Parental Perceptions Related to Co-Administration of Adolescent COVID-19 and Routine Vaccines

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Abbreviations: CDC--Centers for Disease Control and Prevention; EUA--Emergency Use Authorization; FDA--Food and Drug Administration; HaPPI--Healthcare and Public Perceptions of Immunizations.
Abstract

**Purpose:** Vaccinating adolescents against COVID-19 while avoiding delays in other routine vaccination is paramount to protecting their health. Our objective was to assess parental preferences to have their adolescents aged 12-17 years receive COVID-19 and other routine vaccines at the same time.

**Methods:** An online survey with a national, quota-based cross-sectional sample of US parents of youth ages 12-17 was fielded in April 2021 ahead of FDA’s Emergency Use Authorization of COVID-19 vaccine for age 12-15 years. Parents were asked about their willingness to have their adolescents aged 12-17 years receive both COVID-19 and routine vaccines at the same visit and/or to follow their provider’s recommendation. Predictors included demographic characteristics, being behind on routine vaccines, and perceived risks and benefits.

**Results:** Few parents were willing to have their adolescent receive COVID-19 and routine vaccines at the same visit (10.6%) or follow the healthcare provider’s recommendation (18.5%). In multivariate analyses, demographic characteristics had no effect on willingness; reporting that the adolescent was behind on routine vaccines correlated with decreased willingness (p=0.004). Greater concern about the adolescent getting COVID-19 (p=0.001), lower concern about the adolescent having side effects from the COVID-19 vaccine (p=0.013), and more positive feelings about vaccines in general (p=0.002) were associated with higher willingness.

**Discussion:** Few parents would prefer to have their adolescent receive COVID-19 and routine vaccines at the same visit. Understanding what drives willingness to receive all recommended vaccines in the context of the COVID-19 pandemic could inform policies to optimize adolescent vaccination.
Key words: COVID-19 vaccine; routine vaccines; vaccination; adolescent health

Implications and Contribution

Few parents were willing to have their adolescent receive COVID-19 and routine vaccines at the same time. These findings have important implications for adolescents—who are already more behind on routine vaccines than prior to the pandemic—but also for younger children as they become eligible for COVID-19 vaccines.
The COVID-19 pandemic has had a significant impact on children and adolescents, both directly due to infection, and indirectly due to school closures and other societal impacts. Although outcomes such as hospitalization and death are more common in adults, adolescents can be severely affected as well. Of adolescents hospitalized for COVID-19, about one third require admission to the intensive care unit. School closures, whether full or partial, have been associated with an increase in mental health disorders, widened educational disparities, and increased medical and social vulnerability due to the loss of school-based health and other services. Protecting adolescents to the extent possible, including through vaccination, is important to protect their physical, mental, and social well-being.

On December 11, 2020, the Food and Drug Administration (FDA) issued an Emergency Use Authorization (EUA) for the Pfizer-BioNTech COVID-19 vaccine, including for adolescents aged 16–17 years. Younger adolescents became eligible on May 10, 2021, when the FDA expanded its EUA to include adolescents aged 12–15 years. Early on, the CDC initially recommended an interval of 14 days between administration of COVID-19 vaccine and other vaccines. However, this guidance was changed in mid-May 2021 based on substantial safety data and extensive experience with non-COVID-19 vaccines to allow coadministration of COVID-19 vaccine with other vaccines, in part to facilitate catch-up vaccination of adolescents. On August 23, 2021, the FDA fully approved the Pfizer-BioNTech COVID-19 vaccine for individuals 16 years of age and older.
Despite the availability of authorized and approved COVID-19 vaccines, coverage among adolescents remains low; as of October 5, 2021, only 45% of adolescents aged 12-15 years and 52% of those aged 16-17 years had received at least one dose of a COVID-19 vaccine, and fewer than one third had completed the two-dose vaccination series. There was also a substantial drop in routine vaccination of adolescents in the early months of the COVID-19 pandemic, presumably due to stay-at-home orders. In the following months there was a rebound in vaccination rates, but not to the extent required to compensate for the prior drop. Even prior to the COVID-19 pandemic, adolescents were under-vaccinated due in part to lower rates of health care utilization. As a result, there have been calls to vaccinate adolescents at every opportunity to optimize vaccination rates. Ensuring that adolescents receive a COVID-19 vaccine while avoiding delays in other routine vaccinations is paramount to protecting their health. As one strategy, both the CDC and the American Academy of Pediatrics endorse coadministration of vaccines whenever possible as a best practice, including for COVID-19 vaccines. Understanding parents’ willingness for their adolescents to receive COVID-19 vaccine together with other routine vaccines will help to inform strategies to optimize adolescent vaccination.

