

Parental COVID-19 Vaccine Hesitancy in the United States

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Abstract

Objective: Little is known about parents' willingness to vaccinate their children against COVID-19. We assessed the prevalence of vaccine hesitancy among parents with a child or adolescent aged 12–15 years, examined predictors of parents' COVID-19 vaccine hesitancy, their reasons for resisting a pediatric COVID-19 vaccine, and the correlation between parents' intentions to vaccinate their child and the acceptance of a vaccine for themselves.

Methods: We conducted a national online survey of 637 parents of a child or adolescent aged 12–15 years in March 2021, before COVID-19 vaccines had been approved for this age group. We assessed univariate predictors of vaccine hesitancy, and we used logistic regression analysis to assess independent effects of variables on vaccine hesitancy.

Results: Nearly one-third (28.9%; 95% CI, 25.5%–32.5%) of respondents reported pediatric vaccine hesitancy. Vaccine-hesitant parents were less knowledgeable about vaccines, more accepting of vaccine conspiracies, and less worried about COVID-19 risks to their child's health than vaccine-accepting parents were. Vaccine hesitancy was higher among female (vs male), single (vs married/living as married), older (vs younger), low income (vs high income), non-college graduates (vs college graduates), and Republican (vs Democrat) parents. The primary concerns expressed by vaccine-hesitant parents pertained to vaccine safety rather than vaccine effectiveness. One-quarter of vaccine-hesitant parents preferred that their child obtain immunity through infection rather than vaccination. Non-vaccine-hesitant parents' reasons for vaccinating focused on protecting the health of their child and others. Childhood COVID-19 vaccine acceptance was strongly associated with parents' intentions to get the vaccine for themselves.

Conclusion: A messaging strategy for effective public health interventions that includes educating the public about vaccination, countering misinformation about vaccine development and safety, and stressing the safety of approved COVID-19 vaccines may boost vaccine acceptance among vaccine-hesitant parents.

Keywords

children, coronavirus, COVID-19, vaccine, conspiracy beliefs

By late August 2021, about 14% of all laboratory-confirmed COVID-19 cases were among children and adolescents aged <18 years.¹ As the number of cases increased, so did the number of children experiencing severe disease that required hospitalization.² New variants of the coronavirus continue to emerge, and unvaccinated children are at greater risk of severe illness from COVID-19 than vaccinated children.³ The Centers for Disease Control and Prevention (CDC) reported 587 pediatric COVID-19 deaths from January 1, 2020, through October 2, 2021.⁴ Vaccines are proven to reduce the incidence of disease, disability, and death from various infectious diseases in children,⁵ and a safe and effective pediatric COVID-19 vaccine has helped control rates of hospitalization in children.^{1–6}

Many US adults are hesitant to get vaccinated against COVID-19,⁷ and current COVID-19 pediatric vaccination rates vary widely in the United States.⁸ Vaccine hesitancy has been defined as “the delay in acceptance or refusal of

vaccination despite availability of vaccination services.”⁹ Although children are generally at lower risk of severe infection than adults, they do experience emotional distress, morbidity, and mortality from COVID-19.¹⁰ Childhood vaccination rates in the United States are generally stable for most vaccines,^{11,12} but COVID-19 vaccination rates vary by state.⁸ At the time of our assessment in March 2021, no approved pediatric COVID-19 vaccine was available for children and adolescents aged <16 years. In May 2021, 2 months after we collected data, the US Food and Drug Administration approved Pfizer's and BioNTech's request to allow children

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aged 12-15 years to be vaccinated against COVID-19 on an emergency use basis.¹³ Promotion of vaccine uptake for this cohort requires an understanding of parents' concerns and a profile of those who are least inclined to vaccinate.

