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Parents’ intention to have their child vaccinated at a community pharmacy: A national cross-sectional survey

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**Abstract**

**Background:** During the coronavirus disease 2019 pandemic, pediatric vaccination rates for routine childhood vaccines have been declining. To boost pediatric immunizations, pharmacists in the United States may order and administer age-appropriate vaccines to children of 3 years of age and older without a prescription.

**Objective:** The objective of this study was to examine parents’ intention to have their young children between 3 and 10 years of age vaccinated in a community pharmacy setting.

**Methods:** A survey instrument was designed based on the health belief model (HBM). The cross-sectional survey was administered online via Qualtrics Panels to parents in the United States with at least 1 child between the ages of 3 and 10 years. Confirmatory factor analysis was used to estimate the correlation between each of the HBM constructs and a 3-item scale measuring parents’ intention to have their children between the ages of 3 and 10 vaccinated in a community pharmacy.

**Results:** There were 416 usable responses collected for an effective response rate of 25.95%. Most participants were white (79.09%) and female (51.44%), and many had a graduate degree (48.32%). More than half of parents (69.7%) indicated they would be willing to have their child vaccinated in a community pharmacy. Intention to have their child vaccinated in a pharmacy was most strongly corrected with health benefit beliefs (ψ 0.79 [95% CI 0.75–0.83]), (ψ 0.86 [95% CI 0.83–0.89]) cues to action, and perceived convenience.(ψ 0.71 [95% CI 0.66–0.76]).

**Conclusion:** Many parents have high intention to vaccinate their young children in community pharmacies. Parents should be educated and informed about services that community pharmacies offer. Stakeholders need to engage in interventions targeted at promoting health benefits of getting vaccinations at a pharmacy and strong recommendations from health care providers.

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**Background**

Coronavirus disease 2019 (COVID-19) was declared a global pandemic by the World Health Organization and a national emergency by the President of the United States in March 2020. To prevent further spread of the virus, experts advised people to stay at home, limit social interactions, and practice good hand hygiene. Shortly after the declaration of COVID-19 as a pandemic, pediatric vaccinations in the United States dropped dramatically resulting in lower vaccination rates for vaccine-preventable diseases such as measles. Some doctor’s offices were closed or offering reduced hours, limiting parents’ access to pediatric vaccination services during the pandemic. In addition, parents may have been concerned about exposing their children to the COVID-19 virus during routine well-child visits. While many healthcare professionals were less accessible in response to the COVID-19 pandemic, pharmacies remained open to the public and played a vital role serving their communities.
COVID-19 pandemic amid declining pediatric vaccination rates for vaccine-preventable diseases including measles, mumps, and rubella.

The health belief model (HBM) is a widely used health behavior theory that was originally designed to assist researchers in identifying behavioral barriers to preventative health care utilization. The model suggests that the likelihood of an individual accessing care depends on their personal beliefs about care and external or internal cues to action. Although an individual may have a diverse array of beliefs that influence their willingness to receive care, the model distills these into 3 distinct constructs: perceived threat of illness, perceived benefits of health care utilization, and perceived barriers to utilization.

Perceived threat is a combination of beliefs that the individual themselves is at risk of a disease or condition (perceived susceptibility) and beliefs regarding the severity of disease if the individual themselves contracted the disease (perceived severity). People are more likely to act if they believe that they are at higher risk of contracting a disease or that the disease would have severe negative consequences. In addition, an individual is more likely to partake in a behavior if they believe the behavior will mitigate their susceptibility or severity of disease (perceived benefits) and if they do not perceive many negative consequences of the behavior (perceived barriers). Many scholars also include beliefs regarding an individuals perceived ability to perform a behavior (self-efficacy) and internal or external cues that may encourage a person to behave differently (cues to action).

Objective

The objective of this study was to apply the HBM to assess parents’ intention to have their child between the ages of 3 and 10 years vaccinated in a community pharmacy. Identifying determinants of intention to vaccinate is critical to developing interventions to improve pediatric vaccine access in community pharmacies.

Methods

Study design and survey instrument

This study was a national, cross-sectional, online survey of United States parents with at least 1 child between the ages of 3 and 10 years. The survey instrument was designed from a review of pertinent literature regarding parental intention to vaccinate their adolescent children with the HPV vaccine. Items were modified from their original version to suit the current surveyed population.

Intention to vaccinate was measured with 3 Likert-scaled items ranging from 1 (strongly disagree) to 7 (strongly agree). To measure actual behavior, 2 additional binary items assessed whether parents had their child vaccinated in a community pharmacy before or after March 2020.

