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Perceived feasibility of a multicomponent prenatal intervention on childhood vaccinations: Findings from a national cross-sectional survey of prenatal care providers, April-June 2022

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Abstract

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Background: There are inadequate proactive interventions that take advantage of medical contacts during pregnancy to build confidence in vaccines recommended for children after birth. In addition, prenatal providers' perceptions on implementing such proactive childhood vaccination-focused interventions are not well understood.

Methods: A multicomponent prenatal intervention on childhood vaccines was designed for expectant parents to include a prenatal provider recommendation encouraging age-appropriate vaccines for children after birth, an educational website on vaccine recommendations and resources, and a phone consultation with a vaccine navigator during pregnancy. Members of national prenatal provider organizations in the United States were recruited from April-June 2022 for an online cross-sectional survey to assess their demographic and practice characteristics, perceived role as vaccine advocates, training needs, perceived intervention feasibility, and perceived implementation factors.

Results: After data validation, 495 of 1677 responses were included for analysis. Providers expressed agreement (65.1%) with the importance of discussing vaccinations with others, but fewer (46.7%) agreed that they had an impact on changing people's views on vaccination. Over half of providers agreed or completely agreed that the proposed intervention was feasible, as measured through the 4-item Feasibility of Intervention Measure (FIM) (% agreement range reported across items for educational website: 71.4%-75.2%; provider recommendation: 54.0%-59.7%; and vaccine navigator: 53.9%-56.7%). Availability of adequate staff resources (48.0%), time constraints (47.8%), and adequate training on childhood vaccines (45.4%) were the top three perceived implementation challenges. Perceived facilitators included availability of patient education resources on childhood vaccines (57.7%).

Conclusions: The proposed intervention to build confidence in childhood vaccines was perceived by providers to be feasible in prenatal settings. Supportive strategies that reduce time and staff burden and increase provider competency to discuss childhood vaccines will be necessary to overcome perceived implementation challenges. Intervention feasibility and implementation factors should be reassessed upon actual implementation of the intervention.

Keywords

Pregnancy; prenatal provider; childhood vaccines; United States; feasibility

BACKGROUND

The success of routine childhood vaccination programs hinges in part on the intention of parents to seek childhood vaccinations. Most parents in the United States (US) favor vaccination; however, patterns of childhood vaccinations vary considerably with some parents choosing to delay or refuse some or all vaccinations for their child.[1–3] Studies suggest that parental decisions about childhood vaccinations may be solidified during pregnancy[4] or, in some cases, earlier.[5] Pregnancy represents an opportunity to proactively promote health interventions as patients are highly engaged in prenatal care, view prenatal care providers as trusted sources of information, and are highly motivated to achieve best outcomes for themselves and their infants. This may also be an opportunity to proactively engage in vaccine counseling to reach parents before vaccination decisions

become entrenched. There is currently limited research on childhood vaccination promotion interventions delivered proactively during pregnancy.[6]

There are two key research gaps prior to implementing childhood vaccination promotion interventions during pregnancy. First, little is known about the willingness of prenatal providers to advocate for childhood vaccinations during pregnancy. Prenatal providers are not formally trained to discuss childhood vaccinations, as their primary focus is on maternal health and pregnancy outcomes.[7] Current evidence suggests that training prenatal care providers on vaccines recommended during pregnancy can increase provider confidence and comfort with vaccination discussions.[8] However, studies on effectiveness of training prenatal providers on childhood vaccinations are lacking, and current childhood vaccination training programs cater to pediatric, not prenatal providers.[7, 9, 10] Further research is necessary to describe prenatal providers' perceived role as vaccination advocates and any training needs specific to childhood vaccinations.

Second, multicomponent strategies that incorporate tailored and dialogue-based information may be more effective at increasing vaccine uptake.[30] However, the evidence is mixed for the use of such strategies to promote the importance of childhood vaccinations during pregnancy. Some studies describing efforts to promote childhood vaccinations during prenatal care show promise with respect to intervention acceptability and impact on timeliness or coverage of childhood vaccinations.[11–15] However, in a study from New Zealand, Veerasingham et al.[16] found that encouraging vaccination information received during pregnancy had no impact on the timeliness of infant immunizations. While the authors used participants' self-reported classification of information as encouraging or discouraging, they did not analyze the content or quality of the information. These data suggest the need for further research to establish the most effective strategies to mitigate vaccine hesitancy in the prenatal care period and in prenatal care settings.

As part of a cooperative agreement with the US Centers for Disease Control and Prevention (CDC), we sought to implement and evaluate a multicomponent intervention to promote the importance of childhood vaccinations as part of routine prenatal care. To inform intervention implementation, we collected information from a diverse group of prenatal care providers practicing in routine prenatal care settings in the US on their perceived role as a vaccine advocate, training needs around childhood vaccination, as well as feasibility of and implementation factors for the proposed multicomponent intervention. Study findings may help inform quality improvement goals and efforts related to vaccinations in prenatal practices.

METHODS

The methods of this study are described in accordance with the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) checklist for cross-sectional studies (Supplementary File 1, Supplementary Table 1).[17]

Study design:

A cross-sectional survey was conducted of nationally-recruited prenatal providers in the US. The goal of the survey was to assess the perceived role of prenatal providers as vaccine advocates and the feasibility of implementing a multicomponent intervention during pregnancy in prenatal settings to promote vaccinations recommended for children after birth. Providers were presented with brief descriptions of the three intervention components proposed: a prenatal provider recommendation in favor of childhood vaccinations, a web-based educational resource on childhood vaccinations, and availability of a vaccine navigator for task-shifting conversations with vaccine hesitant individuals. Intervention and survey details are presented below.

Setting and timeframe:

The survey was limited to prenatal providers practicing in the United States. Data collection occurred from April – June 2022.

Ethical approval:

The study protocol was approved by the Duke University Health System Institutional Review Board (IRB, Pro00109337) and the Emory University IRB (reliance agreement STUDY00005457).

Participants:

To be eligible for the survey, prenatal providers had to be ≥ 18 years of age, providing routine prenatal care for part or all their time, working or practicing in the United States, and fluent in English. There were no exclusion criteria based on the type of prenatal provider.