Parental acceptance of a pediatric COVID-19 vaccine was about 48.2% to 72.6% in early 2021,¹⁴⁻¹⁶ but these findings reflect parental beliefs before vaccines for adults and children had been approved. A lack of knowledge about how vaccines work, acceptance of vaccine conspiracy beliefs, and minimization of the threat of illness have been shown to undermine adults' decision to get vaccinated^{17,18} and would presumably do the same for pediatric COVID-19 vaccines. We also expected that the demographic characteristics associated with adults' hesitation to get vaccinated against COVID-19, including younger age, low levels of education and income, and Republican party affiliation,^{17,18} would predict their resistance to vaccinate their children. Concerns about vaccine safety, effectiveness, and accelerated development have been predictive of pediatric COVID-19 vaccine hesitancy in the limited research reported to date.^{14,19} Parents might also decline vaccination because they believe their healthy child will not get infected, or at least will not become seriously ill, from COVID-19.¹⁸ Protection of the child is the primary motivator of intent to vaccinate,¹⁴ but other reasons to vaccinate, including opening schools for in-person instruction, bringing herd immunity to the community, and protecting family members (especially grandparents),²⁰ have not been systematically explored. With the exception of a 2020 study suggesting that parents are more likely to accept the COVID-19 vaccine for themselves than for their children,¹⁴ the question has been largely unaddressed.

This study had 5 objectives: (1) to assess the prevalence of vaccine hesitancy among parents with a child aged 12-15 years, (2) to investigate the predictors of parents' COVID-19 vaccine hesitancy, (3) to gauge parents' reasons for resisting vaccinating their child against COVID-19, (4) to examine non-vaccine-hesitant parents' reasons for wanting to vaccinate their child against COVID-19, and (5) to explore the correlation between parents' intentions to have their child vaccinated and their acceptance of a vaccine for themselves.

Methods

Participant Recruitment

We recruited participants from a Centiment-provided nationwide survey panel (www.centiment.co). Centiment advertises for survey respondents through various channels (eg, online advertising, forums), including social media platforms such as Facebook and LinkedIn. Potential Centiment respondents go through a series of security checks, and Centiment builds a respondent profile through information obtained from multiple questionnaires. It uses those data to qualify survey respondents for the intended target audience. The researcher provides Centiment with information on the

study's target audience and the desired sample size. Centiment then alerts all respondents who may qualify that a survey has gone live. These potential survey respondents receive information about the survey topic, the estimated time to complete the survey, and the reward they will receive for their time. This method aims to subvert potential selection bias. Centiment also monitors respondent behavior across surveys in various ways to ensure high-quality data collection. Once the survey meets, or slightly exceeds, the intended sample size, the survey is closed to potential respondents. Eligibility requirements were as follows: (1) English-language reader, (2) US residence, and (3) parent/guardian of a child or adolescent aged 12-15 years.

Data Collection

We set a target sample size of 600 based on budgetary constraints. We calculated power for the sample obtained ($N = 637$) for an α of .05. Based on surveys of adult COVID-19 vaccination rates, we assumed that approximately half of the sample would be vaccine willing and half would be vaccine hesitant. Under these assumptions, and after applying the normal-approximation correction for continuity, the power to detect a difference in proportion of 0.10 for a categorical predictor variable between vaccine-hesitant and vaccine-willing parents was 0.82.

We collected data via the Qualtrics platform (Qualtrics International) during a 7-day period in March 2021. Participants for this survey received \$3 per completed survey, which was delivered to their PayPal account or transferred to various nonprofit options. The University of California, Davis, Institutional Review Board approved this study as exempt and not requiring written informed consent.

Study Measures

We instructed respondents with >1 child or adolescent aged 12-15 years to answer questions with the youngest child in this age group in mind. We pilot tested the survey before data collection.

The primary outcome measure was intention to vaccinate their child against COVID-19. This was a single-item, 5-point measure adapted from previous vaccine work.^{21,22} We assessed vaccination intention by asking if parents intended to vaccinate their child against COVID-19. The response options were 1 = definitely, 2 = probably, 3 = unsure, 4 = probably not, and 5 = definitely not. Following current reporting practices, we dichotomized responses by classifying parents who were definitely or probably going to vaccinate as "not hesitant" and parents who were unsure or would probably or definitely not vaccinate as "hesitant."²²

We used an established knowledge test²³ to assess general vaccine knowledge. This test includes 10 correct and incorrect statements about vaccines. Response options for these knowledge statements were correct, incorrect, and don't

know. Reported scores are the percentage of items answered correctly across the 10 statements.

