


# Perspectives of primary care physicians on acceptance and barriers to COVID-19 vaccination

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## ABSTRACT

**Objectives** The purpose of this study was to examine the perspectives of primary care physicians in Texas around vaccine acceptance and potential patient barriers to vaccination. National surveys have shown fluctuating levels of acceptance for COVID-19 vaccination, and primary care physicians could play a crucial role in increasing vaccine uptake.

**Design** This study employed a cross-sectional anonymous survey design to collect data using an online questionnaire. Participants were asked about vaccination practices and policies at their practice site, perceptions of patient and community acceptance and confidence in responding to patient vaccine concerns.

**Setting** From November 2020 to January 2021, family medicine physicians and paediatricians completed an online questionnaire on COVID-19 vaccination that was distributed by professional associations.

**Participants** The survey was completed by 573 practising physicians, the majority of whom identified as family medicine physicians (71.0%) or paediatricians (25.7%), who are currently active in professional associations in Texas.

**Results** About three-fourths (74.0%) of participants reported that they would get the vaccine as soon as it became available. They estimated that slightly more than half (59.2%) of their patients would accept the vaccine, and 67.0% expected that the COVID-19 vaccine would be accepted in their local community. The majority of participants (87.8%) reported always, almost always or usually endorsing vaccines, including high levels of intention to recommend COVID-19 vaccination (81.5%). Participants felt most confident responding to patient concerns related to education about vaccine types, safety and necessity and reported least confidence in responding to personal or religious objections to COVID-19 vaccination.

**Conclusions** The majority of the physicians surveyed stated that they would receive the COVID-19 vaccination when it was available to them and were confident in their ability to respond to patient concerns. With additional education, support and shifting COVID-19 vaccinations into primary care settings, primary care physicians can use the trust they have built with their patients to address vaccine hesitancy and potentially increase acceptance and uptake.

## Key points

### Question

- ▶ What are the perspectives of primary care physicians and pediatricians in Texas regarding COVID-19 vaccine acceptance and patient barriers to vaccination?

### Finding

- ▶ Vaccine acceptance was high among primary care physicians with the majority of the participants stating they would receive the COVID-19 vaccine when available. Physicians were highly confident that they could address patient concerns regarding receipt of the vaccine. However, the vast majority of participants reported that they disagreed with dismissing a patient for refusing the COVID-19 vaccine.

### Meaning

- ▶ Primary care physicians are in a unique position to address COVID-19 vaccine hesitancy and with additional training and support may be able to positively impact vaccination rates.

## INTRODUCTION

With emergency use authorisation for COVID-19 vaccines approved in December 2020, there is hope that the virus will become more controlled and a return to normalcy can be achieved. Essential to this goal is vaccinating enough of the population to achieve herd immunity, currently estimated at  $\geq 80\%$  of individuals in the USA.<sup>1</sup> However, this concept of achieving herd immunity is changing in respect to COVID-19 due to issues of vaccine hesitancy and uptake and may be unachievable, which is leading some to reorient towards reaching a reasonable level of 'normalcy'.<sup>2</sup> The number of Americans willing to receive the vaccination fluctuated throughout 2020, from as high as 72% in May to 60% in December.<sup>3</sup> A recently published (February 2021) systematic review reported a lower acceptance rate (56.9%), indicating that 3 months of vaccine delivery did not result in higher potential uptake.<sup>4</sup> COVID-19 vaccine uptake may especially be

harder among minority groups (eg, African-Americans) who experience more health inequities.<sup>5</sup>