Sampling strategy and recruitment:

Providers were recruited using non-probability-based sampling. The survey was distributed to members of two national prenatal provider organizations: American College of Obstetricians and Gynecologists (ACOG) and American College of Nurse Midwives (ACNM). According to their websites, ACOG has a membership of 60,000 individuals[18] and ACNM has a membership of 6500 individuals.[19] The survey link was distributed via study-specific flyers posted in the organizations' newsletters and social media channels. A third organization (Society for Maternal Fetal Medicine, SMFM), which has overlapping membership with ACOG, sent out reminders pointing its members to the ACOG survey link. Study team members who are prenatal providers (GS, BG) also posted the survey link on their personal twitter feeds.

Variables:

Survey domains, variables, and expected outcomes are described in Supplementary Table 2 of Supplementary File 1. In brief, the survey included questions on prenatal provider characteristics (e.g., age, training, years of practice), practice characteristics (e.g., size, panel, vaccination policies), providers' perceived role as a vaccine advocate, training needs around childhood vaccinations, intervention feasibility, and implementation factors (i.e., barriers or facilitators of intervention implementation in routine prenatal settings).

The sections on intervention feasibility and implementation factors were preceded by brief descriptions of the proposed intervention components as follows:

- **Provider recommendation:** Prenatal care providers are asked to discuss the importance of childhood vaccinations with pregnant patients during a third trimester clinic visit. The recommendation is brief and directs pregnant patients to the other intervention components listed below (an educational website, phone call with a vaccine navigator) if they need more information.
- **An educational website:** The website is available in English and Spanish, and summarizes key information about childhood vaccines, schedule, safety, and other frequently asked questions. Printed versions are available to those with low technology access.
- **Vaccine navigator:** A vaccine navigator is available via phone to talk to any pregnant patients who have specific questions or concerns about childhood vaccines. The vaccine navigator takes care of any counseling needs around childhood vaccinations that would otherwise fall to the prenatal care provider.

The feasibility of the intervention components was assessed using the Feasibility of Intervention Measure (FIM),[20] which includes four-items: “[*Intervention*] seems implementable”, “[*Intervention*] seems possible”, “[*Intervention*] seems doable”, “[*Intervention*] seems easy to use”. Responses were measured on a 5-point Likert response scale ranging from 1 = Completely disagree to 5 = Completely agree. Items were used as a scale and responses to the 4 statements were averaged to obtain the mean FIM scale score for each intervention component.

The perceived role of providers as vaccine advocates was assessed using the Motors of Vaccination Advocacy (MovAd) scale,[21] which comprises a total of 11 items organized within 4 sub-domains: Knowledge (3 items), Value (3 items), Autonomy (2 items), and Impact (3 items). Responses were measured on a 7-point Likert scale, ranging from strongly disagree to strongly agree. Sub-scale scores were generated by averaging the responses to items belonging to each sub-scale. Full scale scores were generated by averaging the responses to all 11 items.

Data sources and measurement:

Survey data were collected through an online survey platform (REDCap).[22, 23] Participants who clicked on the survey link to opt in were presented with an implied consent script summarizing study details and directed to a brief eligibility screener. Eligible participants were allowed to proceed to the survey. All questions in the survey were voluntary.

Bias:

We mitigated desirability bias by allowing participants to self-administer the survey online and by not collecting identifying information that was associated with survey responses. We mitigated selection bias by distributing the survey to multiple national prenatal provider organizations and including diverse prenatal provider types.

Study size:

Due to the descriptive nature of the survey, the sample size was based on a purposive sampling estimate of 1000 responses across multiple provider organizations.

Evaluation of eligibility and data validity:

Since the survey was published online and open to the public, we evaluated eligibility and validity of responses prior to analysis. The final analytic dataset excluded responses from participants who:

- Did not meet eligibility criteria.
- Did not submit the survey prior to close of data collection.
- Were assessed to be invalid (e.g., surveys with identical timestamps and timestamps indicating survey responses were submitted within 1 second, or open-ended text responses in a foreign language, using canned text, or duplicated throughout; see: Supplementary File 2 for details).

Statistical methods:

Survey data were analyzed using SAS/STAT statistical software, version 9.4 of the SAS System for Windows (SAS Institute Inc). Sensitivity analyses were conducted to compare characteristics of included versus excluded participants. Providers' perceived role as a vaccine advocate, childhood vaccination training needs, intervention feasibility as well as implementation factors were analyzed descriptively and by provider type. Continuous variables related to provider and practice characteristics (e.g., age, practice size) were summarized using means and standard deviations. Categorical variables (e.g., ethnicity, race) were described with frequencies and percentages. Due to the descriptive nature of the study, missing data were excluded from analysis. Since the survey questions were optional, the number of missing responses varied for every question. Missing values are reported in the table. Denominators used for calculation of percentages are reported in each table or figure.

Data visualizations:

Likert scale responses were visualized as diverging stacked bar charts that were generated utilizing Microsoft Excel. Diverging stacked bar charts were organized so that all related scale questions were aligned on a central value; for this analysis all categorically 'neutral' responses across scale questions were represented as non-positive responses, to allow viewers to visualize what percentage of respondents had positive reactions to the corresponding statement. For instance, for the MovAd scale, percent agreement is the reported summation of "somewhat agree", "agree" and "strongly agree" from a 7-point Likert scale response and displayed to the right of the 0% line on the figure, and "strongly disagree", "disagree", "somewhat disagree", and neutral are displayed to the left of the 0% in the figure. Similarly, for FIM scale items percent agreement shows the summation of "agree" and "completely agree" from a 5 point-Likert scale, displayed to the right of the 0% line on the figure. For the figure showing implementation facilitators, "% important" is the summation of responses to statements that a facilitating factor is "important" and "extremely important". For the figure showing implementation challenges, "% challenging" represents

the summation of responses to statements that a given factor is “challenging” or “extremely challenging”.

RESULTS

In total, 1677 survey responses were received, and the total response rate was 2.5% based on estimated combined membership of ACOG and ACNM (n=66,500). Data from 495 respondents were included in the final analytic dataset after evaluation of eligibility and data validity (see: Figure 1). Data from 1,182 records were assessed as invalid. A sensitivity analysis was conducted comparing provider and practice characteristics between included and excluded records. A higher proportion of excluded records corresponded to the first or second response options presented for each question as compared to included records, indicating higher likelihood that excluded responses from this step were from entities skimming the survey (Supplementary Table 3 of Supplementary File 1).