This analysis uses data from a survey of beliefs, attitudes, and behaviors/behavioral intentions of parents of adolescents ages 12-17 years in advance of FDA expansion of the EUA for the Pfizer-BioNTech COVID-19 vaccine to age 12-15 years. The specific research objectives are to:

(1) measure willingness of parents to have their adolescents aged 12-17 years receive COVID-19 and other routine vaccines at the same visit, or to follow their provider’s recommendation; and
(2) identify predictors of willingness to receive COVID-19 and other routine vaccines at the same visit and/or follow their provider’s recommendation to inform future policy recommendations.

**Methods**

*Sample and Procedure*

An online survey on the acceptability of adolescent COVID-19 vaccination was developed by the Healthcare and Public Perceptions of Immunizations (HaPPI) Survey Collaborative, which is a cooperative agreement between CDC and researchers at the University of Iowa and the RAND Corporation to survey healthcare providers and the general public on important vaccine-related issues. The survey was administered to parents of adolescents aged 12-17 years from April 15 through April 23, 2021 (prior to both the FDA’s authorization of the Pfizer-BioNTech COVID-19 vaccine for adolescents, and CDC’s allowance of coadministration of vaccines). Respondents were recruited through Qualtrics Panels (Qualtrics, LLC; Provo, Utah) using sampling quotas for gender, and race and Hispanic ethnicity. For gender, the quota included: 40% identifying as male, 40% identifying as female, and 20% not specified. For race and Hispanic ethnicity, the quota included 62% non-Hispanic White, 12% non-Hispanic Black, 17% Hispanic, and 8% other race/ethnicity. All survey questions are publicly available online at: [https://osf.io/nq94h/](https://osf.io/nq94h/). This survey was approved by the Institutional Review Board at the University of Iowa, reviewed by CDC, and adhered to applicable federal law and CDC policy (45 C.F.R. part 46; 21 C.F.R. part 56).
The participation rate is not reported because the sampling frame was unknown, consistent with American Association for Public Opinion Research reporting guidelines for survey recruitment using an opt-in non-probability panel. The final sample included only those parents who passed a quality check, which means that they answered affirmatively to the question “Do you commit to thoughtfully provide your best answers to each question in this survey?”; did not speed through the survey (i.e., total response time was not shorter than two standard deviations below the mean duration for all survey respondents); completed the survey; and reported that their adolescent had not yet received a COVID-19 vaccine.

**Measures**

Parents were asked “If a healthcare provider recommended your child receive one or more routine vaccines in addition to a COVID-19 vaccine, how would you get your child vaccinated?” Only one response was allowed (see Table 1 for response options). Our main outcome was willingness of parents to have their adolescent receive COVID-19 and routine vaccines at the same visit, which was defined as endorsing either “Routine vaccine(s) and COVID-19 vaccine in the same visit” or “Whatever my child's healthcare provider recommended” in response to the coadministration question. This outcome was chosen to allow for parents to reasonably follow whatever guidance is given (from CDC to vaccinate and/or from their provider). Secondary outcomes were endorsing either of the above responses (COVID-19 and routine vaccines together or following provider recommendation) on their own. We explored each of these response options separately as secondary outcomes to assess internal consistency across these two constructs.
Statistical Analyses

We ran analyses with weights to correct for potential biases in the distribution of adolescents across U.S. Census regions. As unweighted and weighted analyses produced virtually identical results, we report the unweighted for simplicity. We used frequencies with 95% confidence intervals for demographic characteristics, primary and secondary measures, and predictors.