Perceived susceptibility was assessed using 6 Likert-scaled items regarding parents’ beliefs that their child would be at risk of vaccine-preventable diseases if they were not vaccinated. Six additional items assessed perceived severity—beliefs regarding how serious different diseases would be if their child contracted them.

Pharmacies are conveniently located within communities and have extended hours of operation making them ideal sites for vaccine distribution, especially as the number of prescriptions dispensed were affected in COVID-19. Still, before March of 2020, few states allowed for pediatric vaccination in community pharmacies. The Public Readiness and Emergency Preparedness (PREP) Act was originally enacted in December of 2005 and gives the Secretary of the Department of Health and Human Services (HHS) the authority to issue declarations. Such declarations could provide liability immunity to “Covered Persons” for claims of loss related to “Covered Countermeasures.” Owing to the threat of COVID-19, the Secretary of HHS enacted the PREP Act on January 31, 2020. The Third Amendment to the PREP Act was later published in March 2020 and became effective on August 24, 2020, to help combat low childhood vaccination rates. The Third Amendment allows licensed pharmacists in the United States and District of Columbia to order and administer routine childhood vaccinations approved by the Food and Drug Administration and following the Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) guidelines to children 3 years of age or older without a prescription.

Previous research has examined parents’ intention to have their adolescent children aged 11–17 years vaccinated in pharmacies. A national survey of parents revealed that 44% of parents were willing to get their adolescent child vaccinated for human papillomavirus (HPV) in a pharmacy. Parents indicated that pharmacies offered more convenient vaccination services but were not as safe as doctor’s offices. However, little is known about parents’ intention to have their younger children, at ages 3 to 10 years, vaccinated in a pharmacy. This is especially important information during the

Key Points

Background:

- In an attempt to combat low pediatric vaccination rates during the coronavirus disease 2019 pandemic, pharmacist pediatric vaccination authority were expanded.
- Among parents of adolescent children between 11 and 17 years of age, 44% were willing to have their child vaccinated for human papillomavirus in a pharmacy.

Findings:

- More than half of parents had high intention to vaccinate their young children between the ages of 3 and 10 years in a community pharmacy.
- Perceived cues to action, general health benefits of vaccination, and perceived convenience were most strongly correlated with intent to vaccinate in community pharmacies.
- Roughly one-third of parents were concerned that pediatric vaccination in pharmacies was less safe than vaccination in other settings of care.
Parents’ intention to have their child vaccinated

Perceived benefits included 3 subcategories identified in the literature: included vaccine efficacy, general health benefits, and convenience.8,13,14 There were 5 vaccine efficacy items that asked parents how effective they believed a specific vaccine was at preventing the disease. Three items were used to assess general benefits associated with getting their child vaccinated in a community pharmacy including additional health care opportunities8 and that it would be good for their child’s overall health.14 Convenience was measured using 3 items regarding pharmacy hours, appointments, and physical location. Given that this was a new instrument and our objective was to confirm the validity and dimensionality of the instrument, each was treated as an independent latent construct.

Similar to perceived benefits, perceived barriers included 3 subcategories identified in the literature. Subcategories of perceived barriers were safety, affordability, and accessibility.8,13,14 Four items were used to assess parents’ beliefs about the safety of their child receiving a vaccine from a pharmacy. Three items addressed beliefs regarding the affordability of having their child vaccinated at a pharmacy, and 3 additional items addressed beliefs regarding how difficult it would be to find a pharmacy to get their child vaccinated at. Similar to the perceived benefits scale, each of these was treated as an independent latent construct.

There were 7 items that addressed various cues to action including community and health care provider recommendation to have children vaccinated at the pharmacy. Three items addressed parents’ self-efficacy beliefs that they are capable of taking their child to the pharmacy to be vaccinated and make decisions about their child’s vaccines.

Participant demographics were collected including age, state of residence, sex, race, education level, total number of children, and the number of children in the desired age range. The survey was face validated by 3 parents who were eligible for inclusion in the study. Minimal changes were made to the wording of the survey instrument. The final survey instrument can be viewed in Appendix 1.

Sample selection

Study participants were members of research panels managed by Qualtrics (Provo, UT). Qualtrics recruits perspective panel members through targeted emailing, member referral, patient loyalty Web pages, and more.15 After agreeing to participate in future surveys, members complete a demographic profile that is updated periodically to ensure accuracy. A sample of potential respondents are selected based on their profile.15 Qualtrics compensates panel members directly for participation in the survey.15 To be eligible for the study, participants had to be at least 18 years old and fluent in English and have at least 1 child between the age of 3 and 10 years.