To reach normalcy in the USA, all of those who report that they will accept the vaccine will have to do so, and a significant number of those who are vaccine hesitant will have to be motivated to vaccinate. Vaccine confidence and acceptance are largely predicated on trust in the safety and efficacy of the vaccine as well as in healthcare personnel, institutions and public and government officials who shape policies around vaccine dissemination and communication.<sup>6</sup> Evidence-based and novel strategies are needed to increase vaccine acceptance, especially in those communities with historical distrust of healthcare professionals or stringent antivaccination beliefs.<sup>7</sup> For example, Hildreth and Alcendor<sup>8</sup> suggested a multimedia approach using social media, flyers, pamphlets and radio commentaries in multiple languages in order to reach minority groups in the USA. They also propose the use of virtual town halls with community leaders in order to address questions that the general public might have about the COVID-19 vaccine.<sup>8</sup>

A sizeable body of literature demonstrates that healthcare clinician recommendation is one of the most important factors in decreasing vaccine hesitancy and improving vaccine confidence, thereby improving vaccine uptake.<sup>9,10</sup> This finding is borne out in two recent national surveys of US adult acceptance of a COVID-19 vaccine.<sup>7,11</sup> In the study by Head and colleagues, almost a quarter of respondents (n=739) reported that they would be more likely to receive the vaccine if their healthcare provider recommended it.<sup>11</sup> In a national study of 672 participants, the majority of respondents identified “their own physician” as the most reliable source of information about COVID-19.<sup>7</sup> It is important to note that vaccine hesitancy in parents when concerning childhood vaccinations has been linked being uncertain on whether they trust their paediatrician and to thoughts that their physician has not provided adequate information on vaccines.<sup>12,13</sup>

Undoubtedly, many patients will take the vaccine without any need for education, information or encouragement, but the novelty of the COVID-19 virus and vaccine technologies, as well as the speed of development, have the potential to introduce new barriers to vaccination. Furthermore, given that none of the initial vaccine trials enrolled children or pregnant women, and these groups tend to have higher incidences of vaccine hesitancy than the general population,<sup>14,15</sup> primary care physicians (PCPs) will be crucial in providing accurate information and addressing patient concerns as the US approaches future phases of vaccine candidacy.<sup>16</sup> However, while a few studies have gauged healthcare clinician acceptance of COVID-19 vaccines in general,<sup>17,18</sup> no studies to date have explored the perspectives of PCPs on providing the vaccine to patients, anticipated acceptance by their patient population or the sources of hesitancy and concern that they are preparing to address. It is important to note, unless indicated, the authors are including paediatricians

as PCPs based on definitions provided by the American Academy of Family Physicians.<sup>16</sup>

In order to gain insight into these factors, we surveyed paediatricians and family medicine physicians in Texas. Our objective was to understand PCPs’ experiences with COVID-19, their knowledge and willingness to receive the COVID-19 vaccines, their perspectives on their patients’ hesitancy to receive the vaccine and their willingness and reasons for dismissing a patient who refuses the COVID-19 vaccine.

## METHODS

### Participants and procedures

This cross-sectional study consisted of an online questionnaire that was disseminated to a combined total of 8364 family medicine physicians and paediatricians across Texas. Two professional associations, the Texas Academy of Family Physicians<sup>19</sup> and the Texas Pediatric Society,<sup>20</sup> were contacted and agreed to distribute the questionnaire to all active members via email from 20 November 2020 to 31 January 2021. It is important to note, during this time, two mRNA vaccines for COVID-19 were approved for emergency use authorisation for adults.<sup>21</sup> The professional associations sent an email containing the study description, contact information and a link to the questionnaire. Data were collected and stored using Research Electronic Data Capture, a web-based software used to aid research studies in securing and storing data.<sup>22,23</sup> Participants were not incentivised and were given the option to skip questions that they did not want to answer. Responses to the questionnaire were anonymous.

### Inclusion and exclusion criteria

The only inclusion criteria was that all participants had to be active members of one of the two professional associations.

