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A Mixed Methods Study of Parental Vaccine Decision Making and Parent-Provider Trust

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Abstract

Objective—To describe parental vaccine decision making behaviors and characterize trust in physician advice among parents with varying childhood vaccination behaviors.

Methods—Between 2008 and 2011, a mixed methods study was conducted with parents of children aged <4 years who were members of Kaiser Permanente Colorado health plan. Seven focus groups were conducted with vaccine hesitant parents. Based on findings from the focus groups, a survey was developed, pilot tested and mailed to a stratified sample of 854 parents who accepted (n=500), delayed (n=227), or refused (n=127) vaccinations for one of their children. Survey results were analyzed using chi-square tests and multivariable logistic regression.

Results—Several themes emerged from the focus groups, including: 1) the vaccine decision making process begins prenatally, 2) vaccine decision making is an evolving process, and 3) there is overall trust in the pediatrician, but a lack of trust in the information they provided about vaccines. The survey response rate was 52% (n=443). Parents who refused or delayed vaccines were 2-times more likely to report that they began thinking about vaccines before their child was born, and 8-times more likely to report that they constantly re-evaluate their vaccine decisions than parents who accepted all vaccines. While parents tended to report trusting their pediatrician's advice on nutrition, behavior and the physical examination, they did not believe their pediatrician provided balanced information on both the benefits and risks of vaccination.

Conclusion—These results have implications for future interventions to address parental vaccination concerns. Such interventions may be more effective if they are applied early (during pregnancy), often (pregnancy through infancy), and cover both the risks and benefits of vaccination.

Keywords

immunization; vaccine refusal; vaccine decision making; mixed methods

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Conflict of Interest:

Authors of the manuscript have no conflicts of interest relevant to this article to report.

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Parental vaccine hesitancy is a growing public health problem in the United States. Prior research has shown that many parents have concerns about the safety and effectiveness of vaccines, as well as the timing of the current recommended childhood vaccination schedule¹⁻⁴. Vaccine hesitant parents have also expressed a low level of confidence and trust in vaccine information from medical professionals, public health agencies, and the government³. Recent epidemiological data shows that an increasing number of these concerned parents are choosing to either refuse or delay vaccination for their children^{5, 6}.

Clearly, interventions designed to help parents make informed vaccine decisions are needed. However, in order to tailor such interventions to address the concerns of parents with a wide range of vaccine beliefs, additional information on the vaccine decision making process and parent-provider trust is also needed. To address this gap in knowledge, we conducted a mixed methods study that combined both qualitative and quantitative data from parents enrolled in a large integrated health plan in Colorado, a state that ranks second in the United States in nonmedical exemptions to school immunization requirements⁷. We first conducted a series of focus group discussions with vaccine hesitant parents to explore themes related to the vaccine decision making process and parent-provider trust. These themes were then examined quantitatively with a survey administered to a stratified sample of parents who either refused, delayed, or accepted vaccinations for their children.

METHODS

This study was conducted with parents enrolled in the Kaiser Permanente Colorado (KPCO) health plan, a group model managed care organization that provides care to more than 500,000 members. KPCO members receive full coverage of all pediatric vaccines as recommended by the Advisory Committee on Immunization Practices⁸. The study was approved by the KPCO Institutional Review Board, and informed consent was obtained from all participants.

Focus groups

Focus group discussions—A total of 7 focus group discussions were conducted with vaccine-hesitant parents enrolled in KPCO between 2008 and 2010. To identify parents, we first used KPCO's electronic health record (EHR) to identify all children younger than 4 years of age who were either unvaccinated or under-vaccinated (n= 1163), using a previously published algorithm^{6, 9}. We then randomly selected 200 of these children, and a manual medical record review was conducted by two trained medical records abstractors to ascertain the reasons for lack of vaccination. If medical records contained documentation that the parent had either refused or delayed vaccinations for personal, nonmedical reasons, the parent was eligible to participate in the study (n=173). Vaccine refusal was defined as a child who did not receive any vaccinations. Vaccine delay was defined as a child who was on a vaccination schedule that differed from the recommended childhood vaccination schedule of the Advisory Committee on Immunization Practices (ACIP)⁸. Children on delayed schedules may have either been missing certain vaccine doses or received certain doses beyond the ages recommended by the ACIP. Parents who delayed or refused vaccines for personal, nonmedical reasons were contacted to participate in a focus group discussion about immunizations.