Data collection

After identifying eligible participants, Qualtrics distributed the survey via e-mail. On receiving the link to the survey, participants were shown a cover letter detailing their rights as participants, measures to protect their privacy, and information on how their responses would be used. Survey responses were collected in November 2020. This study was approved by the University of Houston Institutional Review Board.

Analysis

Scales with negative wording, including the safety scale, were reverse coded to support consistent interpretation of results. Descriptive statistics were calculated for all variables. Categorical variables were assessed using frequencies and percentages, and continuous variables were described with mean and SD. The Likert-scaled HBM items were treated as ordinal categorical variables throughout the analysis, and the distribution of individual item level responses was analyzed as such.

Given that all scales were measured with ordered, categorical, Likert-scaled items, scale dimensionality, reliability, and validity were assessed through confirmatory factor analysis of the items’ hypothesized polyanch correlative structure.16 The preliminary model as specified in Figure 1 was estimated using a weighted least squares mean variance approach using MPlus version 4 (Muthén & Muthén, February 2006).17 All latent constructs of the HBM were assumed to be significantly and positively correlated (P < 0.05). Our preliminary model assumed that all item residuals were independent and all interitem correlations were assumed to be attributed solely to their latent correlations (ψ1 - ψn > 0, ρi, ψi = 0). Construct validity, the strength of each item’s ability to measure the underlying construct, was assessed using Fornell and Larcker’s criteria, factor loadings greater than 0.6 (λ > 0.6) and a statistically significant (P < 0.05) t value for each loading (H0: λ = 0, Ha: λ ≠ 0).18-20 Items violating these criteria were removed.

After removing items with poor factor loadings, reliability of each scale was assessed through composite reliability and average variance extracted (AVE). Composite reliability (ρ), much like the popular and often misapplied Cronbach’s coefficient α, is a measure of internal consistency.19-21 However, Cronbach’s alpha assumes that items are equivalent meaning that for items 1 – n, λ1 = λ2 = … = λn. This is often an inappropriate assumption, especially in new instruments where factor loadings are unknown.21 Composite reliability allows item loadings to vary and represents the ratio of variance in a scale explained by the latent construct, also known as the true score variance, to the total variance in a scale:

\[
\rho_q = \frac{\left(\sum_{i=1}^{p} \lambda_i^2\right)^2}{\left(\sum_{i=1}^{p} \lambda_i^2\right)^2 + \left(\sum_{i=1}^{p} 1 - \lambda_i^2\right)^2} V
\]

where the term \(\left(\sum_{i=1}^{p} 1 - \lambda_i^2\right)\) represents the error variance (θ) of each item, the variance not explained by the latent factor.20,21 Next, Fornell and Larcker’s AVE was used as a secondary measure of construct reliability. AVE represents the average amount of variance in each item in the scale explained by the construct:

\[
AVE_q = \frac{\lambda_i^2}{N}
\]

where N is the number of items in a scale.19,20 Acceptable values for both of these indicators are 0.7.
After this, we established discriminant validity of the item’s constructs through Anderson and Goehring’s CI test. Here, 1.96 times the standard error of each latent correlation is added and subtracted from each latent correlation establishing the upper and lower limits of a 95% CI for that latent correlation. If this interval does not include 1, we can conclude that the 2 constructs are not perfectly correlated and thus divergent. After establishing dimensionality, reliability, and validity of scales, we examined the latent correlation matrix to draw inferences about the interdependence of the measured constructs.

Results

A total of 1603 people opened the survey link, and 416 usable responses were collected for an effective response rate of 25.95%. Most respondents were female (51.44%) and white (79.09%). Almost one-third of participants had a college degree (29.81%) and almost half had a graduate degree (48.32%). The average age of the parent responding to the survey was 38 years. Overall, parents expressed agreement with items measuring their intent to vaccinate their young children in the community pharmacy setting. Here, 69.7% indicated that they would be willing to have their child vaccinated at a pharmacy (somewhat agreed, agreed, or strongly agreed), 56.6% indicated that they would take their child to the pharmacy to be vaccinated, and 56.7% said they wanted to take their child to the pharmacy for their next vaccination. In this analysis, 53.0% and 43.6% of parents indicated that they had had their child vaccinated in a pharmacy before or after March 2020, respectively. A full sample description can be seen in Table 1.