### Measures

The questionnaire used in this study was developed by the investigators to assess the perspectives of the physicians regarding COVID-19 vaccination. In addition to background and demographic questions, we asked participants about their medical training, practice characteristics, and patient population. Participants were also asked about vaccination practices at their site, including the age ranges that they vaccinate, vaccine endorsement frequency and dismissal policies (ie, policies related to discontinuing medical care of a patient) related to patient vaccine hesitancy or refusal. To assess vaccine intentions, participants (ie, physicians) were asked if and when they would accept vaccination for COVID-19. They were also asked to identify potential types of COVID-19 vaccines (eg, viral vector), estimate acceptance of COVID-19 vaccines by their patients and in their community. Finally, participants were asked to rate their confidence in responding to concerns related to delaying or refusing COVID-19 vaccinations using a 10-point Likert scale,<sup>24</sup>

a psychometric method used to assess the attitudes and motivations of individuals.<sup>24</sup> Given that all questions were developed by the investigators specifically for this project and the recent onset of COVID-19, the questionnaire was not validated nor piloted prior to this study.

### Descriptive statistics

Responses to questions were summarised using descriptive statistics using SPSS V.26.<sup>25</sup> Percentages and means with SDs (when applicable) were reported for each response.

## RESULTS

Of the 676 individuals who opened the questionnaire, 103 did not complete any questions and were excluded from the data analysis. In total, 573 participants were included in the final sample.

### Demographics

A description of participants (n=573) and their practice setting are presented in [table 1](#). About 3/4 (71.0%) of the sample were family medicine physicians. Slightly more than half of the sample was white (59.3%), and about 10% were of Hispanic ethnicity. The most common religion among participants was Christianity of some type (55%). The type, size and location of clinical practice settings were quite diverse.

### Experiences with vaccines in patients

Participants' experiences with patient vaccination are presented in [table 2](#). Depending on the patient age group, from about 1/2 to 2/3 of participants reported that they provide vaccines to their patients in their practice. The majority of participants (87.8%) reported that they usually, always, or almost always endorse vaccines with their patients.

### COVID-19 vaccination expectations

Data on COVID-19 vaccination expectations are presented in [table 3](#). About 2/3 (65.6%) of participants were able to correctly identify the type of vaccine expected to be out soon as an RNA vaccine. Participants anticipated that over half (59.2%) of patients in their practice would accept the COVID-19 vaccine, and about 2/3 (67.0%) thought that the vaccine would be accepted in their local community. Three-fourths (74.0%) of participants indicated that they would get the vaccine as soon as it was available with only about 6% reporting that they would not get or were unsure if they would get the vaccine.

### COVID-19 vaccine and patient dismissal practices

As noted in [table 4](#), only a small number of participants (8.9%) indicated that they thought that physicians should dismiss parents or patients who refuse the COVID-19 vaccine. The most commonly cited potential reasons for dismissal were concern for either the safety of other patients (47.6%) or clinical staff (40.8%). In terms of rating their own confidence to respond to patients and

**Table 1** Description of sample and practice (n=573)

Variable	N or mean	% or SD
<b>Specialty</b>		
Family medicine	407	71.0
Paediatrics	147	25.7
Other*	18	3.1
Missing	1	0.2
Age (n=425)†	50.88	11.8
<b>Race</b>		
White	340	59.3
Asian	57	9.9
Black/African-American	18	3.1
Other	17	3.0
Missing	141	24.6
Hispanic ethnicity	65	11.3
<b>Religion</b>		
Christianity Protestant	184	32.1
Christianity Catholic	88	15.4
No religion	50	8.7
Christianity other	43	7.5
Prefer not to answer	23	4.0
Judaism	13	2.3
Islam	8	1.4
Hinduism	7	1.2
Buddhism	5	0.90
Other	4	0.7
Missing	143	25.0
<b>Main clinical practice setting</b>		
Independent small solo or group practice (<10 physicians)	201	35.1
Employed by health system	131	22.9
Independent large group practice (>10 physicians)	76	13.3
Academic teaching clinic	62	10.8
Other/NA	42	7.3
Federally qualified health centre or community health centre	35	6.1
Urgent care	17	3.0
Veterans Affairs or other military services	4	0.7
Health department	1	0.2
<b>Number of physicians in practice where employed</b>		
Solo practice	129	22.5
2–3	129	22.5
4–10	188	32.8
>10	122	21.3
Missing	5	0.9
<b>Geographic location of primary practice</b>		

