Original article

Unvaccinated Adolescents’ COVID-19 Vaccine Intentions: Implications for Public Health Messaging

Grace W. Ryan, Ph.D., Natoshia M. Askelson, Ph.D., Kate R. Woodworth, M.D., Megan C. Lindley, M.P.H., Amber Gedlinske, M.P.H., Andrew M. Parker, Ph.D., Courtney A. Gidengil, M.D., Christine A. Petersen, D.V.M., Ph.D., and Aaron M. Scherer, Ph.D.

Division of Preventive and Behavioral Medicine, Department of Population and Quantitative Health Sciences, University of Massachusetts Chan Medical School, Worcester, Massachusetts
Department of Community and Behavioral Health, University of Iowa, Iowa City, Iowa
CDC COVID-19 Response Team, Atlanta, Georgia
Department of Internal Medicine, University of Iowa, Iowa City, Iowa
RAND Corporation, Pittsburgh, Pennsylvania
RAND Corporation, Boston, Massachusetts
Division of Infectious Diseases, Boston Children’s Hospital, Harvard Medical School, Boston, Massachusetts
Department of Epidemiology, University of Iowa, Iowa City, Iowa

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ABSTRACT

Purpose: COVID-19 vaccine uptake remains low for US adolescents and contributes to excess morbidity and mortality. Most research has assessed parental intention to vaccinate their children. We explored differences between vaccine-acceptant and vaccine-hesitant unvaccinated US adolescents using national survey data.

Methods: A nonprobability, quota-based sample of adolescents, aged 13–17 years, was recruited through an online survey panel in April 2021. One thousand nine hundred twenty-seven adolescents were screened for participation and the final sample included 985 responses. We assessed responses from unvaccinated adolescents (n = 831). Our primary measure was COVID-19 vaccination intent (“vaccine-acceptant” defined as “definitely will” get a COVID-19 vaccine and any other response classified as “vaccine-hesitant”) and secondary measures included reasons for intending or not intending to get vaccinated and trusted sources of COVID-19 vaccine information. We calculated descriptive statistics and chi-square tests to explore differences between vaccine-acceptant and vaccine-hesitant adolescents.

Results: Most (n = 831; 70.9%) adolescents were hesitant, with more hesitancy observed among adolescents with low levels of concern about COVID-19 and high levels of concern about side effects of COVID-19 vaccination. Among vaccine-hesitant adolescents, reasons for not intending to

IMPLICATIONS AND CONTRIBUTION

COVID-19 vaccine uptake among adolescents remains challenging. Most existing research focuses on parental intentions for their children; however, adolescents’ intentions about COVID-19 vaccination are understudied. This study identified important differences between COVID-19 vaccine-accepting and vaccine-hesitant adolescents, which can inform communication with

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* Address correspondence to: Grace W. Ryan, Ph.D., Department of Population and Quantitative Health Sciences, University of Massachusetts Chan Medical School, 368 Plantation Street, Worcester, MA 01605.

E-mail address: grace.ryan1@umassmed.edu (G.W. Ryan).
get vaccinated included waiting for safety data and having parents who would make the vaccination decision. Vaccine-hesitant adolescents had a lower number of trusted information sources than vaccine-acceptant adolescents.

**Discussion:** Differences identified between vaccine-acceptant and vaccine-hesitant adolescents can inform message content and dissemination. Messages should include accurate, age-appropriate information about side effects and risks of COVID-19 infection. Prioritizing dissemination of these messages through family members, state and local government officials, and healthcare providers may be most effective.