In our primary model of the main outcome, which was specified \textit{a priori}, predictors of interest included demographics (parental gender, parental age, parental race/ethnicity, parental education level) and parental perception that the adolescent is behind on routine vaccines (which was measured by their response to the survey question “Have you been told by a health care provider or someone else that your child is behind on their routine vaccinations?”). Since respondents could have more than one adolescent, we included whether they had an older adolescent (age 16-17 years and already eligible for COVID-19 vaccine), a younger adolescent (age 12-15 years), or both; information on exact adolescent age and adolescent gender was not obtained in the parent survey. Respondents were not anchored to a particular child for the survey, so responses were presumed to be consistent across adolescent children in the family. We also included parental concern about their adolescent getting COVID-19 infection (on a 4-point scale from “Not concerned” to “Very concerned”, with an option to indicate that their adolescent had already had COVID-19 infection), parental concern about their adolescent having side effects from the COVID-19 vaccine (on a 4-point scale from “Not concerned” to
“Very concerned”), and the parent’s feeling about vaccines in general (on a 7-point scale from “Very negative” to “Very positive).

The multivariate models were constructed using logistic regression. P-values ≤ 0.05 were considered statistically significant. All data analyses were conducted using Stata (v.14; StataCorp LLC).

Sensitivity Analyses
Sensitivity analyses assessed stability of the model to alternate predictor sets within two key constructs: confidence in vaccines (broadly similar to parental concern regarding vaccine side effects) and perceived risk of COVID-19 infection. In both cases, these alternate sets involved longer sets of questions than those used in our primary model, which were summed into a confidence in vaccines aggregate measure and a perceived risk of COVID-19 aggregate measure. One item in the set of perceived risk questions that formed the perceived risk of COVID-19 aggregate measure (“My child is at greater risk for getting very sick from COVID-19 than the average child”) did not strongly correlate positively with the other items in the set. In bivariate associations, this item also had an opposite relationship with willingness to have an adolescent received all needed vaccines at a visit. As a result, we analyzed it as its own predictor separately from the perceived risk of COVID-19 measure in our sensitivity analyses.

The sensitivity analyses included logistic regression models parallel to the primary model, but with the following predictors: (1) demographics, being behind on routine vaccines, mean
vaccine confidence (for both routine vaccines and COVID-19 vaccine), the single risk item described above (“My child is at greater risk for getting very sick from COVID-19 than the average child”), and mean perceived risk from COVID-19 infection (excluding the single risk item about greater than average risk); and (2) identical to the primary model, but with the additional risk item related to greater risk than average of getting very sick from COVID-19 as described above. These two models were also run for each of the secondary outcomes.

Results

Sample characteristics

In total, 1,457 parents met eligibility criteria and accessed the survey, of whom 156 failed a quality check prior to consent and 172 did not agree to participate. Of the 1,129 who consented, 31 were identified by Qualtrics as “speeders” (completing the survey too quickly) and 74 closed the browser before completion (90.5% completion rate). An additional 256 parents reported that their adolescent had already received a COVID-19 vaccine and 3 did not disclose their child’s vaccination status, leaving a final sample of N=765 parents.

The majority of parents were White and non-Hispanic (60%), about half were female, and just over half had a Bachelor’s degree or higher (Table 2). Fifty-seven percent had an adolescent age child, 12-15 years only, 26% an adolescent age child, 16-17 years only, and 16% both. Thirteen percent reported that their adolescent was behind on receiving routine vaccines (an additional 2.6% were unsure).
Willingness to receive COVID-19 and other routine vaccines at the same visit

A minority of parents (29%) were willing to have their adolescent receive COVID-19 and routine vaccines in the same visit [preference to receive both at the same visit (10.6%) or to follow a healthcare provider’s recommendation (18.6%)] (Table 1). The remainder said they would choose to have their adolescent receive COVID-19 and routine vaccines at separate visits (40%), routine vaccines only (16%), COVID-19 vaccine only (1%), or no vaccines (8%) (Table 1).