Continued

**Table 1** Continued

Variable	N or mean	% or SD
Suburban	253	44.2
Urban	218	38.1
Rural	90	15.7
Other/unknown/missing	12	2.1
Most common type of payor for practice		
Private insurance (includes Tricare)	291	50.8
Medicare	95	16.6
Medicaid/CHIP	93	16.2
Uninsured/charity/self-pay	41	7.2
Other/don't know/not applicable/missing	38	6.6
Number of patients seen per week in practice		
Less than 25	53	9.3
25–49	108	18.8
50–100	325	56.7
Other/NA/missing	87	15.2

\*The individuals who identified as 'other' specialty were members of the Texas Academy of Family Physicians and the Texas Paediatric Society but did not identify primarily as family medicine or paediatric physicians.

†Mean and SD.

parents who want to delay or refuse the vaccine, highest average confidence ratings were for issues related to patient education: belief that the vaccine would cause illness (8.12), not knowing enough about the vaccine (8.08) or thinking that it was not needed or necessary (7.92). Participants reported lowest average ratings of confidence for responding to parents or patients for whom the vaccine was not consistent with their religious or personal beliefs (5.85).

## DISCUSSION

Based on our results, we expect that the majority of family medicine physicians and paediatricians in Texas will accept vaccination for COVID-19, and most of those will do so as soon as possible. This finding aligns with other studies that show high acceptance of the vaccine among healthcare workers,<sup>26,27</sup> but this study is unique as it focuses specifically on the attitudes of PCPs in the USA. A similar study conducted with general practitioners (n=1623) and primary care nurses (n=1055) in Canada, France and Belgium from October to November 2020 found high levels of COVID-19 vaccine acceptance (74.98%).<sup>28</sup> Similarly high levels of participants (79.27%) reported that they would recommend COVID-19 vaccines to their patients. The high level of reported acceptance, coupled with frequent vaccine endorsement, including majority intention to endorse COVID-19 vaccination, is crucial as physician vaccine attitudes and recommendation are vital

**Table 2** Experiences with vaccines in practice

Variable	N	%
Location where majority of your patients receive their vaccines		
Age group: ages 0–2 years		
In own clinic	305	53.2
Health department	20	3.5
From other physician	31	5.4
Do not know/do not treat age group/missing	217	37.9
Age group: ages 2–18 years		
In own clinic	370	64.6
Health department	25	4.4
From other physician	28	4.9
Do not know/do not treat age group/missing	150	26.2
Age group: ages 18–65 years		
In own clinic	347	60.6
Health department	18	3.1
From other physician	26	4.5
Do not know/do not treat age group/missing	182	31.8
Age group: ages: over 65 years		
In own clinic	302	52.7
Health department	17	3.0
From other physician	25	4.4
Do not know/do not treat age group/missing	229	40.0
Frequency of endorsing vaccines with patients		
Always or almost always	488	85.2
Usually	15	2.6
Sometimes	1	0.2
Rarely or never	2	0.4
Missing	67	11.7

to patient uptake.<sup>10,29</sup> Participants estimated patient and community acceptance at rates similar to those reported in national surveys,<sup>3,7,30</sup> yet still not high enough to reach herd immunity or a level of normality.<sup>2</sup>

At the time of questionnaire dissemination, only the mRNA vaccines (Pfizer-BioNTech and Moderna) were candidates for emergency use authorisation.<sup>21</sup> While the majority of participants correctly identified these vaccine types, the novelty of the technology warrants increased physician education show that they can effectively answer patient questions, discuss how the vaccines work and address relevant concerns about safety and efficacy.<sup>31</sup> Informed approaches will be especially important as new variants arise, more vaccine types become available and more individuals become eligible for vaccination. In terms of dismissal policies, prior research has shown that