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Low rates of COVID-19 vaccination have resulted in unnecessary morbidity and mortality among all age groups. As of April, 2023, only 62% of US adolescents aged 12–17 years were considered fully vaccinated (two doses in the primary COVID-19 series) and only 7.5% of fully vaccinated have received an updated (Bivalent) booster dose [1]. To protect adolescents themselves as well as their family and community members, we need to continue refining strong vaccination advocacy that targets both adolescents and their parents. While US parents or guardians have the legal authority to decide whether an adolescent aged 12 to 17 years receives a COVID-19 vaccine in most states, there is increasing evidence that adolescents want to be part of the vaccine decision-making [2–4] as well as growing literature on the use of shared decision-making with younger patients [5–7]. Thus, messaging and communication efforts need to address not only parents but also adolescents [8].

The majority of research related to adolescent COVID-19 vaccination has focused on parental intentions [9–15], with few studies on adolescents’ own intentions [16–19]. Understanding adolescents’ own intentions around COVID-19 vaccination and identifying factors driving those intentions is vital for guiding message design and dissemination plans to reach yet-to-be-vaccinated adolescents. In this study, we conducted secondary analyses of data from a nonprobability-based internet panel of US adolescents aged 13–17 years to explore factors associated with vaccination intentions, as well as adolescents’ trusted sources of information about COVID-19 vaccines. In the initial analysis of these data, all unvaccinated adolescents were grouped together regardless of intention [18]. The objective of the current analyses is to test for differences among unvaccinated adolescents who definitely intended to get a COVID-19 vaccine compared with those who did not to better understand sources of hesitancy and sources of information.

**Methods**

The survey was administered by the Healthcare and Public Perceptions of Immunizations Survey Collaborative, a cooperative agreement between the Centers for Disease Control and Prevention (CDC) and researchers at the University of Iowa and the RAND Corporation. This study was reviewed and approved by the University of Iowa Institutional Review Board. Additionally, this activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (see e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq). Adolescents between ages 13 and 17 years were recruited through a national, online panel via Qualtrics during April 15–23, 2021. Sampling quotas were used to obtain approximately equal and/or representative group sizes for each of the following demographics: gender, race/ethnicity (64% Non-Hispanic White, 12% Non-Hispanic Black, 16% Hispanic, 18% other race or ethnicity), and age (13–15 years; 16–17 years). Data collection occurred just prior to the COVID-19 vaccine Emergency Use Authorization (EUA) being extended to 12-year-olds to 15-year-olds; 16-year-olds and 17-year-olds were already covered by the EUA. Full survey methodology details are reported elsewhere [18]. Here, we report results from adolescents aged 13–17 years who reported not having received a COVID-19 vaccine at the time of the survey (n = 831), 84% of the original survey sample.

Our primary measure was COVID-19 vaccination intentions among unvaccinated adolescents. We dichotomized adolescent survey responses to the following question: “How likely are you to get a COVID-19 vaccine when you become eligible?” Adolescents who selected the response option “definitely will” get a COVID-19 vaccine were categorized as “vaccine-acceptant” (n = 242) and adolescents who selected any other response (“probably will”, “not sure”, “probably will not”, “definitely will not”) as “vaccine-hesitant” (n = 589), as this definition was consistent with the branching logic used to guide respondents through the survey. Additionally, this is consistent with and captures the nuance of established definitions of vaccine hesitancy that summarize the concept as “delay in acceptance or refusal” [20] or “a state of indecisiveness regarding a vaccination decision” [21]. Secondary measures were reasons for getting (asked of adolescents who indicated that they “definitely will” get vaccinated) or not getting vaccinated (asked of adolescents who indicated that they either “probably will”, “not sure”, “probably will not”, or “definitely will not” get vaccinated). The survey was programmed to employ skip logic so that respondents answering anything other than “definitely will” get vaccinated were asked to select the reasons that they were not getting vaccinated and factors that would make them more likely to get vaccinated, while those answering “definitely will” selected reasons why they will get vaccinated. To determine trusted sources of information, we asked “Which of the following sources do you trust for accurate information about the COVID-19 vaccine? Select all that apply.” We calculated frequencies and descriptive statistics for all variables and used chi-square statistics to test for differences between vaccine-acceptant and vaccine-hesitant adolescents. A post-hoc p-value correction (p = .0025) was used to account for multiple comparisons [22]. We also conducted a sensitivity analysis in which we defined “vaccine-acceptant” adolescents as those who would “definitely” or “probably will” get a COVID-19 vaccine and all others as vaccine-hesitant.
more (27.5%) (Table 2). The main reasons for wanting to be vaccinated among vaccine-acceptant adolescents were protecting the health of family and friends (87.2%), personal COVID-19 prevention (77.3%), protecting the health of their communities (75.6%), and allowing them to resume social activities (67.8%) (Table 2).