Table 1 summarizes practice characteristics, provider characteristics, and provider behaviors among those who were included in the analysis. Of the providers electing to provide demographic information, just over half were between the ages of 31-40 years (n=253, 51.1%), and a little over half were female (n=282, 57.0%). Three-fourths were non-Hispanic or Latino or Spanish origin (n=379, 76.6%). The two most frequently reported racial groups among providers were White (n=313, 63.2%) and Black or African American (n=62, 12.5%). Certified nurse-midwives, certified midwives, and certified professional midwives comprised the largest provider group (n=186, 37.6%) followed by nurse practitioners and physician assistants (PA) (n=89, 18.0%). Including years spent in residency, most providers had worked in prenatal care for 2-10 years (n=298, 60.2%). Slightly more providers worked in a practice in an urban (n=253, 51.1%) rather than rural setting. There were similar numbers of providers from the different US Department of Health and Human Service (HHS) regions; the largest region represented in this sample was HHS region 4, which includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee (n=78, 15.8%).

Most providers reported that their practice focused on obstetrics only or obstetrics and gynecology (n=265, 53.5%), and a majority served high risk patients (n=386, 78.0%). There were similar numbers of providers practicing in federally qualified health centers, community health clinics, academic medical centers, and private practice. A little over one third of the providers reported working in a practice of 3-10 providers (n=166, 33.5%) and saw an average of more than 20 patients who were pregnant per week (n=179, 36.2%). When asked about their perceptions of vaccine hesitancy of patients compared to the rest of their state, about half of providers reported hesitancy at their clinic to be ‘about average’ (n=200, 40.4%).

Figure 2 shows practice policies regarding vaccination, a provider’s own vaccination status, practice policies for vaccination during pregnancy, and patterns of recommending vaccinations in general and specifically to pregnant people. A majority of providers reported vaccine mandates for employees at their practice (n=381, 90.9%). Among providers reporting their own vaccination status, a vast majority had completed the initial series of

COVID-19 vaccines, and influenza vaccine for the 2021-22 season (n=406, 97.8%; n=401, 97.1%, respectively), while slightly fewer had received the COVID-19 booster dose (n=381, 92.1%). Overall, n=311 (62.8%) reported recommending vaccines to patients most of the time (51-90% of the time, n=121, 24.4%) or routinely (91-100% of the time, n=190, 38.4%). When probed about recommendations for specific vaccines, only about half of the providers reported recommending influenza vaccine or the Tdap vaccine during pregnancy (n=244, 49.3%; n=227, 45.9%, respectively), and fewer recommended COVID-19 vaccine during pregnancy (n=210, 42.4%). Seventy percent of the providers reported practice policies that excluded unvaccinated patients (n=292, 69.7%). (Data not shown)

Findings on providers' perceived role as a vaccine advocate measured using the MovAd scale are displayed in Figure 3. Notably, over half of participants reported agreement with all but one statements (percent agreement ranging from 46.7% - 65.1%). When assessing sub-scale scores, Autonomy and Value scored highest, followed closely by Knowledge and Impact. Sub-scale item on Value *"Vaccination is an important topic I want to discuss with others"* had the highest percent agreement among providers. The lowest percent agreement among providers was for the statement from the sub-scale item on Impact *"If I discuss vaccination, it will very much change views on this topic"*.

Providers were asked to assess their confidence in topics about childhood vaccines and to indicate preferences around mode, duration, and frequency of training sessions (data not shown). Providers were least confident, defined as a rating of 1 or 2 on a 5-point Likert scale of confidence, on details of the development processes for childhood vaccines (n=190, 38.4%), information about childhood vaccine ingredients (n=180, 36.4%), and how childhood vaccine recommendations are developed (n=173, 34.9%). When asked about preferred training mode, in-person presentation was the most preferred mode for a majority of providers (n=328, 66.2%), followed by recorded webinar or video (n=67, 13.5%). Roughly half of providers indicated 60 minutes as the most acceptable duration for each training session, with slightly higher numbers if continuing medical education (CME) credits were not provided (CME provided: n=218, 44.0%; CME not provided: n=268, 54.1%). Half of providers indicated they would attend the trainings even if they had to pay for them (n=231, 46.7%). For a four-session training program, the most preferred frequencies were four sessions offered once a week (n=131, 26.5%), and four sessions offered once every month (n=117, 23.6%).

Participants' responses regarding intervention feasibility are presented in Figure 4. These results show a high proportion of agreement, which includes 'Agree' and 'Completely Agree' on feasibility of all three proposed intervention components. Of the three proposed intervention components, providers reported highest percent agreement on the feasibility of the educational website, followed by the provider recommendation and vaccine navigator components. Across these questions, we observed neutral responses (neither agree nor disagree) from 16-28% of respondents.

Figures 5 & 6 display key perceived facilitators and challenges to implementation. The most important perceived facilitator among prenatal providers were educational materials or resources on childhood vaccinations for patients (n=250, 57.7% important). There was

very little variability between the other 6 presented facilitating factors, and half of providers indicated all were of similar importance (% importance variation: 48.3% - 51.4%). Among the subset of providers who also saw children (n=36, 7.2%), quality improvement goals to increase childhood vaccinations were identified as an important facilitating factor (n=20, 55.6%). The top perceived challenges identified by providers include availability of staff resources, availability of time during appointment, and adequate training on childhood vaccines (% challenging: n=208 (48.0%), n= 207(47.8%), n= 197 (45.4%), respectively).

DISCUSSION

The findings of this study inform the implementation of a multicomponent prenatal intervention to promote the importance of vaccinations recommended for children after birth. In addition, findings provide information for relevant professional organizations and policy makers on knowledge, attitudes, beliefs and behaviors of prenatal providers regarding vaccination recommendations for children and during pregnancy. Study findings may be used to inform quality improvement goals and programs related to vaccination promotion.

The first major finding of this study was the large disparity between provider vaccine behavior and provider vaccination recommendations during pregnancy. The large gap between providers' behavior could be related to their perceived impact as a vaccine advocate, and in part to variations in practice policies mandating vaccines for employees versus patients. While the proposed multicomponent intervention promotes importance of early childhood vaccinations, there may be an opportunity to couple childhood vaccination recommendations with maternal vaccination recommendations during pregnancy. In a prior study, we reported that only 67% of participants who were pregnant from one of the implementation settings planned to vaccinate their child with all recommended vaccines, and fewer (35%) planned to get the COVID-19 vaccine for their child after birth.[32] These data reiterate the significance of intervening during pregnancy to promote the importance of maternal and childhood vaccinations. Strengthening provider capacity to make a strong recommendation in favor of vaccination remains a critical need in this population. Our survey only asked about childhood vaccination training needs. The most highlighted topics pertained to vaccine development, testing, and recommendations, and less about the diseases being prevented by vaccines, suggesting the need to bolster provider capacity to answer questions about the how vaccines are developed, tested, and recommended.