**Table 3** COVID-19 vaccine expectations

Variables	N or mean	% or SD
Correctly identified type of vaccine expected to be out soon (RNA)	376	65.6
Percentage of patients anticipated to accept the COVID-19 vaccine in your practice*	59.15	19.1
Believe that the COVID-19 vaccine will be accepted in your local community		
Yes	384	67.0
No	45	7.9
Do not know	74	12.9
Missing	70	12.2
When you will get the COVID-19 vaccine		
As soon as it is available	424	74.0
After it has been used for a few months	33	5.8
More than 6 months after introduced	13	2.3
Never	5	0.9
Not sure if I will get the COVID-19 vaccine	29	5.1
Missing	69	12.0
Will endorse the COVID-19 vaccine to your patients		
Yes	467	81.5
No	5	0.9
Do not know	32	5.6
Missing	69	12.0

\*Mean and SD.

most physicians do not endorse dismissing patients who refuse vaccines, though the practice has grown over the last decade and is more prominent among paediatricians than family medicine physicians.<sup>32</sup> We report similarly low endorsement of dismissal, though our findings are consistent with the few studies that show that dismissal is used to promote clinical safety and reduce disease risk for other patients.<sup>33</sup> While COVID-19 is highly transmissible, with a rate of reproduction ( $R_0$ ) ranging from 1.9 to 6.5,<sup>34</sup> and the effects are potentially life threatening, our study suggests that physicians may feel a duty to provide care to their patients and a willingness to assume risks associated with unvaccinated patients.

Our study identified physician self-reported confidence at high levels to respond to specific patient concerns about COVID-19 vaccination. Participants indicated that they felt most confident in situations related to educating patients where factual information might be used to address patient concerns. Specifically, most participants felt confident providing general information about the vaccines and discussing the safety and necessity of vaccination. PCPs and other healthcare professionals have

**Table 4** COVID-19 vaccine and patient dismissal practices

Variables	N or mean	% or SD
Physicians should dismiss parents or patients who refuse COVID-19 vaccination		
Strongly agree	17	3.0
Somewhat agree	34	5.9
Neither agree nor disagree	81	14.1
Somewhat disagree	129	22.5
Strongly disagree	210	36.7
Missing	102	17.8
What are potential reasons for dismissing families or patients who refuse COVID-19 vaccine?		
Concern for safety of other patients	273	47.6
Concern for the safety of clinical staff	234	40.8
Lack of shared goals for care	169	29.50
Lack of trust between patient and doctor	157	27.4
Other	54	9.4
Fear of litigation	41	7.2
Negative effect on quality metrics	40	7.0
How confident are you in your ability to respond to patients/parents who want to delay or refuse the COVID-19 vaccine because*		
They think the vaccine will cause illness	8.12	2.0
They do not know enough about it	8.08	1.9
It is not needed or necessary	7.92	2.0
They heard or read bad things about the vaccine in the news	7.52	2.2
They do not trust healthcare personnel	7.41	2.4
They have concerns about lasting health problems due to the vaccine	7.09	2.3
It is not consistent with their religious or personal beliefs	5.85	2.9

\*Mean and SD. For these questions, physicians rated their confidence on a scale of 1–10 with one being the least confident and 10 being the most confident.

been identified as trustworthy sources of COVID-19 information<sup>7</sup> and may be the best situated group to counter misinformation that could dissuade patients from accepting vaccination. A 2021 study of 5 years of Medicare data (2012–2017) found that PCPs provide the most vaccines in the USA,<sup>35</sup> which supports that they are both experienced and well equipped to provide COVID-19 vaccinations, immunisation counselling and ongoing clinical guidance to patients. However, others have noted that COVID-19 vaccinations in the USA have mainly been occurring outside of primary care settings, and thus, to encourage the vaccine hesitant to receive the COVID-19 vaccine, vaccination efforts may need to be shifted to

primary care in order to take advantage of the trust the PCPs have built with their patients.<sup>36</sup>