Predictors of parental willingness

In the primary multivariate model predicting willingness of parents to have their adolescents vaccinated for COVID-19 and routine vaccines at the same visit (Table 3, Model 1), none of the demographic characteristics were significant. If a parent reported that their adolescent was behind on routine vaccines, they were significantly less willing to have their adolescent receive COVID-19 and routine vaccines together (OR 0.47; 95% CI 0.28, 0.79). Greater concern about side effects of the COVID-19 vaccine was associated with decreased willingness to receive the vaccine with other routine vaccines (OR 0.80; 95% CI 0.66, 0.95). Greater concern about the risk of COVID-19 infection to their adolescent (OR 1.33; 95% CI 1.12, 1.58) as well as more positive feelings towards vaccines in general (OR 1.23; 95% CI 1.08, 1.40) were both significantly associated with greater willingness to have their adolescents vaccinated for COVID-19 and routine vaccines at the same time.

In analyses of the secondary outcomes, the predictors remained largely consistent. First, we looked separately at predictors of preference to receive COVID-19 and routine vaccines at the
same visit (Table 3, Model 2). Demographic characteristics remained non-significant. The odds ratios for all other predictors were in the same direction as in the primary model and of similar magnitude; only higher concern about side effects of the COVID-19 vaccine remained significant (OR 0.69, 95% CI 0.53, 0.89). Next, we looked at willingness to follow their healthcare provider’s recommendation on timing of COVID-19 vaccine and routine vaccine administration (Table 3, Model 3). Again, all predictors were in the same direction and were of similar magnitude compared to the primary model; however, concern about side effects of COVID-19 vaccine was no longer significant.

Sensitivity analyses
Results from the sensitivity models were generally very similar in direction and magnitude to the primary model, including those for the secondary outcomes (Tables 4 and 5). An exception was that, although respondents’ perception that their adolescent was at higher risk of getting very sick from COVID-19 compared to the average child was significant in correlational analyses, it was not a significant predictor in any of the multivariate models in the sensitivity analyses.

Discussion
A national survey of parents of adolescents aged 12 to 17 years who were not yet vaccinated against COVID-19 found that only 29% would prefer for their adolescent to receive COVID-19 and other routine vaccines at the same visit or follow their healthcare provider’s recommendation with regard to coadministration, with the remainder opting for the vaccinations to occur at different visits (or not at all). No demographics characteristics were
associated with greater willingness for coadministration but an adolescent being behind on routine vaccines was associated with lower willingness. Greater willingness was associated with higher perceived risk of COVID-19 infection, lower perceived risk of side effects from the vaccine, and more positive feelings about vaccines in general. Our sensitivity analyses confirmed the robustness of our findings to different measures of perceived risk and different outcomes related to willingness. To our knowledge this is the first national survey to specifically report on parental preferences for coadministration of COVID-19 with other routine vaccines.

The lack of demographic characteristics predicting willingness to have COVID-19 and other routine vaccines coadministered to adolescents serves as an important reminder that healthcare providers should not make assumptions about parent’s vaccination intentions based on any such characteristics. It also implies that if interventions are undertaken to encourage coadministration of vaccines, they should be implemented widely across populations. The relationships between perceived risks of COVID-19 infection and willingness to vaccinate imply that strategies that help parents to understand risks may be successful in helping adolescents consistently receive all recommended vaccines when indicated and on time. Such strategies have already been identified as particularly useful to increase COVID-19 vaccine acceptance in general, including boosting confidence in the safety and effectiveness of the COVID-19 vaccines and combating complacency about the pandemic.²⁰

One potentially troubling finding was that parents of adolescents who were behind on their routine vaccines were less willing to have COVID-19 and other routine vaccines given at the
same visit. The question we asked about willingness to coadminister vaccines was predicated on the adolescent needing vaccines. We expected that such parents might be more willing if they realized their adolescent was already late to receive other needed vaccines. However, it is possible that parents whose adolescents are behind on their routine vaccines differ from parents whose adolescents are up-to-date on vaccines in ways that were not measured in this survey. These unmeasured differences may also influence their acceptance of COVID-19 vaccines and willingness to have them coadministered with other vaccines. For example, adolescents who are behind on routine vaccines may have less consistent access to a trusted health care provider for their child.