We used the Vaccine Conspiracy Beliefs Scale, which consists of 8 vaccine conspiracy statements, to measure conspiratorial thinking about immunizations.^{24,25} We measured perceived threat of COVID-19 to the child by using 5 items modeled after an established measure.²² We used a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree) for responses and then averaged them to create a composite score for each variable.

We asked respondents if they were planning to get a vaccine (or had begun vaccination), were unsure about doing so, or would probably or definitely not get a vaccine for themselves. We presented parents who intended to have their child vaccinated with 9 possible reasons for doing so and checked all those that applied to their decision. We presented parents who indicated that they were hesitant to vaccinate with 12 potential reasons for their hesitancy, and they could check all reasons that reflected their concerns. We culled these reasons and concerns from media reports, social media posts, and published works.^{18,26} The questionnaire also collected data on parents' demographic characteristics, including sex (female, male), marital status (married/living as married), age (continuous), race (American Indian/Alaska Native, Asian, non-Hispanic Black or African American, Hispanic/Latino, Native Hawaiian/Other Pacific Islander, non-Hispanic White, and non-Hispanic Other; categories were dichotomized into non-White and White), total annual household income (<\$40 000, \$40 000-\$79 999, \$80 000-\$99 999, \$100 000-\$119 999, \geq \$120 000), education (\leq high school, some college/associate's degree, bachelor's degree, graduate degree), and political party identity (Republican/leans right, Democrat/leans left).

Data Management and Analysis

We performed analyses using Stata release 17 (StataCorp). We used basic descriptive statistics to characterize the sample and study variables. We assessed univariate predictors of vaccine hesitancy with cross-tabulations and the Fisher exact test, with $P < .05$ considered significant. We estimated effect sizes using Cramer V , which is a measure of the strength of association between 2 categorical variables and has a range of 0 (no correlation) to 1 (perfect correlation). We used multivariate regression analysis to assess independent effects of variables on vaccine hesitancy. We reported 95% CIs for percentages and odds ratios. We reported the z score for the test of the null hypothesis that the odds ratios did not differ significantly from the reference group. We used Cronbach α , which ranges from 0 to 1.0, to assess the internal consistency (reliability) of the items composing each of the 3 multiple-item scales. An internally consistent scale is one in which much of its variance is variance that is shared (covariance) by the items used to measure it.²⁷ Cronbach α values are sensitive to the number of items used, but in general, values of

0.70, 0.80, and 0.90 indicate acceptable, good, and excellent reliability, respectively.

Results

A total of 637 people responded to the survey. Most respondents were female ($n = 332$, 52.1%), married/living as married ($n = 565$, 88.7%), non-Hispanic White ($n = 570$, 89.5%), and had \geq bachelor's degree ($n = 469$, 73.6%) (Table 1). The mean (SD) age of respondents was 40.8 (6.7) years. More than half (333 of 626, 52.1%) of respondents had a total annual household income of \geq \$100 000. The mean (SD) age of the focal child reported upon was 13.3 (1.0) years.

The mean (SD) vaccine knowledge score was 57.9% (25.9%). Acceptance of vaccine conspiracy beliefs was relatively low (median [SD] = 2.78 [0.96]). The median perceived threat value was 3.14 (SD = 1.06) on a 5-point scale. Cronbach α reliabilities ranged from acceptable to excellent: vaccine knowledge (0.72), acceptance of vaccine conspiracies (0.92), and perceived risk of COVID-19 to the child (0.82).

One hundred eighty-four (28.9%; 95% CI, 25.5%-32.5%) parents surveyed were hesitant about vaccination. Specifically, 13.7% (95% CI, 11.2%-16.6%) were unsure about vaccinating their child, 7.1% (95% CI, 5.3%-9.3%) reported that they were "probably not" going to vaccinate their child, and 8.2% (95% CI, 6.3%-10.6%) said they would "definitely not" vaccinate their child.