Finally, we compared trusted sources of COVID-19 vaccine information for vaccine-hesitant and vaccine-acceptant adolescents (see Figure 1 for information source options). Vaccine-acceptant adolescents identified more total sources of trusted information ($M = 4.35$, standard deviation = 2.26) compared with vaccine-hesitant adolescents ($M = 2.75$, standard deviation = 2.21), $p < .001$. Top sources of trusted information among both acceptant and hesitant adolescents were government officials (45.8% of hesitant adolescents; 80.2% of acceptant adolescents), state/local health officials (38.7% of hesitant adolescents; 70.7% of acceptant adolescents), usual healthcare provider (37.0% of hesitant adolescents; 64.1% of acceptant adolescents), and family (30.4% of hesitant adolescents; 41.7% of acceptant adolescents). Vaccine-hesitant adolescents were less likely to report trusting information from government agencies, $p < .001$, families, $p = .002$, usual healthcare provider, $p < .001$, state/local health officials, $p < .001$, news sources, $p < .001$, and online publishers of medical info, $p < .001$, compared to vaccine-acceptant adolescents (Figure 1).

We additionally conducted two sensitivity analyses. First, we explored a reclassification of our primary outcome variable (acceptance) in which vaccine-acceptant adolescents were defined as those reporting they would “probably”
be vaccinated against COVID-19 (as opposed to “definitely” only). This resulted in 48.4% of the sample (n = 402) being defined as vaccine-hesitant. In terms of statistical significance, findings were virtually identical to our primary analysis, with the exception that vaccine-acceptant adolescents were significantly more likely than vaccine-hesitant adolescents to report Instagram as a trustworthy information source (9.3% vs. 4.0%, respectively), p = .002. Next, we conducted an age-stratified analysis to assess potential differences between adolescents aged 13–15 years and 16–17 years to account for the fact that older adolescents would have been eligible for vaccination prior to the timing of the survey. As previously stated, a significantly higher percentage of younger adolescents were classified as vaccine-acceptant (34.3% vs. 24.4%, respectively), p = .002. The directionality for all other analyses in terms of reasons for vaccination hesitancy/acceptance and trusted sources of information were similar to the overall analysis. Therefore, we only report overall results here.

Discussion

Data from a national, nonprobability-based internet panel survey of US adolescents aged 13–17 years revealed critical insights into differences between those who are vaccine-hesitant and those who are vaccine-acceptant. We found that at the time of this survey (April 2021), just prior to adolescents aged 12–15 years becoming eligible for vaccination, most unvaccinated adolescents expressed some level of hesitancy about getting a COVID-19 vaccine. Given the persistently low rates of COVID-19 vaccine uptake of both the primary series and booster doses in this age group, this hesitancy has clearly persisted. Underlining the importance of vaccination in this age group is the finding that during the Omicron surge in December 2021, COVID-19 hospitalization rates among unvaccinated adolescents were six times higher than that among fully vaccinated adolescents [23]. In this study comparing vaccine-acceptant and vaccine-hesitant adolescents, our results offer additional information for how to effectively create messaging to encourage primary vaccination among unvaccinated adolescents and increase uptake of booster doses among the fully vaccinated.