After estimating the hypothesized model with all 46 HBM items, 44 items were retained. After reviewing model modification indices, 2 items from the cues to action scale were removed owing to strong, unexplainable cross-loadings onto the general health benefits construct. Scale reliability was established through computation of composite reliability and AVE from each scale’s factor loadings. Factor loadings, AVE, and composite reliability for each scale are all displayed in Appendix 2. All scales displayed acceptable composite reliability ranging from 0.75 for the accessibility scale to 0.86 for the perceived susceptibility scale. AVE was also acceptable with scales ranging from 75% for the accessibility scale to 86% for the intention to vaccinate in a pharmacy scale.

Next, the latent correlation matrix, $\psi$, was reviewed to establish discriminant validity using the CI test (Table 2). Although all constructs were positively and statistically significantly correlated, no CIs for latent correlations were bounded by 1 thus suggesting sufficient scale discriminant validity. Intention to vaccinate was most strongly correlated with perceived cues to action ($\psi = 0.86\ [95\% CI 0.83–0.89]$), perceived health benefits ($\psi = 0.79\ [95\% CI 0.75–0.83]$), and perceived convenience ($\psi = 0.71\ [95\% CI 0.66–0.76]$). For ease of interpretation, all values of $\psi$ are standardized. Model fit was acceptable ($\chi^2/df = 2.72; \text{CMIN/DF} = 2.67; \text{CFI} = 0.96; \text{SRMR} = 0.069$; 95% CI $\text{RMSEA} : 0.065 – 0.072$; Comparative Fix Index [CFI] : 0.96; Standardized Root Mean Squared Residual [SRMR] : 0.039).

Table 1

| Demographic characteristic | n (%) |
|----------------------------|-------|
| Sex                        |       |
| Male                       | 202 (48.56) |
| Female                     | 214 (51.44) |
| Race                       |       |
| Caucasian/non-Hispanic white | 329 (79.09) |
| Nonwhite/Hispanic          | 87 (20.91) |
| Highest level of education |       |
| Some high school           | 5 (1.20) |
| High school graduate, diploma, or GED | 25 (6.01) |
| Some college               | 43 (10.34) |
| Trade/technical/vocational training | 18 (4.33) |
| College graduate           | 124 (29.81) |
| Graduate degree            | 201 (48.32) |
| Vaccinated their child at a community pharmacy before March 2020 |       |
| No                         | 198 (47.60) |
| Yes                        | 218 (52.40) |
| Vaccinated their child at a community pharmacy after March 2020 |       |
| No                         | 241 (57.93) |
| Yes                        | 175 (42.07) |
| Age of parent              | 38.28 (6.06) |

Abbreviation used: GED, General Educational Development.

* Proportions may not add up to 100% owing to rounding.
### Table 2
Latent covariances (φ) and 95% CIs from a confirmatory factor model intended to assess parents’ willingness to have their children vaccinated in community pharmacies

|     | CAP     | BEH     | SUSC    | SEV     | EFF     | HEAL    | CONV    | SAFE    | AFF     | ACC     | CUES    |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| CAP | 1       |         |         |         |         |         |         |         |         |         |         |
| BEH | 0.60 (0.54–0.66) | 1       |         |         |         |         |         |         |         |         |         |
| SUSC| 0.45 (0.37–0.54) | 0.53 (0.46–0.60) | 1       |         |         |         |         |         |         |         |         |
| SEV | 0.55 (0.48–0.62) | 0.54 (0.47–0.61) | 0.70 (0.65–0.75) | 1       |         |         |         |         |         |         |         |
| EFF | 0.73 (0.68–0.78) | 0.48 (0.40–0.55) | 0.53 (0.46–0.60) | 0.67 (0.62–0.73) | 1       |         |         |         |         |         |         |
| HEAL| 0.57 (0.50–0.64) | 0.79 (0.75–0.83) | 0.56 (0.49–0.63) | 0.60 (0.53–0.67) | 0.52 (0.45–0.60) | 1       |
| CONV| 0.67 (0.60–0.73) | 0.71 (0.66–0.76) | 0.53 (0.46–0.61) | 0.57 (0.50–0.65) | 0.53 (0.46–0.61) | 0.89 (0.86–0.92) | 1       |
| SAFE| 0.28 (0.19–0.37) | 0.41 (0.34–0.49) | 0.49 (0.42–0.56) | 0.54 (0.48–0.61) | 0.33 (0.25–0.42) | 0.49 (0.42–0.56) | 0.41 (0.33–0.49) | 1       |
| AFF | 0.27 (0.18–0.36) | 0.45 (0.38–0.51) | 0.48 (0.40–0.55) | 0.54 (0.47–0.60) | 0.31 (0.23–0.40) | 0.52 (0.46–0.59) | 0.44 (0.37–0.51) | 0.95 (0.92–0.98) | 1       |
| ACC | 0.67 (0.61–0.74) | 0.64 (0.58–0.70) | 0.57 (0.50–0.63) | 0.56 (0.49–0.63) | 0.57 (0.50–0.64) | 0.81 (0.77–0.85) | 0.81 (0.77–0.85) | 0.47 (0.40–0.55) | 0.47 (0.40–0.54) | 1       |
| CUES| 0.64 (0.58–0.70) | 0.86 (0.83–0.89) | 0.60 (0.53–0.66) | 0.63 (0.57–0.69) | 0.57 (0.50–0.64) | 0.83 (0.79–0.87) | 0.76 (0.71–0.80) | 0.58 (0.52–0.64) | 0.60 (0.54–0.66) | 0.69 (0.63–0.75) | 1       |