All variables were significantly associated with parental vaccine hesitancy except race ($P = .06$; Table 1). Parents with poor vaccine knowledge were more than twice as likely as parents with good vaccine knowledge to report vaccine hesitancy. Parents who accepted conspiracy beliefs were nearly twice as likely to be vaccine hesitant as parents who rejected such beliefs (33.8% vs 18.4%). Parents who perceived COVID-19 as less of a threat to their child were more likely to report hesitation than parents who believed COVID-19 to be a greater threat to their child (52.8% vs 13.8%). Women/mothers were more likely than men/fathers to have doubts about vaccinating their child (37.7% vs 19.3%). Respondents in the lowest income group (total annual household income <\$40 000) were more likely to be vaccine hesitant than respondents in the highest income group (total annual household income \geq \$120 000; 48.3% vs 18.0%). The least educated group (\leq high school) was more likely to be hesitant than the most educated group (graduate degree; 48.3% vs 18.0%). Republicans were more likely to be hesitant than Democrats (43.8% vs 18.1%).

Significant predictors of parental vaccine hesitancy were fair knowledge about vaccines, acceptance of vaccine conspiracy beliefs, and uncertainty about the threat of COVID-19 to their child (Table 2). Most demographic variables were not significantly related to vaccine hesitancy in the multivariate model, with 2 exceptions: having a graduate/professional degree and holding Democratic political views.

Table 1. Univariate predictors of COVID-19 vaccine hesitancy among parents of a child or adolescent aged 12-15 years who responded to a survey on COVID-19 vaccination hesitancy, United States, 2021 (N = 637)

Variable	No.	Hesitancy to vaccinate child, % (95% CI) ^a	P value ^b	Cramer V ^c
Knowledge and beliefs				
General vaccine knowledge ^d				
Poor (score ≤50%)	268	41.0 (35.3-47.0)	.001	0.23
Fair (score >50%-75%)	173	22.0 (16.4-28.8)		
Good (>75%)	196	18.4 (13.5-24.4)		
COVID-19 conspiracies				
Reject (1.0-2.4)	266	18.4 (14.2-23.6)	.001	0.20
Unsure (2.5-3.4)	235	37.9 (31.9-44.3)		
Accept (3.5-5.0)	136	33.8 (26.4-42.2)		
Risk of COVID-19 to child ^e				
Lower perceived threat (1.0-2.4)	178	52.8 (45.5-60.0)	.001	0.35
Unsure (2.5-3.4)	206	26.7 (21.1-33.2)		
Higher perceived threat (3.5-5.0)	253	13.8 (10.1-18.8)		
Parent/guardian demographic characteristics				
Sex				
Female	332	37.7 (32.6-43.0)	.001	0.20
Male	305	19.3 (15.3-24.2)		
Marital status				
Married/living as such	565	26.9 (23.4-30.1)	.003	0.12
Not married	72	44.4 (33.4-56.0)		
Age, y				
31-39	324	25.0 (20.6-30.0)	.03	0.09
≥40	313	32.9 (27.9-38.3)		
Race ^f				
Non-White	67	38.8 (27.9-50.9)	.06	0.08
White	570	27.7 (24.2-31.5)		
Total annual household income, \$ ^g				
<40 000	89	48.3 (38.1-58.6)	.001	0.26
40 000-79 999	113	41.6 (32.9-50.9)		
80 000-99 999	91	26.4 (18.3-36.4)		
100 000-119 999	99	22.2 (15.1-31.5)		
≥120 000	234	18.0 (13.5-23.4)		
Education				
≤High school	59	55.9 (43.1-68.0)	.001	0.29
Some college/associate's degree	109	45.9 (36.7-55.3)		
Bachelor's degree	173	28.3 (22.1-35.5)		
Graduate degree	296	17.6 (13.6-22.3)		
Political party identity				
Republican/leans right	267	43.8 (38.0-49.8)	.001	0.28
Democrat/leans left	370	18.1 (14.5-22.4)		

^aParents were classified as "hesitant to vaccinate" if they indicated that they were unsure about, probably not, or definitely not going to vaccinate their child (n = 184). Parents who reported that they were definitely or probably going to vaccinate their child were classified as "not hesitant" (n = 453).

^bTest of significance based on the Pearson χ^2 test, with $P < .05$ considered significant.