Understanding how best to design these COVID-19 vaccine promotion messages for adolescents is vital. However, to date, most research around intentions and reasons for COVID-19 vaccine hesitancy has focused on adults aged 18 years or older [24–26] or parents of children and adolescents aged 0–18 years [9–15], with few studies focused on this perspectives of adolescents aged 12–17 years. In general, we found that vaccine-hesitant adolescents had low levels of concern about the severity of COVID-19 and high levels of concern about side effects from the vaccine. These are similar factors identified in another survey of adolescents conducted approximately six months after ours; researchers found that risk perceptions were highest among unvaccinated adolescents who did not plan to get vaccinated [19]. Moreover, the factors identified in our survey are similar to general factors that have been identified in the broader, and now extensive, vaccine hesitancy literature [20]. To promote vaccination among hesitant adolescents, messaging could focus on addressing fears and concerns about side effects while simultaneously communicating COVID-19 risk information for this age group and promoting the positive effects of vaccination.

Table 2
Factors affecting vaccine decisions for hesitant (n = 589) and acceptant (n = 242) adolescents

<table>
<thead>
<tr>
<th>Factors for vaccine-hesitant adolescents (n = 589)</th>
<th>Which of the following, if any, are reasons that you are not sure/probably will not definitely will not get a COVID-19 vaccine? (select all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am concerned about possible side effects</td>
<td>265 45.0</td>
</tr>
<tr>
<td>I plan to wait and see if it is safe and may get it later</td>
<td>258 43.9</td>
</tr>
<tr>
<td>My parent(s)/caregivers will decide whether I get a COVID-19 vaccine</td>
<td>216 36.7</td>
</tr>
<tr>
<td>I don't trust the COVID-19 vaccines</td>
<td>165 28.0</td>
</tr>
<tr>
<td>I think other people need it more than I do right now</td>
<td>162 27.5</td>
</tr>
<tr>
<td>I don't like needles</td>
<td>122 20.7</td>
</tr>
<tr>
<td>I don't know if the COVID-19 vaccine will work</td>
<td>122 20.7</td>
</tr>
<tr>
<td>I don't believe I need a COVID-19 vaccine</td>
<td>118 20.0</td>
</tr>
<tr>
<td>I am concerned about having an allergic reaction</td>
<td>108 18.3</td>
</tr>
<tr>
<td>I don't think COVID-19 is that big of a threat</td>
<td>101 17.1</td>
</tr>
<tr>
<td>There are obstacles that may prevent me from getting a vaccine</td>
<td>50 8.5</td>
</tr>
<tr>
<td>Other people in my community are choosing not to get vaccinated</td>
<td>39 6.6</td>
</tr>
<tr>
<td>I am concerned about the cost of a COVID-19 vaccine</td>
<td>33 5.6</td>
</tr>
</tbody>
</table>

Factors for vaccine-acceptant adolescents (n = 242)

<table>
<thead>
<tr>
<th>Which of the following would make you more likely to get a COVID-19 vaccine? (select all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It would protect the health of my friends and family</td>
</tr>
<tr>
<td>It would prevent me from getting COVID-19</td>
</tr>
<tr>
<td>It would protect the health of my community</td>
</tr>
<tr>
<td>It would allow me to resume or do more social activities</td>
</tr>
<tr>
<td>It would allow me to travel</td>
</tr>
<tr>
<td>I am concerned about the severity of COVID-19 if I get it</td>
</tr>
<tr>
<td>It was recommended to me by a family member or friend</td>
</tr>
<tr>
<td>It would help me get back to school</td>
</tr>
<tr>
<td>I saw people in my community getting vaccinated</td>
</tr>
<tr>
<td>It would allow me to get back to school</td>
</tr>
<tr>
<td>I personally know someone who became seriously ill or died from COVID-19</td>
</tr>
<tr>
<td>It was recommended to me by a healthcare provider</td>
</tr>
<tr>
<td>My school requires it</td>
</tr>
<tr>
<td>My workplace requires it</td>
</tr>
</tbody>
</table>