Participants reported that they felt the least confident in responding to patients' personal or religious objections. In this study, the majority of participants self-identified as having some type of religious affiliation, most commonly a Christian denomination. We did not collect data on the religious preferences or affiliations of participants' patients, but according to the Pew Research Center, 77% of adult Texans identify as Christian.<sup>37</sup> Thus, while there is ongoing debate within the medical and ethical literature about the role of physicians' spirituality in the practice of medicine,<sup>38</sup> it is possible some physicians may choose to have discussions about religion and its impact on vaccine decisions with their patients. However, it is unknown whether comfort level in having such discussions varies by the religion of the physician and patient.

PCPs are ideally situated to deliver guidance and messaging on COVID-19 vaccination. It is important to note that in general PCPs are given little or no training on how to manage discussion of controversial topics with their patients.<sup>18</sup> Therefore, providing training on how to address COVID-19 vaccine hesitancy or controversial topics in general may be beneficial to increase vaccination rates. To this end, PCPs may benefit from assistance from professional associations, medical institutions and local governments who provide factual information that they can provide to patients who are considering whether to accept the vaccine. Possible reasons for refusal will likely be diverse and vary by region of the USA, which may necessitate tailored messaging and thoughtful discussions. PCPs should emphasise the benefits of vaccination, including the ability to travel, visit loved ones in nursing homes and achieve a return to normalcy. Messaging should be adapted to physician comfort level, local contexts and patient factors in order to successfully impact vaccine uptake.

### Limitations

While this study provides timely data on physician's expectations for the COVID-19 vaccine, our sample was only conducted in one state and with just family medicine physicians and paediatricians, and thus the findings may not be generalisable to other physicians practising in other states. It is also possible that there are factors not addressed in this questionnaire that may impact vaccination uptake. The response rate for this questionnaire is also a significant limitation that could potentially hamper the generalisability of our findings, though we do report data from a variety of practice types and settings. Due to the low response rate, it is possible that response biases (ie, recall bias and social desirability bias) may have skewed the results of our sample and may not represent the population of PCPs in Texas. Furthermore, the rate of vaccine acceptance responses and endorsements could also be skewed by physicians' desire to report socially and scientifically accepted positions on vaccinations. Finally, given the method of sampling and the lack of data on actual vaccination behaviours (eg, COVID-19

vaccination status of participants or patients) follow-up studies are warranted to determine the vaccination uptake by PCPs and their patients in Texas. Nevertheless, the novelty of our findings and the role that they could play in future studies or in the development of messaging for patients should be balanced against the low rate of questionnaire return. The questionnaire and the questions contained within it were developed specifically for this study and were created to address issues that were important to the study investigators. Thus, the questionnaire is not validated and may not be generalisable to other study populations.

### Implications

These data can be used to assist in the development of targeted messaging aimed at improving vaccine uptake and advancing the public health goal of minimising disease and achieving a return to normality. With additional education, support and shifting COVID-19 vaccinations into primary care setting, PCPs can use the trust they have built with their patients to address vaccine hesitancy in their patients. Governments, institutions and medical associations should provide PCPs with the resources needed to respond to patient vaccine hesitancy and to increase vaccine confidence and uptake of COVID-19 vaccination.

### CONCLUSIONS

We surveyed PCPs in the state of Texas to assess their acceptance of COVID-19 vaccination and their perceptions of patient and community acceptance. The vast majority of the PCPs surveyed stated that they would receive the COVID-19 vaccination when it was available to them and were able to correctly identify the type of vaccines available. We found that PCP confidence to respond to patient concerns about COVID-19 vaccines was fairly high for all of the patient concerns identified. Finally, the PCPs in our study stated they would not dismiss a patient despite not receiving the COVID-19 vaccine, which suggests a commitment to the needs of all patients, including those who choose not to get the vaccine.