^cCramer V, a measure of the strength of association between 2 categorical variables, was used to estimate effect sizes. It has a range of 0 (no correlation) to 1 (perfect correlation).

^dPercentage of items answered correctly across 10 general vaccine knowledge questions.

^eComposite score for each variable was comprised of average responses to 5 items using a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree).

^fRace was dichotomized into non-White and White. Non-White includes American Indian/Alaska Native, Asian, non-Hispanic Black or African American, Hispanic/Latino, Native Hawaiian/Other Pacific Islander, and non-Hispanic Other categories.

^gAnalysis excludes 11 respondents who did not provide information on annual household income.

The primary reasons reported by the 184 vaccine-hesitant parents for not wanting to vaccinate their child were related to safety, namely, worries about the vaccine being

unsafe for children (56.5%; 95% CI, 49.2%-63.5%) and being developed too quickly (56.0%; 95% CI, 48.7%-63.0%) (Table 3). The third most acknowledged reason was

Table 2. Multiple logistic regression analysis of predictors of parental hesitancy to vaccinate their 12- to 15-year-old child or adolescent against COVID-19 among respondents (N = 637) to a survey on vaccine hesitancy, United States, 2021^a

Variable	OR (95% CI)	z ^b	P value ^c
General vaccine knowledge			
Poor	1 [Reference]		
Fair	0.45 (0.26-0.76)	-2.94	.003
Good	0.42 (0.23-0.76)	-2.85	.004
Vaccine conspiracy beliefs			
Reject	1 [Reference]		
Unsure	2.94 (1.69-5.11)	3.81	.001
Accept	2.65 (1.33-5.27)	2.78	.005
Threat of COVID-19 to child			
Lower threat	1 [Reference]		
Uncertain	0.33 (0.20-0.55)	-4.25	.001
Higher threat	0.16 (0.09-0.27)	-6.60	.001
Parent sex			
Female	1 [Reference]		
Male	0.70 (0.43-1.11)	-1.52	.13
Marital status			
Not married	1 [Reference]		
Married or living as such	0.82 (0.44-1.56)	-0.60	.55
Parent age, y			
≤39	1 [Reference]		
≥40	1.20 (0.77-1.85)	0.80	.42
Race ^d			
Non-White	1 [Reference]		
White	0.86 (0.44-1.67)	-0.44	.66
Total annual household income, \$			
<40 000	1 [Reference]		
40 000-79 999	1.22 (0.60-2.51)	0.55	.58
80 000-99 999	0.69 (0.30-1.61)	-0.86	.39
100 000-119 999	0.93 (0.39-2.21)	-0.16	.87
≥120 000	0.61 (0.28-1.33)	-1.23	.22
Declined to answer	0.64 (0.14-3.05)	-0.56	.58
Education			
≤High school	1 [Reference]		
Some college/associate's degree	0.86 (0.39-1.88)	-0.38	.70
Bachelor's degree	0.55 (0.24-1.24)	-1.44	.15
Graduate/professional degree	0.36 (0.16-0.83)	-2.41	.02
Political affiliation			
Republican/leans right	1 [Reference]		
Democrat/leans left	0.47 (0.30-0.73)	-3.39	.001

Abbreviation: OR, odds ratio.

^aHesitancy dependent variable was dichotomized as follows: 0 = "probably" or "definitely" will vaccinate child; 1 = "unsure about vaccinating child," "probably will not vaccinate," or "definitely will not vaccinate" child.

^bz score for the test of the null hypothesis that the OR does not differ significantly from the reference group.

^cProbability value of the z score, with $P < .05$ considered significant.