**Abbreviations used:** ACC, perceived accessibility; AFF, perceived affordability; BEH, intention to vaccinate; CAP, capability; CONV, perceived convenience; CUES, cues to action; EFF, perceived effectiveness; HEAL, health benefits; SAFE, perceived safety; SEV, perceived severity; SUSC, perceived susceptibility.

**Note:** All latent correlations were statistically significant at $P < 0.001$ and showed sufficient divergent validity with no 95% CIs including 1.
Immunization Certificate Training Program is recognized by all states in the United States. The training program is based on the CDC ACIP immunization guidelines for all ages and includes numerous vaccine-preventable diseases, vaccine research and design, and considerations for special populations. In addition, there is a hands-on assessment of immunization technique and vaccine providers are required to maintain Basic Life Support certification to be able to assist patients in the event of a life-threatening reaction. One study identified that up to 79% of parents would support getting their adolescent child vaccinated for HPV in a pharmacy if pharmacists were properly trained in vaccine administration and adverse reactions, reported vaccinations to the child’s doctor, and made referrals to the child’s doctor for other routine health services. If stakeholders want parents to use community pharmacies for pediatric vaccinations, parents’ perceptions of the safety of community pharmacies need to be addressed. This could include making sure pharmacists are trained in handling the potentially erratic behavior of very young patients that could result in adverse outcomes (e.g., needle sticks) as well as trained on distraction techniques to make vaccination in a community pharmacy more child friendly.

Pharmacists need to educate parents on the importance of pediatric vaccines and advertise availability in community pharmacies. In addition, policy makers must consider how many parents in the United States have high intentions to vaccinate their children in the community pharmacy setting and should consider extending pharmacist pediatric vaccination privileges beyond the COVID-19 pandemic. Researchers should continue to assess the pediatric vaccination rates and usage of community pharmacy vaccine programs.

Potential limitations

Limitations of this study include its cross-sectional design. The temporal and causal link between HBM constructs and behavior cannot be distinctly confirmed. Whether parents will actually take their child to the pharmacy for their next vaccination cannot be assessed. In addition, this sample was more educated and had a higher percentage of Caucasian/non-Hispanic white than the general United States population, which could potentially limit the generalizability of the study. A low response rate may also contribute to bias. Considering these limitations, the study may help further understand parental concerns regarding vaccinating their younger children outside of doctors’ offices. In addition, the study provides unique insight into how parents feel regarding expanding pharmacist vaccination services.

Conclusion

Most parents who completed this survey had high intention to vaccinate their child in a community pharmacy. Significant factors associated with high intention included perceived benefits regarding general health beliefs and cues to action from a variety of sources. Based on the principles of the HBM, to promote adoption of a behavior, perceived benefits should be maximized to overcome any perceived barriers. Stakeholders should engage in interventions targeted at promoting health benefits of getting vaccinations at a pharmacy and strong recommendations from health care providers. Pharmacist’s ability to order and administer pediatric vaccinations is a service many parents intend to use and could boost pediatric vaccination rates across the country; therefore, permanent policies are warranted to allow pharmacies to continue this service.

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Appendix 1

Vaccine survey instrument

Survey Instrument

In order to make sure you qualify for this study, please answer the following questions about yourself.