The second major finding was the high feasibility of the proposed intervention components. When asked about intervention feasibility, providers reported the most feasible component to be the educational website, followed closely by provider recommendation and vaccine navigator. The degree of feasibility of intervention components may be associated with resource and time availability, as the website potentially requires the least resources and the navigator the most. Healthcare providers consistently rank as the most trusted resource on vaccine information in studies with parents.[24] Nevertheless, there are data to suggest that, compared to non-vaccine hesitant parents, those who are vaccine-hesitant may have lower trust in health providers.[25, 26] Not surprisingly, pediatric providers report spending 5-30 more minutes per appointment,[27, 28] sometimes over a period of several months,[28] when counseling vaccine-hesitant parents. This additional time spent on vaccine counseling

often conflicts with providers' schedule and may come at the cost of other preventive health services that need to be completed at each visit, leading to provider frustration.[28, 29] Yet, interventions that use provider-independent strategies to mitigate vaccine hesitancy have limited effectiveness.[30, 31] Further research is needed to understand how to effectively leverage the provider-patient relationship in primary care settings to mitigate vaccine hesitancy, while minimizing the burden on provider time. This is particularly important in the context of prenatal care where the providers face the dual burden of caring for the patient who is pregnant and the unborn baby. One strategy to facilitate prioritization of vaccine discussions may be to compensate providers for vaccine counseling, even if they do not administer the vaccine at the visit.

The third major finding was the identification of specific perceived barriers and facilitators of intervention implementation in routine prenatal settings. The facilitators identified in our study included providing educational materials and resources on early childhood vaccinations for patients. Coupled with the reported feasibility of the educational website, these results strengthen evidence toward the utility of the proposed intervention. With these facilitating factors, three main challenges emerged: availability of staff resources, adequate training on childhood vaccines, and availability of time during the appointment. Notably, over half of providers did not identify these or other factors as challenges to implementation, suggesting opportunity rather than barriers toward implementing the intervention.

Strengths and Limitations

Study strengths are the inclusion of a diverse range of provider types, representation of diverse prenatal practice types, practices from rural and urban settings, and the national scope for recruitment. Study limitations include the low response rate and non-probability-based sampling strategy, due to which findings have limited external validity. While we sampled prenatal providers nationally, the results are not representative of the prenatal provider population in the United States. In addition, on questions related to vaccination behaviors, providers self-reported their vaccination status. While we tried to mitigate desirability bias by allowing self-administration of the survey and not linking responses with identifying information, its impact on responses cannot be fully ruled out. Since the survey was available to all individuals online, duplicate responses with assessed spurious data had to be screened and removed from the data analyzed. In interpreting likert scale results, neutral responses were categorized as 'negative' for the purposes of interpretation and figures.

Conclusions and future work

Study findings suggest that it will be feasible to implement the proposed multicomponent intervention to promote the importance of childhood vaccinations in prenatal settings. Study findings also suggest discordance in providers' own vaccination behaviors and their vaccination recommendation during pregnancy, identifying an area for future intervention to strengthen maternal vaccination recommendation. The feasibility and effectiveness of the proposed multicomponent intervention will be evaluated as part of a trial[33] funded under cooperative agreement (U01IP001200) with the CDC, and the results will be reported in a future manuscript.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflicts of interest

LLZ has served as a consultant to Novartis, although unrelated to this work.

EBW has received support from Pfizer, Moderna, Seqirus, Najit Technologies and Clinetic as an investigator for clinical trials or studies. He has served as an advisor to Pfizer and Vaxcyte, consultant to Iliad Biotechnologies and as a member of a data safety monitoring board for Shionogi.

WAO is a paid consultant for Sanofi, Moderna, and Merck, although unrelated to this work.

GKS serves as a consultant for GlaxoSmithKline, Pfizer, Sanofi, and Moderna and as a co-author/contributor to Medscape and UpToDate.

All other authors have no conflicts relevant to this publication.

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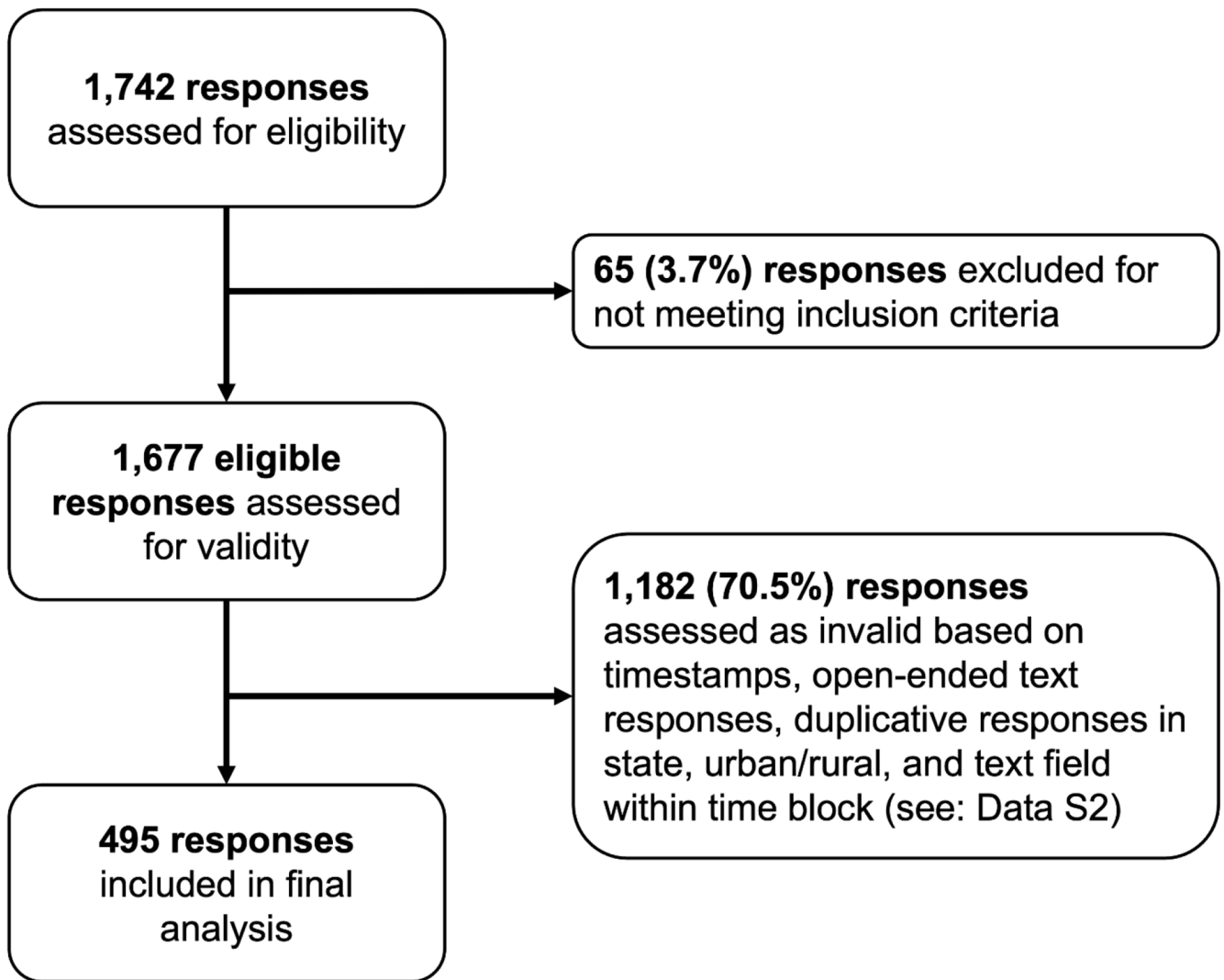