^dRace was dichotomized into non-White and White. Non-White includes American Indian/Alaska Native, Asian, non-Hispanic Black or African American, Hispanic/Latino, Native Hawaiian/Other Pacific Islander, and non-Hispanic Other categories.

also safety related: the concern that the vaccine might induce an allergic reaction was reported by 28.3% (95% CI, 22.2%-35.2%) of parents. One-quarter of parents preferred that their child develop immunity through infection (25.0%; 95% CI, 19.2%-31.8%). About 1 in 5 parents thought that vaccination was not needed because their child was either not susceptible to infection due to their good health or

would not get seriously ill if infected (21.2%; 95% CI, 15.9%-27.7%) for both concerns. Similarly, parents reported a lack of trust in drug companies (21.2%; 95% CI, 15.9%-27.7%). All remaining reasons were endorsed by fewer than 1 in 10 parents. Only 9.2% (95% CI, 5.8%-14.4%) of parents believed that available vaccines would be ineffective.

Table 3. Reasons, by frequency endorsement, cited by parents (N = 184) for being hesitant about vaccinating their child or adolescent (aged 12-15 years) against COVID-19 among respondents to a survey on vaccine hesitancy, United States, 2021^a

Reason	No.	% (95% CI)
I worry that a COVID-19 vaccine may not be safe for children.	104	56.5 (49.2-63.5)
COVID-19 vaccines have been developed too fast and, thus, not carefully studied.	103	56.0 (48.7-63.0)
My child might be allergic to the vaccine.	52	28.3 (22.2-35.2)
I prefer that my child develop immunity from infection rather than with a vaccine.	46	25.0 (19.2-31.8)
My child is healthy and, thus, unlikely to catch the coronavirus.	39	21.2 (15.9-27.7)
My child would not get seriously ill even if they caught the coronavirus.	39	21.2 (15.9-27.7)
I don't trust the drug companies that make vaccines.	39	21.2 (15.9-27.7)
The vaccine would probably be ineffective for children.	12	9.2 (5.8-14.4)
My child hates needles and injections.	13	7.1 (4.1-11.8)
My child does not need vaccination because they are immune from a past COVID-19 infection.	8	4.3 (2.2-8.5)
I don't know how to get a vaccine for my child.	4	2.2 (0.8-5.7)
I fear that I will not be able to afford a vaccine for my child.	4	2.2 (0.8-5.7)

^aThis table aggregates the responses of parents who were unsure about vaccinating their child (n = 87) or who said they would probably (n = 45) or definitely would not (n = 52) vaccinate. Percentages sum to >100% because respondents were asked to check all reasons that applied to their decision.

Table 4. Reasons endorsed by parents intending to vaccinate their child against COVID-19,^a by frequency of endorsement (N = 453) among respondents to a survey on vaccine hesitancy, United States, 2021

Reason	No.	% (95% CI)
Vaccination is needed to reduce the chance of my child getting seriously ill, or even dying.	355	78.4 (74.3-81.9)
Vaccination of my child will protect other children enrolled in their school.	235	51.9 (47.3-56.5)
Vaccination of my child will help to keep the rest of the family healthy.	232	51.2 (46.6-55.8)
Vaccination of my child will help protect elderly members of my family, such as grandparents.	186	41.1 (36.6-45.7)
Vaccination of children will help keep K-12 schools open.	170	37.5 (33.2-42.1)
Vaccination will bring about "herd immunity" in my community faster.	148	32.7 (28.5-37.1)
Vaccination is likely to be required by my child's school.	104	23.0 (19.3-27.1)
My child's pediatrician has already recommended that I vaccinate my child as soon as a vaccine becomes available.	82	18.1 (14.8-21.9)
My child's pediatrician might think less of me if I do not vaccinate my child.	37	8.2 (6.0-11.1)

Abbreviation: K-12, kindergarten through 12th grade.

^aThis table aggregates the responses of parents who reported that they would definitely (n = 230) or probably (n = 223) vaccinate their child against COVID-19. Percentages sum to >100% because respondents were asked to check all reasons that applied to their decision.

Among the 453 non-vaccine-hesitant parents, the 4 most endorsed reasons for wanting to vaccinate their child were related to protection of the health of the child, other school-children, and the family (Table 4). Concerns about returning to normalcy (bringing about herd immunity and keeping schools open) were less frequently given. Nearly 1 in 5 parents noted that a pediatrician's recommendation to vaccinate was a motivating factor.