- How old are you?
- What state do you live in?
- Do you have at least one child between the ages of 3 and 10 years old?
  - Yes (1)
  - No (2)

Before the COVID-19 pandemic, pharmacists in most states were allowed to vaccinate children 3 years of age or older with a doctor’s prescription. During the pandemic, pediatric vaccination rates for diseases like measles, mumps, and rubella (MMR) and diphtheria, tetanus, and whooping cough have decreased. In order to expand access to childhood vaccines, pharmacists in all states are now allowed to order and administer age-appropriate vaccinations approved by the Food and Drug Administration without a prescription from the child’s doctor. The purpose of this study is to examine how parents feel about getting their child age 3-10 years old vaccinated at pharmacies during the COVID-19 pandemic.

Section 1: Likelihood of Contracting Disease

The following questions pertain to your beliefs regarding the likelihood of your child between the ages of 3 and 10 years old getting various vaccine-preventable diseases.

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

Without vaccines, what do you think is the chance that your child will get measles?
  - Very unlikely (1)
  - Unlikely (2)
  - Somewhat unlikely (3)
  - Undecided (4)
  - Somewhat likely (5)
  - Likely (6)
  - Very likely (7)

Without vaccines, what do you think is the chance that your child will get mumps?
  - Very unlikely (1)
  - Unlikely (2)
  - Somewhat unlikely (3)
  - Undecided (4)
  - Somewhat likely (5)
  - Likely (6)
  - Very likely (7)

Without vaccines, what do you think is the chance that your child will get rubella?
  - Very unlikely (1)
  - Unlikely (2)

Without vaccines, what do you think is the chance that your child will get whooping cough (pertussis)?
  - Very unlikely (1)
  - Unlikely (2)
  - Somewhat unlikely (3)
  - Undecided (4)
  - Somewhat likely (5)
  - Likely (6)
  - Very likely (7)

Without vaccines, what do you think is the chance that your child will get tetanus?
  - Very unlikely (1)
  - Unlikely (2)
  - Somewhat unlikely (3)
  - Undecided (4)
  - Somewhat likely (5)
  - Likely (6)
  - Very likely (7)

Without vaccines, what do you think is the chance that your child will get chicken pox (varicella)?
  - Very unlikely (1)
  - Unlikely (2)
  - Somewhat unlikely (3)
  - Undecided (4)
  - Somewhat likely (5)
  - Likely (6)
  - Very likely (7)

Section 2: Seriouness of Disease

The next set of questions pertain to your beliefs regarding how serious it would be if your child between the ages of 3 and 10 years old got a vaccine-preventable disease.

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

How serious would it be if your child got measles?
  - Not serious (1)
  - Low seriousness (2)
  - Slightly serious (3)
  - Neutral (4)
  - Moderately serious (5)
  - Very serious (6)
  - Extremely serious (7)

How serious would it be if your child got mumps?
  - Not serious (1)
  - Low seriousness (2)
  - Slightly serious (3)
  - Neutral (4)
  - Moderately serious (5)
  - Very serious (6)
  - Extremely serious (7)
How serious would it be if your child got rubella?
- Not serious (1)
- Low seriousness (2)
- Slightly serious (3)
- Neutral (4)
- Moderately serious (5)
- Very serious (6)
- Extremely serious (7)

How serious would it be if your child got whooping cough (pertussis)?
- Not serious (1)
- Low seriousness (2)
- Slightly serious (3)
- Neutral (4)
- Moderately serious (5)
- Very serious (6)
- Extremely serious (7)

How serious would it be if your child got tetanus?
- Not serious (1)
- Low seriousness (2)
- Slightly serious (3)
- Neutral (4)
- Moderately serious (5)
- Very serious (6)
- Extremely serious (7)

How serious would it be if your child got chicken pox (varicella)?
- Not serious (1)
- Low seriousness (2)
- Slightly serious (3)
- Neutral (4)
- Moderately serious (5)
- Very serious (6)
- Extremely serious (7)

Section 3: How Well do Vaccines Work

The next set of questions pertain to your beliefs regarding how well vaccines work at preventing disease.
- MMR: Measles, mumps, and rubella vaccine
- DTaP: Diphtheria, tetanus, and pertussis (whooping cough) vaccine

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

How effective do you think the MMR vaccine is at preventing measles?
- Totally ineffective (1)
- Ineffective (2)
- Slightly ineffective (3)
- Neutral (4)
- Slightly effective (5)
- Effective (6)
- Totally effective (7)

How effective do you think the MMR vaccine is at preventing mumps?
- Totally ineffective (1)
- Ineffective (2)
- Slightly ineffective (3)
- Neutral (4)
- Slightly effective (5)
- Effective (6)
- Totally effective (7)

How effective do you think the DTaP vaccine is at preventing whooping cough (pertussis)?
- Totally ineffective (1)
- Ineffective (2)
- Slightly ineffective (3)
- Neutral (4)
- Slightly effective (5)
- Effective (6)
- Totally effective (7)