- 0.83% of vaccine-acceptant adolescents selected none of these reasons; 8.2% of vaccine-hesitant adolescents selected none of these reasons.
Vaccine-hesitant (n=589)

The health of friends and family (n = 242) was driving their decision to get vaccinated was that it would protect health issues from infection. It is notable that in our survey, (e.g., protection of one’s family and reducing risk of long-term health issues from infection). It is notable that in our survey, among vaccine-acceptant adolescents, the most selected reason for this age-group. While adolescents are often considered digital natives, they report significant challenges in finding what they consider to be credible health information online [32]. Moreover, while there are recommendations to rely on social media applications like Facebook, Instagram, and TikTok to reach adolescents with information about COVID-19 [33,34], these were very rarely cited as being trusted sources for accurate information in our study. However, if using social media, efforts could consider how to increase trust in messages received over social media among adolescents. Additionally, messaging campaigns may consider prioritizing dissemination through more traditional trusted sources of information like healthcare providers and news sources.

Finally, while only age group was found to be statistically significant, our results also identified nonsignificant demographic patterns in vaccine hesitancy that merit further exploration, especially as our findings differ from the literature. For example, while rurality has been associated with lower COVID-19 vaccination intention [35] and higher rates of adolescent vaccination have been observed for the Hispanic/Latino population [36], we did not find any differences by rurality or ethnicity. Overall, it is clear that more research is needed to understand the nuances of intention among different

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populations and how that has evolved over time, especially those who are traditionally under-represented (e.g., gender minorities [37]) and those who have been most disproportionately impacted by the pandemic [38]. Further research to understand intentions and strategies for messaging to these adolescent populations will be crucial to increase vaccine uptake.

Strengths and limitations

This study begins to address important gaps in the current literature on COVID-19 vaccine hesitancy among adolescents and our results have implications for how to create messaging for vaccine-hesitant adolescents compared to more vaccine-acceptant adolescents. Collecting data from adolescents across the country provides critical insights into this understudied population and actionable information for those working on vaccine promotion efforts. However, there are several limitations to note. This was a nonprobability survey, offered only in English, and we did not collect sufficient sample sizes for some demographic comparisons (i.e., insurance status, household income), both factors that limit the generalizability of these data. Additionally, we do not have data about adolescents’ hesitancy toward other vaccines to know whether their vaccine hesitancy is specific to COVID-19 or all vaccines. Data collection occurred prior to EUA of COVID-19 vaccines for the 12-year-old to 15-year-old population. Now that vaccination has been authorized and widely available to all age groups in this study for over a year, adolescents may have different perspectives and intentions as the context of COVID-19 continues to evolve. Additionally, in April 2021, the first reports of vaccination-associated myocarditis and pericarditis were released [39] and it is possible this news may have impacted adolescents’ survey responses. While this survey was conducted in April 2021, vaccine hesitancy clearly remains a challenge as evidenced by low rates of vaccination uptake for both the primary series and booster doses among adolescents [1]. Moreover, increasing the relevancy of our findings is that many of the factors that we identified in our survey are similar to general factors observed in vaccine hesitancy research [20].

Conclusion

Unfortunately, COVID-19 vaccination rates among adolescents remain low resulting in avoidable morbidity and mortality from COVID-19 infections. Directed and specific efforts must be made to reach the most vaccine-hesitant populations, including vaccine-hesitant adolescents, for whom there are now three authorized vaccine options. This analysis offers insights into potential message content and dissemination channels, specifically that messaging should focus on accurate, age-appropriate information about side effects of vaccination as well as potential risks of COVID-19 infection. Moreover, while there is often a focus on social media messaging for adolescents, we found that most adolescents did not report social media as a trusted source of information about COVID-19 vaccines, suggesting that disseminating messaging through more interpersonal approaches (e.g., family members, healthcare professionals) may be more effective. Researchers and practitioners alike can use this information in communication development efforts to improve COVID-19 vaccination of adolescents.

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