Our primary outcome was respondents’ primary preference for how they would like their adolescent to receive COVID-19 and routine vaccines. We asked parents to endorse only their single, strongest preference (by question design). However, there is value in understanding what parents most strongly prefer, while recognizing that parents may also be willing to consider other vaccination options. We also included the option of doing whatever their child’s healthcare provider recommends as an indication of the parent’s willingness for vaccine coadministration, as it would be reasonable to expect parents to follow the healthcare provider’s advice. In fact, health care providers’ recommendation to get vaccinated is a significant factor in parental decision making.\textsuperscript{21} This highlights the importance of understanding whether providers are comfortable with and likely to recommend coadministration for adolescents. Although coadministration of vaccines is one means of getting adolescents who are in need of routine vaccines caught up, healthcare providers may be more reluctant to do so
with COVID-19 vaccines. Strategies that rely on encouraging coadministration of COVID-19 vaccine with other routine vaccines may need to ensure that healthcare providers feel supported and are well equipped to make this recommendation.

In addition to considering healthcare providers’ comfort and implications for these settings, there are also important implications for policymakers. As the COVID-19 pandemic moves to a model of less frequent but still regular COVID-19 vaccination efforts, it will be important to understand the public’s willingness to receive COVID-19 vaccines together with other vaccines. The most common scenario for adolescents (who typically have a period without needing routine vaccinations between 11-12 and 16-18 years of age if otherwise up-to-date) is needing COVID-19 vaccine together with influenza vaccine. A strategy that relies on encouraging the public to get both vaccines at the same time may backfire and cause heightened concern, never mind a new vaccine that combines protection against both viruses in one injection. At the time of our survey, a majority of parents were willing to get both COVID-19 and other routine vaccines for their adolescents even if not simultaneously, which is encouraging overall. Our results suggest that policymakers may wish to ensure diversified strategies to continue to encourage vaccination regardless of timing. For those who prefer to receive all vaccines at the same time, the best strategy may to make doing so as easy as possible. Others who would decline to get COVID-19 and other vaccines together may need lots of different exposures and opportunities to get the vaccines they need (e.g., at school, in retail locations, and in all health care settings they might encounter).
The timing of this survey is important to consider, as it was conducted in the weeks preceding the FDA authorization of COVID-19 vaccine for younger adolescents (and full approval in those aged 16 years and older) and prior to the emergence of the Delta variant as a “variant of concern”; these developments may well have had an impact on parental willingness for adolescents to receive COVID-19 with other vaccines. It was also conducted prior to CDC stating that COVID-19 vaccines could be given at the same time as other vaccines, which occurred around the time of FDA’s authorization of the vaccine for adolescents. Thus it is entirely possible that the opinions held by parents at the time of the survey may have changed with new guidance from CDC explicitly endorsing coadministration. As a result, our findings may underestimate parents’ willingness to have their adolescents receive COVID-19 vaccines with other vaccines, and limits our certainty in interpreting our results. That being said, the relationships between willingness and other covariates (such as being behind on vaccines) may be less affected by changes in CDC policy. We also note that there are no other studies to our knowledge that have explicitly examined this construct. Updating our findings now that guidance on coadministration is clearer and with the evolution of COVID-19 boosters in this population would be an important next step.

Our findings are subject to other limitations. The surveys were administered online and only in English, which could yield underrepresentation of U.S. residents without Internet access or those who have limited English proficiency. We used a nonprobability, quota-based sample, which also has the potential to increase potential for bias and limit generalizability.\textsuperscript{22} Some respondents had more than one adolescent in their household, and we did not ask them to
anchor to a particular adolescent. As a result, we were unable to draw firm conclusions on relationship between age of the adolescent and willingness, though we did control for having one age group or the other or both. We asked about routine vaccines, but not about influenza vaccine in particular. Finally, as noted above, this same survey conducted after authorization of COVID-19 vaccines for adolescents and allowance for coadministration with other vaccines might have yielded different findings.