Figure 1: Participant flow diagram of responses from a national prenatal provider survey, USA, April-June 2022. Several observations met exclusion by more than 1 flag, summation of flags 1-4 greater than unique number of exclusions, n=1182.

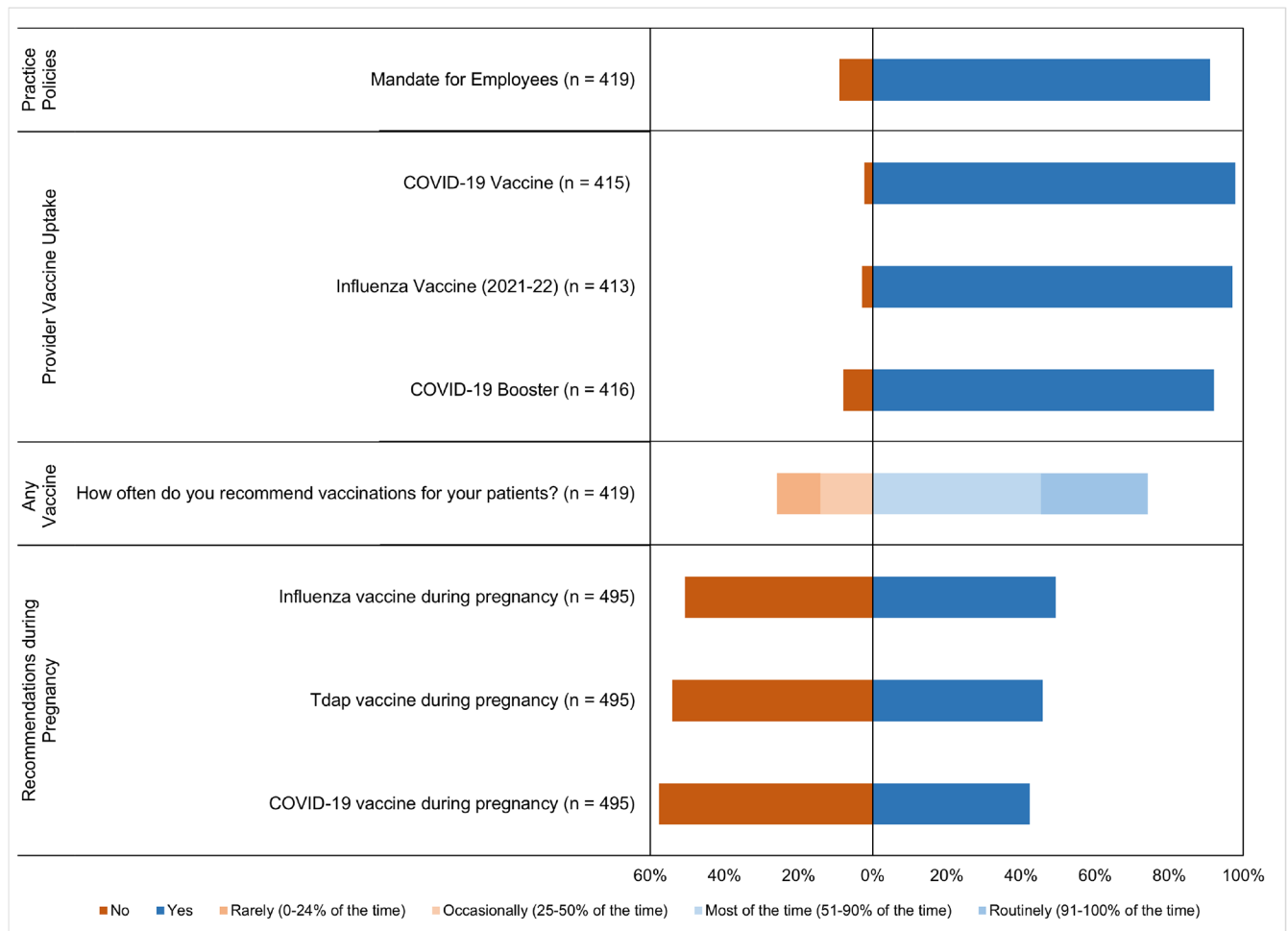


Figure 2:
Provider vaccine uptake behaviors, practice policies, and routine provider recommendations during pregnancy; among national sample of prenatal providers, April-June, 2022 (n=495)