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**Contributors** PD is credited with substantial contribution to the design of the overall work, including reviewing relevant literature to create the study questionnaire, creating the questionnaire, identifying the means of questionnaire dissemination, coordinating dissemination and receipt of study data, interpreting the results, writing the first draft of the manuscript, approving revisions to the manuscript, final approval of the version to be published and agreement of accountability for all aspects of the work. CS is credited with significant contribution to the overall work, reviewing relevant literature, performing all statistical analysis, constructing and designing data tables, reviewing first and final drafts, providing significant revisions to the version to be published and agreement of accountability for all aspects of the work. NK and FDS are credited with providing substantial interpretation of the data from a clinical perspective, reviewing and approving included elements of the questionnaire, assisting in the dissemination of the questionnaire, reviewing and approving the first and final drafts, approval of the version to be published and agreement of accountability for all aspects of the work. EMA is credited with significant contribution to the study design, reviewing the

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## REFERENCES

- Anderson RM, Vegvari C, Truscott J, *et al*. Challenges in creating herd immunity to SARS-CoV-2 infection by mass vaccination. *Lancet* 2020;396:1614–6.
- Aschwanden C. Five reasons why COVID herd immunity is probably impossible. *Nature* 2021;591:520–2.
- Funk C, Tyson A. *Intent to get a COVID-19 vaccine rises to 60% as confidence in research and development process increases*. Pew Research Center, 2020: 3.
- Sallam M. COVID-19 vaccine Hesitancy worldwide: a Concise systematic review of vaccine acceptance rates. *Vaccines* 2021;9:160.
- Bogart LM, Ojikutu BO, Tyagi K, *et al*. COVID-19 related medical Mistrust, health impacts, and potential vaccine Hesitancy among black Americans living with HIV. *J Acquir Immune Defic Syndr* 2021;86:200–7.
- MacDonald NE, SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: definition, scope and determinants. *Vaccine* 2015;33:4161–4.
- Malik AA, McFadden SM, Elharake J, *et al*. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine* 2020;26:100495.
- Hildreth JEK, Alcendor DJ. Targeting COVID-19 vaccine Hesitancy in minority populations in the US: implications for herd immunity. *Vaccines* 2021;9:489.
- Jacobson RM, St Sauver JL, Griffin JM, *et al*. How health care providers should address vaccine hesitancy in the clinical setting: evidence for presumptive language in making a strong recommendation. *Hum Vaccin Immunother* 2020;16:2131–5.
- Darden PM, Jacobson RM. Impact of a physician recommendation. *Hum Vaccin Immunother* 2014;10:2632–5.
- Head KJ, Kasting ML, Sturm LA, *et al*. A national survey assessing SARS-CoV-2 vaccination intentions: implications for future public health communication efforts. *Sci Commun* 2020;42:698–723.
- Bianco A, Mascaro V, Zucco R, *et al*. Parent perspectives on childhood vaccination: how to deal with vaccine hesitancy and refusal? *Vaccine* 2019;37:984–90.
- Napolitano F, D'Alessandro A, Angelillo IF. Investigating Italian parents' vaccine hesitancy: a cross-sectional survey. *Hum Vaccin Immunother* 2018;14:1558–65.
- Kepe A, Saville AW, Albertin C, *et al*. Parental Hesitancy about routine childhood and influenza vaccinations: a national survey. *Pediatrics* 2020;146:e20193852.
- Wilson RJ, Paterson P, Jarrett C, *et al*. Understanding factors influencing vaccination acceptance during pregnancy globally: a literature review. *Vaccine* 2015;33:6420–9.