How effective do you think the DTaP vaccine is at preventing tetanus?
- Totally ineffective (1)
- Ineffective (2)
- Slightly ineffective (3)
- Neutral (4)
- Slightly effective (5)
- Effective (6)
- Totally effective (7)

How effective do you think the chicken pox (varicella) vaccine at preventing chicken pox?
- Totally ineffective (1)
- Ineffective (2)
- Slightly ineffective (3)
- Neutral (4)
- Slightly effective (5)
- Effective (6)
- Totally effective (7)

Section 4: Beliefs About Vaccinating Your Child at a Pharmacy

The next set of questions pertain to your beliefs about having your child between the ages of 3 and 10 years old vaccinated in a pharmacy.

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.
Immunizing pharmacists cannot give vaccines to children as safely as doctors.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Immunizing pharmacists cannot give vaccines to children as safely as nurses.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Immunizing pharmacists do not know what to do if children have a major problem like an allergic reaction.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

I think getting my child vaccinated at a pharmacy is unsafe compared to the doctor's office.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Getting my child vaccinated at a pharmacy is too expensive compared to the doctor's office.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

I am concerned it would cost more than I could pay to have my child vaccinated at a pharmacy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)

Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

I am concerned that my insurance does not cover the cost of vaccines administered at a pharmacy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

How difficult do you think it would be to find a pharmacy that is conveniently located?

- Very hard (7)
- Hard (6)
- Somewhat hard (5)
- Neither hard nor easy (4)
- Somewhat easy (3)
- Easy (2)
- Very easy (1)

How difficult do you think it would be to find a pharmacy that has the vaccines your child needs?

- Very hard (7)
- Hard (6)
- Somewhat hard (5)
- Neither hard nor easy (4)
- Somewhat easy (3)
- Easy (2)
- Very easy (1)

How difficult do you think it would be to find a pharmacy where you don't have to make an appointment to get your child vaccinated?

- Very hard (7)
- Hard (6)
- Somewhat hard (5)
- Neither hard nor easy (4)
- Somewhat easy (3)
- Easy (2)
- Very easy (1)

Getting my child vaccinated at a pharmacy would give my child more opportunities to get healthcare in addition to the care my child's doctor gives.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
Getting my child vaccinated at a pharmacy would be good for their health.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Getting my child vaccinated at a pharmacy would prevent my child from getting sick.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

The pharmacy's hours are more convenient than my child's doctor's office.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

It would be easier to get my child vaccinated without an appointment at the pharmacy than at my child's doctor's office.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

The pharmacy is easier to get to than my child's doctor's office.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Section 5: Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

My pediatrician recommends getting my child vaccinated.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

My pharmacist recommends getting my child vaccinated.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Government agencies recommend getting my child vaccinated.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

COVID-19 has made me want to get my child vaccinated with routine childhood vaccines.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

My friends are getting their children vaccinated at the pharmacy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
-Somewhat agree (5)
- Agree (6)
- Strongly agree (7)
Other healthcare providers think it is a good idea to get my child vaccinated at the pharmacy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

My family thinks it is a good idea to get my child vaccinated at the pharmacy.

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Section 6: Ability

The following section asks questions regarding your abilities.

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

- I am able to make decisions about the vaccines my child receives.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

- I am able to make the decision about vaccinating my child at a pharmacy.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

- I am able to take my child to the pharmacy to get vaccinated.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

Section 7: Willingness to Vaccinate at a Pharmacy

The following section asks questions regarding your willingness to have your child vaccinated at a pharmacy.

Please consider your child between the ages of 3 and 10 years old, and select the answer choice you agree with.

- I have had my child vaccinated at a pharmacy before March 2020.
  - Yes (1)
  - No (2)
  - Unknown (3)

- I would be willing to have my child vaccinated at a pharmacy.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

- I will take my child to the pharmacy for their next vaccination.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

- I want to take my child to the pharmacy to get their next vaccination.
  - Strongly disagree (1)
  - Disagree (2)
  - Somewhat disagree (3)
  - Neither agree nor disagree (4)
  - Somewhat agree (5)
  - Agree (6)
  - Strongly agree (7)

Section 8: Demographics

Please answer the following questions about yourself.

- How many children do you have total?
- How many children do you have between the ages of 3 and 10 years old?
- Please indicate your sex
Parents' intention to have their child vaccinated

- Male (1)
- Female (2)
- Other (3)

Q8 Which of the following best describes your racial/ethnic background?

