Emergency Use Authorization (EUA) by the US Food and Drug Administration (FDA). As a result, our findings reflect healthcare professionals' views on adolescent vaccination before vaccination was widespread. In the intervening months, additional safety and efficacy data have been released and COVID-19 vaccines are being approved for progressively younger age groups. Further research will be required to evaluate how these changes have influenced adolescent and paediatric healthcare professionals' willingness to recommend and provide COVID-19 vaccines.

Overall, the majority of adolescent primary care professionals in this survey were willing to recommend COVID-19 vaccination for their patients. Physicians were more willing to recommend vaccination than advanced practice providers and nurses. More years in practice, being vaccinated against COVID-19, and perceiving greater parental support for COVID-19 vaccination were also associated with a greater willingness to recommend adolescent vaccination. Further research is required to understand the extent to which willingness to recommend is predictive of healthcare professionals' actions. Additional studies are also needed to investigate the relationship between healthcare professionals' recommendations and adolescent COVID-19 vaccine uptake.

Supplementary material

Supplementary material is available at *Family Practice* online.

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Ethical approval

We obtained ethical approval from the University of North Carolina Institutional Review Board (IRB# 20-2102) before initiating the study.

Conflict of interest

Dr. NTB has served as a paid advisor for Merck, the Centers for Disease Control and Prevention, and the World Health Organization. Dr. PT receives funding from the National Institutes of Health, the American Society of Tropical Medicine and Hygiene (ASTMH)/Burroughs-Wellcome Fund, as well as research support from Abbott Laboratories. All COI for PT are outside of this work. The other authors declared no conflicts.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author. The survey tool is available in the Supplementary Material.

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