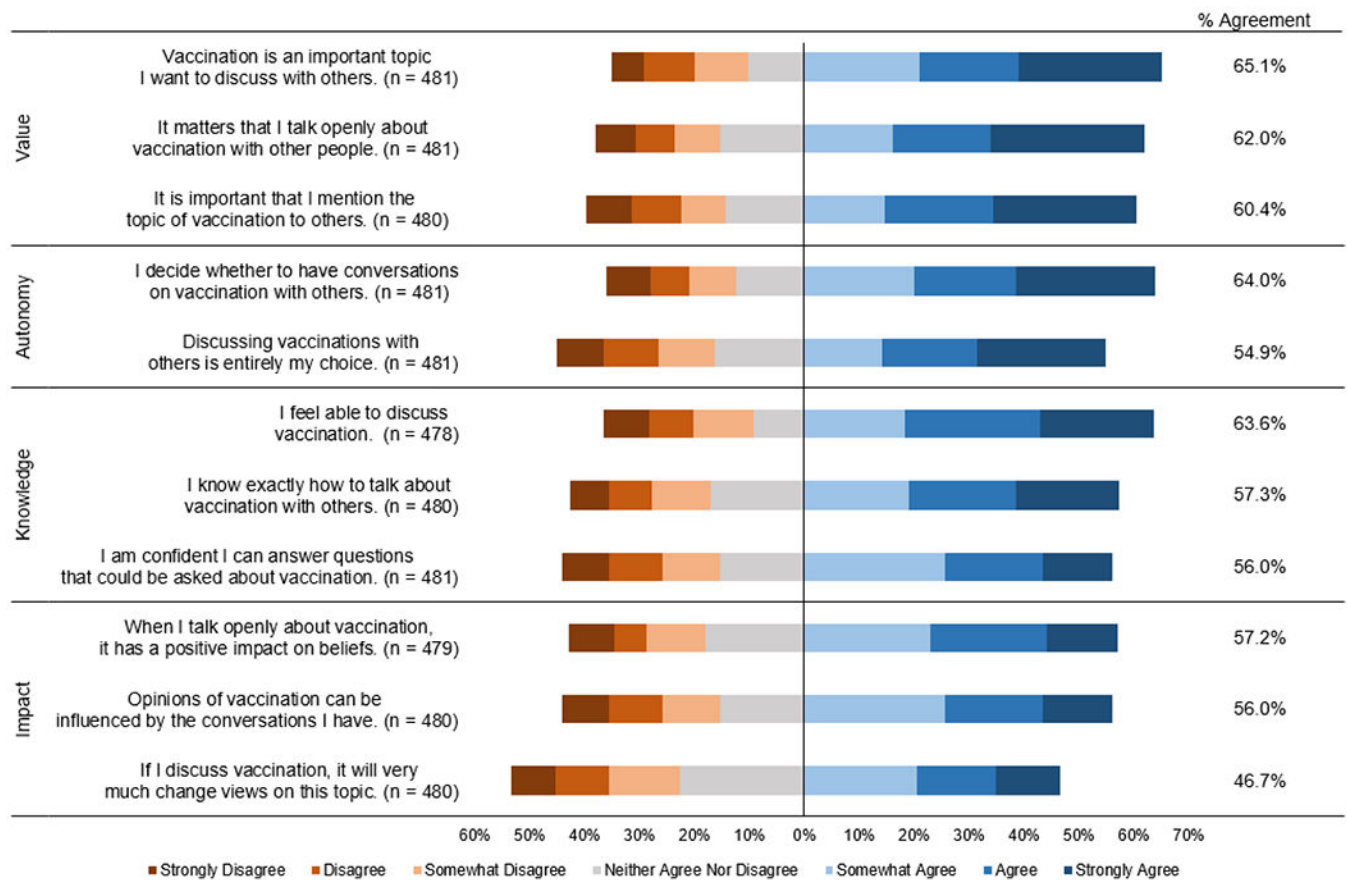


Figure 3:
Motors of Vaccination Advocacy (MovAd) Scale, Amongst a National Sample of Prenatal Providers, April – June, 2022 (n = 495).