- African American/Non-Hispanic Black (1)
- American Indian or Alaskan Native (2)
- Asian Pacific Islander (3)
- Caucasian/Non-Hispanic White (4)
- Mexican American/Hispanic (5)
- Other (6)

Please indicate the highest level of education you have completed

- Some high school, no diploma (1)
- High school graduate, diploma, or GED (2)
- Some college credit, no degree (3)
- Trade/technical/vocational training (4)
- Associate degree (5)
- Bachelor's degree (6)
- Master's degree (7)
- Professional degree (8)
- Doctorate degree (9)
Appendix 2. Questionnaire responses and results from a confirmatory factor model intended to measure the association between the constructs of the health belief model and parents' intention to vaccinate their children in community pharmacies.
### Perceived Effectiveness

| EFF1  | How effective do you think the MMR vaccine is at preventing measles? | 0.92 | (0.87-0.95) | 0.85 | 15 | 73.92 | (60%) | (4.3%) | (3.6%) | (13.5%) | (8.9%) | (34.4%) | (31.3%) |
|-------|---------------------------------------------------------------------|------|-------------|------|----|-------|-------|--------|--------|---------|--------|---------|---------|
| EFF2  | How effective do you think the MMR vaccine is at preventing mumps?  | 0.94 | (0.92-0.96) | 0.88 | 12 | 102.44 | (5.5%) | (3.6%) | (6.3%) | (11.3%) | (10.3%) | (34.9%) | (30%)   |
| EFF3  | How effective do you think the DTP vaccine is at preventing whooping cough (pertussis)? | 0.91 | (0.89-0.93) | 0.83 | 17 | 80.61 | (3.1%) | (4.1%) | (4.3%) | (11.1%) | (13.9%) | (34.9%) | (28.6%) |
| EFF4  | How effective do you think the DTP vaccine is at preventing tetanus?  | 0.89 | (0.86-0.91) | 0.79 | 21 | 66.74 | (4.8%) | (3.1%) | (5.6%) | (9.8%) | (14.2%) | (33.7%) | (29.6%) |
| EFF5  | How effective do you think the chicken pox (varicella) vaccine at preventing chicken pox? | 0.9 | (0.88-0.93) | 0.82 | 18 | 71.2 | (7%) | (4.6%) | (4.3%) | (11.8%) | (13.7%) | (25.2%) | (20.8%) |

### Perceived Susceptibility

| RISK1 | Without vaccines, what do you think is the chance that your child will get measles? | 0.91 | (0.88-0.93) | 0.82 | 10 | 71.81 | (8.2%) | (6.5%) | (9.6%) | (7.9%) | (19%) | (20.4%) | (28.4%) |
|-------|--------------------------------------------------------------------------------|------|-------------|------|----|-------|-------|--------|--------|---------|--------|---------|---------|
| RISK2 | Without vaccines, what do you think is the chance that your child will get mumps? | 0.94 | (0.92-0.95) | 0.86 | 12 | 110.57 | (7.5%) | (5.8%) | (12.3%) | (7.9%) | (19.5%) | (21.2%) | (26%)   |
| RISK3 | Without vaccines, what do you think is the chance that your child will get rubella? | 0.93 | (0.92-0.94) | 0.86 | 14 | 101.23 | (8.2%) | (7%) | (12%) | (10.3%) | (15.1%) | (22.4%) | (25%)   |
| RISK4 | Without vaccines, what do you think is the chance that your child will get whooping cough (pertussis)? | 0.9 | (0.88-0.92) | 0.81 | 19 | 78.06 | (7.7%) | (7%) | (10.3%) | (10.1%) | (16.8%) | (21.4%) | (26.7%) |
| RISK5 | Without vaccines, what do you think is the chance that your child will get tetanus? | 0.88 | (0.85-0.90) | 0.77 | 23 | 69.34 | (6.7%) | (7.2%) | (8.2%) | (12.7%) | (21.2%) | (17.5%) | (20.4%) |
| RISK6 | Without vaccines, what do you think is the chance that your child will get chicken pox (varicella)? | 0.86 | (0.83-0.89) | 0.74 | 26 | 54.8 | (7.7%) | (4.6%) | (5.5%) | (8.7%) | (16.3%) | (26.9%) | (30.3%) |

**Perceived accessibility was anchored from very hard to very easy, perceived effectiveness was anchored from totally ineffective to totally effective, perceived susceptibility was anchored from very unlikely to very likely. The remaining scales were anchored from strongly disagree to strongly agree.**

### Appendix 2. Continued.