We found a strong correlation between parental hesitation to get a COVID-19 vaccine for themselves and for their child. Approximately 1 in 4 parents was hesitant to get a vaccine for themselves (n = 156; 24.5% [95% CI, 21.3%-28.0%]). Of these, 78.8% (95% CI, 71.7%-84.6%) were also hesitant to vaccinate their child. In contrast, 481 parents intended to get a vaccine for themselves (75.5%; 95% CI, 72.0%-78.7%), 87.3% (95% CI, 82.0%-90.0%) of whom also intended to vaccinate their child ($P < .001$, $V = 0.63$).

Discussion

Parental hesitation about vaccination is well documented for childhood illnesses,²⁶ and COVID-19 vaccination rates among children vary widely by state.⁸ In this online convenience sample of parents, nearly 3 in 10 respondents were hesitant to vaccinate their child. This number likely underestimates the true level of hesitancy, because the sample underrepresented groups that appear to be concerned about pediatric COVID-19 vaccines, namely, parents from racial and ethnic minority groups and parents with low socioeconomic status. In 1 study, participants who identified as Black, Asian, and >1 race were almost 3 times more likely than non-Hispanic White parents to reject a COVID-19 vaccine for themselves and their children, citing safety and efficacy concerns about the seemingly quick vaccine development.¹⁴ Investigations of such groups are needed.

The multivariate analysis of predictors of vaccine hesitancy suggests that the primary concerns of vaccine-hesitant parents were based on a poor understanding of how vaccines work, a susceptibility to vaccine misinformation, and a disregard for the serious health consequences that can befall a child with COVID-19. Only 2 demographic variables contributed to prediction above and beyond respondents' knowledge, attitudes, and beliefs: education and political party affiliation. Higher education has been shown by others to predict pediatric COVID-19 vaccination intentions.²¹ Other studies have shown that conservative voters are more likely than liberal voters to refuse a COVID-19 vaccine for themselves,^{17,19} a pattern that extends to their decisions about vaccinating their child.

Limitations

This study had several limitations. First, the sample skewed heavily toward affluent parents with a total annual household income of \geq \$100 000. A study examining the vaccine hesitancy of parents from racial and ethnic minority groups and with low socioeconomic status is needed. Second, the study used a self-report questionnaire, which is subject to response bias, such as social desirability. Finally, our study was cross-sectional; therefore, it was not possible to make a causal inference.

Conclusions

One bright spot in our findings was that parents rarely referenced vaccine ineffectiveness as a reason for their hesitancy. It is likely that information about the high levels of effectiveness of the 3 vaccines available in the United States has reached parents. Vaccination promotion efforts should address parents' primary concern: vaccination safety. It is concerning that 1 in 4 parents preferred that their child achieve immunity against COVID-19 through infection rather than vaccination. This finding suggests that some parents may be unaware of some of the potential adverse effects of COVID-19 on children, that some parents may not believe that their child is at risk of severe disease, and that other parents may perceive vaccine risks to be greater than the potential for disease.

Little research has been conducted on the question of whether parents differentiate between the value of COVID-19 vaccination for adults and children. Parents might see their children as uniquely vulnerable to vaccine side effects. Alternatively, parents could believe that the risk–benefit ratio favors vaccination for adults because of the higher risk of serious complications and death from COVID-19 among adults compared with children. However, we did not observe such differentiation, because parents either accepted vaccination for self and child or rejected vaccination for self and child.

Many parents are hesitant to vaccinate their children against COVID-19. Our findings suggest a 3-prong messaging strategy for effective public health interventions that focuses on (1)

educating the public about the nature of vaccination, (2) countering misinformation about vaccine development and safety, and (3) stressing the safety of approved COVID-19 vaccines. Previous research assessing provaccine messaging created by public health authorities did not increase the intent to vaccinate.²⁸ However, using subtle narratives may prove more persuasive than a presentation of data alone for health prevention and control²⁹ as well as avoiding health narratives that induce fear.³⁰ Furthermore, because parents report their child's physician as a key trusted source of information about COVID-19 vaccines for children,³¹ it is important for pediatric health care providers to communicate with parents about COVID-19 vaccines. Previous studies found that recommendations by primary care clinicians have a substantial impact on vaccine receipt.³²⁻³⁴

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