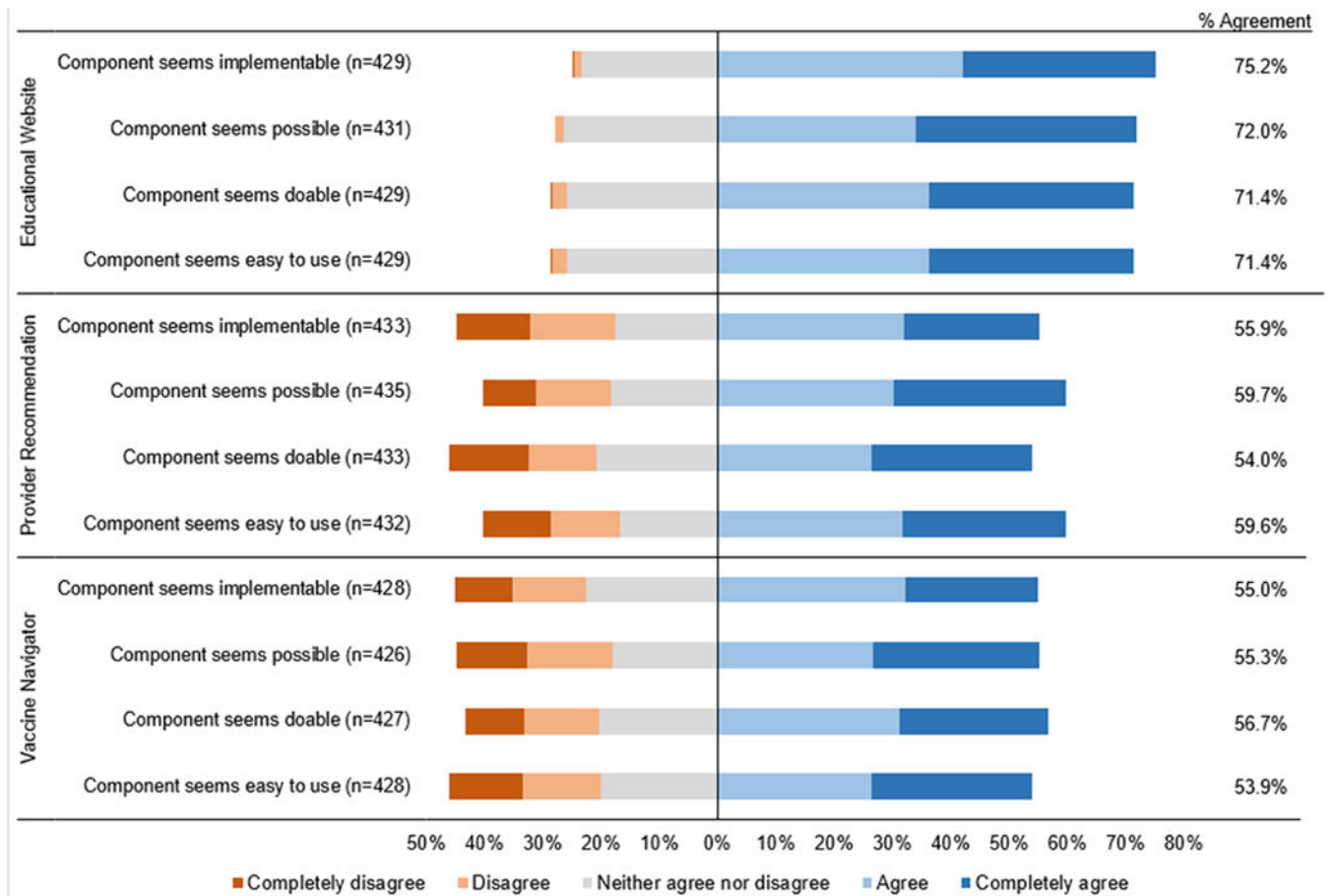


Figure 4:
Intervention Feasibility by Component, Among national sample of prenatal providers, April – June, 2022 (n = 495).

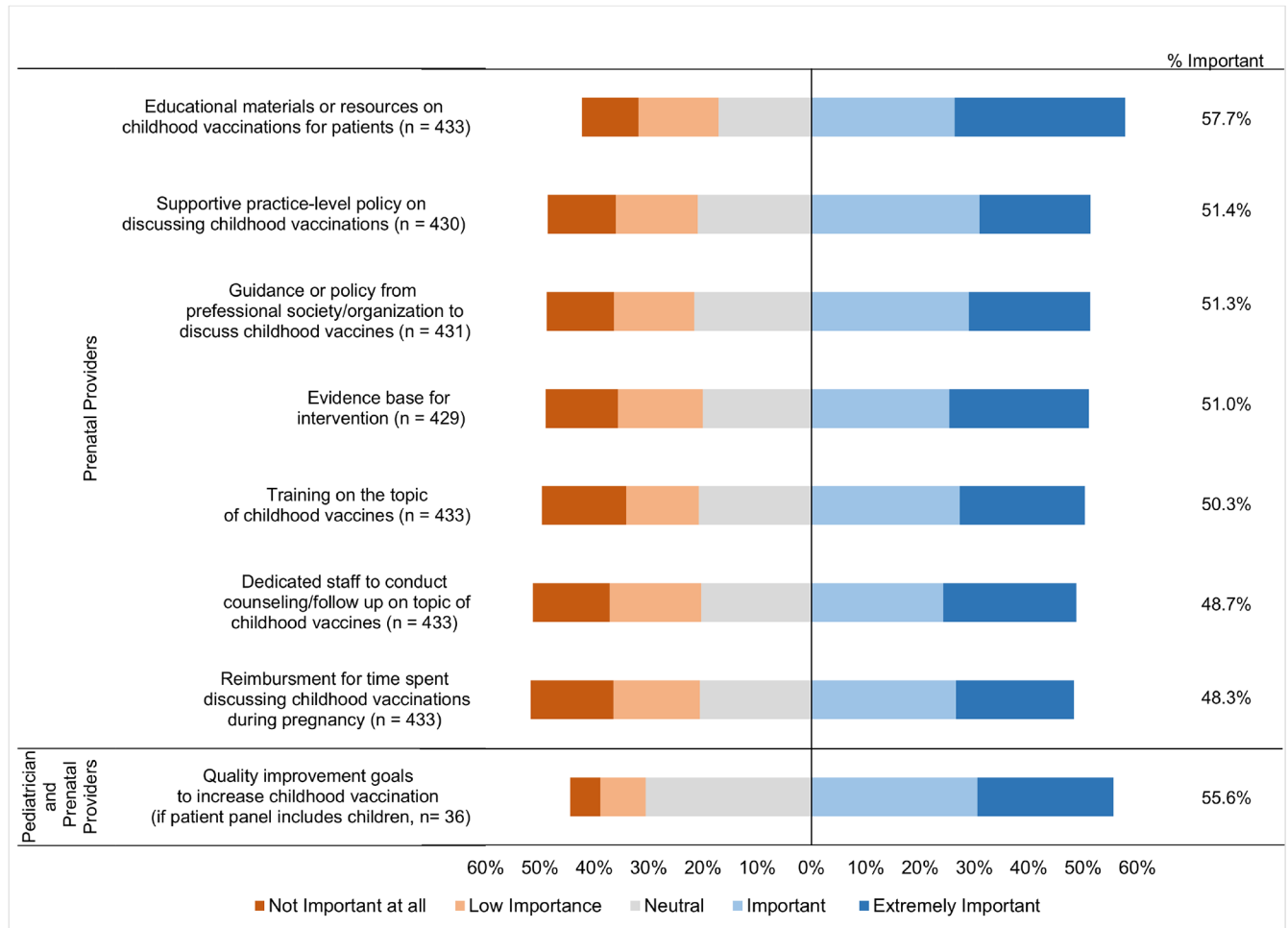
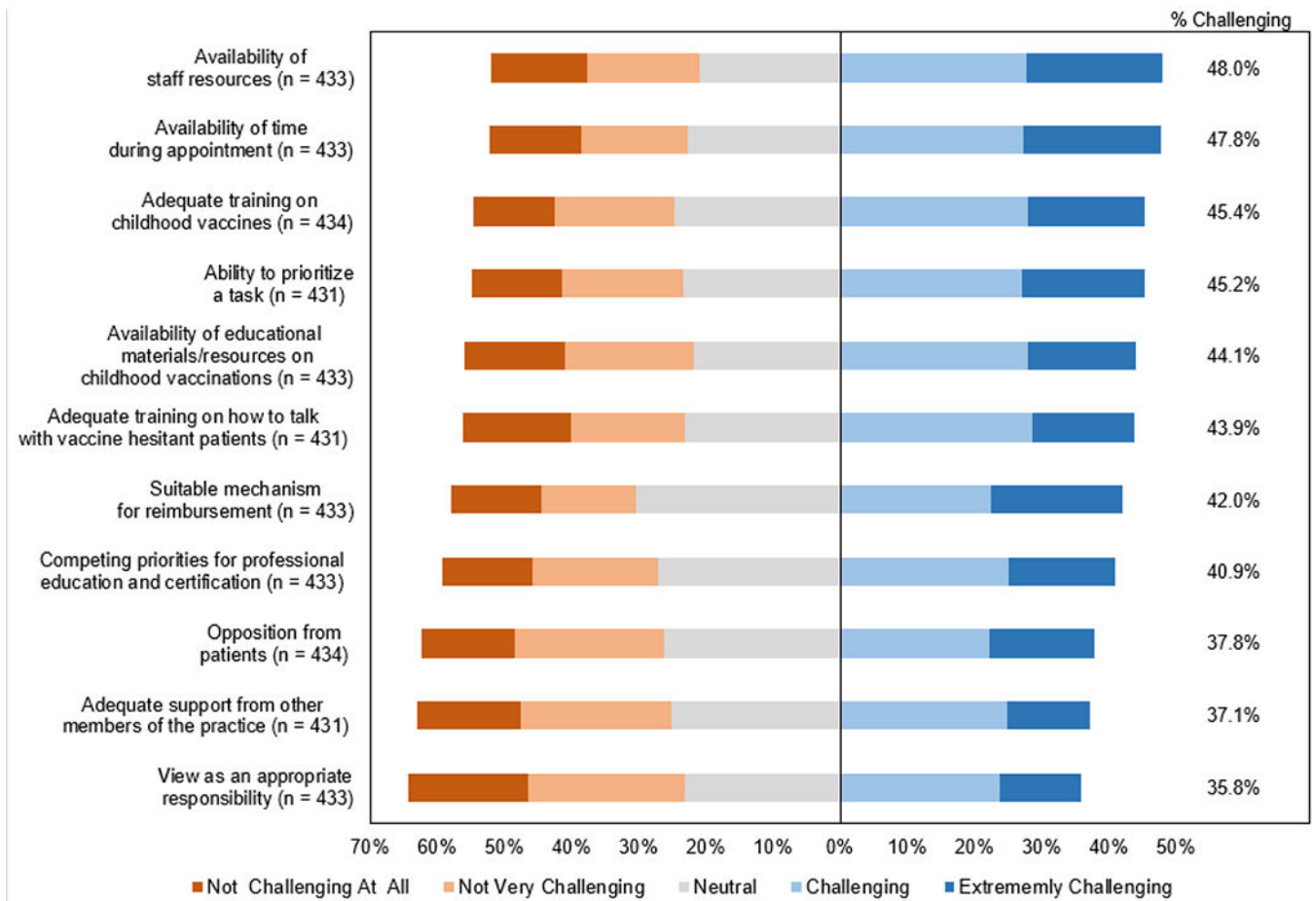