Conclusions

We report findings from a national survey of parents in the United States that explored willingness to have adolescents receive COVID-19 vaccine together with other routine vaccines. Identifying factors associated with willingness to receive all recommended vaccines in the context of the COVID-19 pandemic is important not only for adolescents, but also for younger children as they become eligible for COVID-19 vaccines. Our findings are timely and urgently needed to inform strategies to optimize the administration of both COVID-19 and routine vaccines—including against influenza—to protect the health of the nation’s children.
References


Table 1. Preferences for timing of administration of COVID-19 and routine vaccines (N=765)*

<table>
<thead>
<tr>
<th>Preference</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine vaccine(s) and COVID-19 vaccine in the same visit</td>
<td>81 (10.6%)</td>
</tr>
<tr>
<td>Whatever my child’s healthcare provider recommended</td>
<td>142 (18.6%)</td>
</tr>
<tr>
<td>COVID-19 vaccine first, then routine vaccine(s) at a separate visit</td>
<td>166 (21.7%)</td>
</tr>
<tr>
<td>Routine vaccine(s) first, then COVID-19 vaccine at a separate visit</td>
<td>142 (18.6%)</td>
</tr>
<tr>
<td>Only a COVID-19 vaccine; I do not want my child to receive routine vaccine(s)</td>
<td>9 (1.2%)</td>
</tr>
<tr>
<td>Only routine vaccine(s); I do not want my child to receive a COVID-19 vaccine</td>
<td>121 (15.8%)</td>
</tr>
<tr>
<td>No vaccines</td>
<td>58 (7.6%)</td>
</tr>
<tr>
<td>Don’t know/Not sure</td>
<td>46 (6.0%)</td>
</tr>
</tbody>
</table>

*Response to the following question: “If a healthcare provider recommended your child receive one or more routine vaccines in addition to a COVID-19 vaccine, how would you get your child vaccinated?”
Table 2. Sample characteristics (N=765)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of parents’ adolescent child(ren)</strong></td>
<td></td>
</tr>
<tr>
<td>12-15 years only</td>
<td>437 (57.1%)</td>
</tr>
<tr>
<td>16-17 years only</td>
<td>203 (26.5%)</td>
</tr>
<tr>
<td>Both 12-15 years and 16-17 years</td>
<td>125 (16.3%)</td>
</tr>
<tr>
<td><strong>Parent gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>349 (45.6%)</td>
</tr>
<tr>
<td>Male</td>
<td>413 (54.0%)</td>
</tr>
<tr>
<td>Transgender or other gender identity</td>
<td>3 (0.4%)</td>
</tr>
<tr>
<td><strong>Parent age (mean ± SD)</strong></td>
<td>44.2 ± 8.3</td>
</tr>
<tr>
<td><strong>Parent race/ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>455 (59.5%)</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>106 (13.9%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>150 (19.6%)</td>
</tr>
<tr>
<td>Other, non-Hispanic</td>
<td>54 (7.1%)</td>
</tr>
<tr>
<td><strong>Parent education</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; High school</td>
<td>152 (19.9%)</td>
</tr>
<tr>
<td>Some college</td>
<td>228 (29.8%)</td>
</tr>
<tr>
<td>&gt; Bachelor’s degree</td>
<td>385 (50.3%)</td>
</tr>
<tr>
<td><strong>U.S. Census region</strong></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>139 (18.2%)</td>
</tr>
<tr>
<td>Midwest</td>
<td>148 (19.4%)</td>
</tr>
<tr>
<td>South</td>
<td>310 (40.5%)</td>
</tr>
<tr>
<td>West</td>
<td>168 (22.0%)</td>
</tr>
</tbody>
</table>
Table 3. Models predicting willingness to have adolescent receive COVID-19 and other routine vaccines at the same visit (N=735)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model 1 Prefer coadministration of vaccines at same visit OR follow HCP recommendation OR (95% CI)</th>
<th>Model 2 Prefer coadministration of vaccines at same visit OR (95% CI)</th>
<th>Model 3 Follow HCP recommendation OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Told behind on routine vaccines</td>
<td>0.47 (0.28, 0.79)</td>
<td>0.60 (0.28, 1.27)</td>
<td>0.49 (0.26, 0.90)</td>
</tr>
<tr>
<td>Greater concern about adolescent getting COVID-19</td>
<td>1.33 (1.12, 1.58)</td>
<td>1.28 (0.99, 1.65)</td>
<td>1.25 (1.03, 1.53)</td>
</tr>
<tr>
<td>Greater concern about side effects from COVID-19 vaccine</td>
<td>0.80 (0.66, 0.95)</td>
<td>0.69 (0.53, 0.89)</td>
<td>0.94 (0.76, 1.16)</td>
</tr>
<tr>
<td>More positive feelings about vaccines in general</td>
<td>1.23 (1.08, 1.40)</td>
<td>1.19 (0.97, 1.45)</td>
<td>1.19 (1.02, 1.39)</td>
</tr>
</tbody>
</table>