- American Academy of Family Physicians. Primary care: American Academy of family physicians, 2021. Available: <https://www.aafp.org/about/policies/all/primary-care.html>
- Gagneux-Brunon A, Detoc M, Bruel S, *et al*. Intention to get vaccinations against COVID-19 in French healthcare workers during the first pandemic wave: a cross-sectional survey. *J Hosp Infect* 2021;108:168–73.
- Katzman JG, Katzman JW. Primary care clinicians as COVID-19 vaccine Ambassadors. *J Prim Care Community Health* 2021;12:21501327211007026.
- Texas Academy of Family Physicians. Texas Academy of family physicians: Texas Academy of family physicians, 2021. Available: <https://www.taafp.org/>
- Texas Pediatric Society. Texas pediatric society: Texas pediatric Society, 2021. Available: <https://txpeds.org/>
- Food and Drug Administration. FDA takes additional acting in fight against COVID-19 by issuing emergency use authorization for second COVID-19 vaccine.: food and drug administration, 2020. Available: <https://www.fda.gov/news-events/press-announcements/fda-takes-additional-action-fight-against-covid-19-issuing-emergency-use-authorization-second-covid>
- Harris PA, Taylor R, Minor BL, *et al*. The REDCap Consortium: building an international community of software platform partners. *J Biomed Inform* 2019;95:103208.
- Harris PA, Taylor R, Thielke R, *et al*. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81.
- Joshi A, Kale S, Chandel S, *et al*. Likert scale: explored and explained. *Br J Appl Sci Technol* 2015;7:396–403.
- IBM Corp. *Statistics for windows, version 26.0*. Armonk, NY, 2019.
- Shekhar R, Sheikh AB, Upadhyay S, *et al*. COVID-19 vaccine acceptance among health care workers in the United States. *Vaccines* 2021;9:119.
- Di Giuseppe G, Pelullo CP, Della Polla G, *et al*. Surveying willingness toward SARS-CoV-2 vaccination of healthcare workers in Italy. *Expert Rev Vaccines* 2021;20:881–9.
- Verger P, Scronias D, Dauby N, *et al*. Attitudes of healthcare workers towards COVID-19 vaccination: a survey in France and French-speaking parts of Belgium and Canada, 2020. *Eurosurveillance* 2021;26:2002047.
- Suryadevara M, Handel A, Bonville CA, *et al*. Pediatric provider vaccine hesitancy: an under-recognized obstacle to immunizing children. *Vaccine* 2015;33:6629–34.
- Fisher KA, Bloomstone SJ, Walder J, *et al*. Attitudes Toward a Potential SARS-CoV-2 Vaccine : A Survey of U.S. Adults. *Ann Intern Med* 2020;173:964.
- Berg S. *Which COVID-19 vaccine should I get? what to tell your patients*. Chicago, IL: American Medical Association, 2021. <https://www.ama-assn.org/delivering-care/public-health/which-covid-19-vaccine-should-i-get-what-tell-your-patients>
- Garcia TB, O'Leary ST. Dismissal policies for vaccine refusal among US physicians: a literature review. *Hum Vaccin Immunother* 2020;16:1189–93.
- Flanagan-Klygis EA, Sharp L, Frader JE. Dismissing the family who refuses vaccines: a study of pediatrician attitudes. *Arch Pediatr Adolesc Med* 2005;159:929–34.
- Park M, Cook AR, Lim JT, *et al*. A systematic review of COVID-19 epidemiology based on current evidence. *J Clin Med* 2020;9:967.
- Wilkinson E, Jetty A, Petterson S, *et al*. Primary care's historic role in vaccination and potential role in COVID-19 immunization programs. *Ann Fam Med* 2021;19:351–5.
- Ratzan S, Schneider EC, Hatch H, *et al*. Missing the Point - How Primary Care Can Overcome Covid-19 Vaccine "Hesitancy". *N Engl J Med* 2021;384:e100.
- Pew Research Center. Religious landscape study: adults in Texas: Pew research center, 2021. Available: <https://www.pewforum.org/religious-landscape-study/state/texas/>
- Appleby A, Wilson P, Swinton J. Spiritual care in general practice: Rushing in or Fearing to Tread? an integrative review of qualitative literature. *J Relig Health* 2018;57:1108–24.