Figure 5:
Perceived factors that facilitate implementation of ADEPT intervention, among a national sample of prenatal providers, April-June 2022 (n=495)

**Figure 6:**

Perceived Challenges to Implementation of ADEPT Intervention, among national sample of prenatal providers, April – June 2022 (n = 495).

Table 1.
Provider and Practice Characteristics of Participants of National Survey of Prenatal Providers, April – June, 2022 (n=495)

Provider Characteristics			Practice Characteristics		
	N	col %		N	col %
Total	495		Total	495	
Age (categorical)			Practice location ¹		
18-30 years	25	5.0	Rural	163	32.9
31-40 years	253	51.1	Urban	253	51.1
41-50 years	78	15.7	Missing	79	16.0
51-60 years	29	5.9			
>60 years	34	6.9	Health and Human Services (HHS) Region ²		
Missing	76	15.4	1	47	9.5
			2	32	6.5
Sex			3	26	5.2
Male	137	27.7	4	78	15.8
Female	282	57.0	5	41	8.3
Missing	76	15.3	6	41	8.3
			7	19	3.8
Race			8	33	6.7
American Indian or Alaska Native	6	1.2	9	55	11.1
Asian	34	6.9	10	22	4.4
Black or African American	62	12.5	Missing	101	20.4
Native Hawaiian or Pacific Islander	0	0.0			
White	313	63.2	Practice Type		
Multi-racial	5	1.0	Obstetrics and gynecology	163	32.9
Missing	75	15.2	Obstetrics only	102	20.6
			Midwifery	142	28.7
Ethnicity			Family medicine or general practice	8	1.6
Hispanic or Latino	30	6.1	Other	2	0.5
Not Hispanic or Latino	379	76.6	Missing	78	15.7
Prefer not to answer	9	1.8			
Missing	77	15.6	Practice designation		
			Federal qualified health center	92	18.6
Provider type			Community health clinic	96	19.4
OB/GYN	85	17.1	Academic medical center	104	21.0
Family physician	59	11.9	Private practice	110	22.2
Nurse practitioner	39	7.9	Other	17	3.4
Physician Assistant	50	10.1	Missing	76	15.4
Certified nurse-midwife/certified midwife	148	29.9			
Direct-entry midwife or certified professional midwife	38	7.7	High Risk Patient Population		

Provider Characteristics			Practice Characteristics		
	N	col %		N	col %
Missing	76	15.4	No	32	6.4
			Yes	386	78.0
Years of practical experience			Missing	77	15.6
Less than 2 years	15	3.0			
2-10 years	298	60.2	Practice size		
11-20 years	46	9.3	1-2 providers	96	19.4
>20 years	60	12.1	3-10 providers	166	33.5
Missing	76	15.4	>10 providers	157	31.7
			Missing	76	15.4
Average number of patients who were pregnant seen per week					
1-5	18	3.6	Perceptions of vaccine hesitancy of patients compared to the rest of your state		
6-10	105	21.2	Less hesitant	119	24.0
11-20	117	23.6	About average	200	40.4
>20	179	36.2	More hesitant	99	20.0
Missing	76	15.4	Missing	77	15.6
Number of children seen per week					
0	217	43.8			
1-5	120	24.2			
6-10	42	8.5			
11-20	29	5.9			
>20	11	2.2			
Missing	76	15.4			

¹Urban/Rural designation was self-reported by provider by answering the following: "How would you describe your practice location?"

²The USA is divided into 10 administrative regions for use by several agencies, including the US Department of Health and Human Services (HHS), the US Centers for Disease Control and Prevention (CDC), and the Federal Emergency Management Agency (FEMA). States are grouped together based on similar geography and are standardized for federal reporting.