Abbreviations: HCP—Healthcare provider; OR—Odds ratio; CI—Confidence intervals  
*Adjusted for parental gender, age, race/ethnicity, education, and adolescent(s’) age group(s) (12-15 years only, 16-17 years only, or both), of which none were significant; results in bold indicate statistical significance at p<0.05.
Table 4. Sensitivity analyses--model predicting willingness to have adolescent receive COVID-19 and other routine vaccines at the same visit with alternative predictors (N=760)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model 1 Prefer coadministration of vaccines at same visit OR follow HCP recommendation OR (95% CI)</th>
<th>Model 2 Prefer coadministration of vaccines at same visit OR (95% CI)</th>
<th>Model 3 Follow HCP recommendation OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Told behind on routine vaccines</td>
<td>0.48 (0.28, 0.80)</td>
<td>0.56 (0.26, 1.19)</td>
<td>0.53 (0.28, 0.99)</td>
</tr>
<tr>
<td>Perceived risk of COVID-19 aggregate measure</td>
<td>1.39 (1.10, 1.76)</td>
<td>1.13 (0.80, 1.59)</td>
<td>1.44 (1.10, 1.88)</td>
</tr>
<tr>
<td>Perceived higher than average risk that adolescent could get very sick from COVID-19</td>
<td>0.96 (0.79, 1.16)</td>
<td>1.13 (0.86, 1.48)</td>
<td>0.87 (0.70, 1.09)</td>
</tr>
<tr>
<td>Confidence in vaccines aggregate measure</td>
<td>2.38 (1.70, 3.35)</td>
<td>2.03 (1.23, 3.35)</td>
<td>2.12 (1.43, 3.15)</td>
</tr>
</tbody>
</table>

Abbreviations: HCP—Healthcare provider; OR—Odds ratio; CI—Confidence intervals
*Adjusted for parental gender, parental age, parental race/ethnicity, parental education, adolescent(s’) age group(s) (12-15 years only, 16-17 years only, or both), of which none were significant; results in bold indicate statistical significance at p<0.05.
Table 5. Sensitivity analyses--model predicting willingness to have adolescent receive COVID-19 and other routine vaccines at the same visit with additional risk item (N=735)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model 1 Prefer coadministration of vaccines at same visit OR follow HCP recommendation OR (95% CI)</th>
<th>Model 2 Prefer coadministration of vaccines at same visit OR (95% CI)</th>
<th>Model 3 Follow HCP recommendation OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Told behind on routine vaccines</td>
<td>0.48 (0.28, 0.81)</td>
<td>0.54 (0.25, 1.16)</td>
<td>0.53 (0.29, 1.00)</td>
</tr>
<tr>
<td>Higher concern about adolescent getting COVID-19</td>
<td>1.34 (1.12, 1.59)</td>
<td>1.24 (0.95, 1.60)</td>
<td>1.29 (1.05, 1.58)</td>
</tr>
<tr>
<td>Perceived higher than average risk that adolescent could get very sick from COVID-19</td>
<td>0.97 (0.81, 1.18)</td>
<td>1.22 (0.94, 1.58)</td>
<td>0.85 (0.68, 1.07)</td>
</tr>
<tr>
<td>Higher concern about side effects from COVID-19 vaccine</td>
<td>0.80 (0.67, 0.96)</td>
<td>0.67 (0.51, 0.87)</td>
<td>0.96 (0.78, 1.19)</td>
</tr>
<tr>
<td>More positive feelings about vaccines in general</td>
<td>1.23 (1.08, 1.40)</td>
<td>1.18 (0.97, 1.45)</td>
<td>1.20 (1.03, 1.40)</td>
</tr>
</tbody>
</table>

Abbreviations: HCP—Healthcare provider; OR—Odds ratio; CI—Confidence intervals
*Adjusted for parental gender, parental age, parental race/ethnicity, parental education, adolescent(s’) age group(s) (12-15 years only, 16-17 years only, or both), of which none were significant; results in bold indicate statistical significance at p<0.05.