Each focus group lasted approximately 60 to 90 minutes, with an average of three to five participants in each group. Separate focus groups were conducted with parents who refused and parents who delayed vaccines for their children. We intentionally limited the focus group sizes to allow for in depth conversations with parents who may have felt passionately about the topic¹⁰. Four focus groups were conducted with a total of 13 parents who refused vaccinations; and three focus groups were conducted with a total of 11 parents who delayed

vaccinations. The number of focus groups was not predetermined; rather it was guided by our analysis described below. In these discussions, there was one moderator and one note-taker. The moderator asked the parents open-ended questions from a focus group guide developed by the research team. The questions focused on parent's vaccine decision-making process, their experiences with their pediatricians, whether they trusted their pediatrician's advice, and their sources of vaccine information. The focus group process was designed to facilitate discussion and encourage parents to express their thoughts, concerns and beliefs about the process of vaccinating their children¹¹. Each focus group was audio recorded and transcribed by an independent transcriptionist.

Focus group analysis—Our focus group data were analyzed using a team-based inductive approach that incorporated principles of grounded theory, a qualitative methodology in which theories to explain real-world phenomena are generated from the data^{12–14}. Using the constant comparative analytic method, the transcribed data were coded and categorized in a multi-step process by four researchers (JMG, NMW, JAS, EVM), with the aid of ATLAS.ti 6.2 (scientific software development GmbH, Berlin, 2010) qualitative analytic software.

At the conclusion of each focus group discussion, each member of the research team independently reviewed the transcripts to identify and code unique themes, while recording their thoughts and ideas in the margins of the transcript¹⁵. After the individual coding, the research team met as a group to discuss key themes and refine the coding structure. Through this continual process of evaluation, we identified patterns and associations between these patterns in the data. After each coding session, the research team decided if additional participants needed to be sampled for further focus group discussions. The sampling, focus groups, and coding sessions continued until the research team felt that additional data was no longer contributing to the development of existing categories or to the generation of new ones¹³.

After the final codes and themes were agreed upon, an independent review of each transcript was conducted by two of the four reviewers. All transcripts had a greater than 80% agreement between the reviewers. Sections of the transcript with disagreement were discussed between reviewers and final codes were established through negotiation and consensus.

Survey study

Survey design—The design of the survey instrument was informed by our qualitative focus group analyses and previously published survey instruments^{1, 3, 16, 17}. Survey questions focused on parent-provider trust, vaccine decision-making, confidence in vaccine information and demographics. There were a total of 16 closed-ended questions. Ten of the questions were measured on a 5-point Likert scale, and six of the questions were either dichotomous or categorical (Table 1). Questions measured on a Likert scale were dichotomized in the final analyses (e.g. strongly agree/agree versus strongly disagree/disagree/neutral).

The survey was pilot tested on a sample of parents (n=10) to assess the readability and clarity of survey questions. Six of the questions appeared to be poorly understood and were revised by the study team before the final survey was mailed to participants.

Survey sample—As described for the focus groups, we identified potential survey participants by using the KPCO EHR to create a stratified sampling frame of parents who either accepted, delayed, or refused vaccines for their children. We first identified all children ages 4 to 24 months between years 2009 and 2011, which overlapped but differed

from the time frame of the focus groups (2008–2010). Each child had to be continuously enrolled in the KPCO health plan from birth until the age at which they were identified for the survey. Electronic immunization records were used to stratify children as either fully vaccinated, partially vaccinated, or unvaccinated by the age at which they were identified. A manual medical record review – independent of the medical review for the focus groups – was then conducted on the unvaccinated and partially vaccinated children to determine if the parents had explicitly delayed or refused vaccinations for personal, nonmedical reasons. Based on the medical record review, 3 strata of parents were categorized according to their vaccine behavior: vaccine acceptors, vaccine delayers, or vaccine refusers. Surveys were sent by mail to a random sample of the vaccine acceptors (n=500) and all of the delayers (n=227) and refusers (n=127). Surveys were mailed up to two times to each participant and no incentive was provided.

Survey analysis—Descriptive statistics were calculated for all demographic variables, including gender, race/ethnicity, marital status, education, household income, and age. Responses to dichotomized survey questions on vaccine decision-making and trust were compared across the three strata of parents with chi-square tests and multivariable polytomous logistic regression. In the logistic regression models, vaccine behavior (accept, delay, refuse) represented the multi-level dependent variable, and the dichotomized survey questions were the main independent variables, controlling for demographic characteristics. Separate models were run for each survey question, and the vaccine acceptors served as the reference category in all of the models.

An additional sub-analysis was conducted on the demographics (age, income, home clinic) of the survey non-responders to assess the potential impact of non-response bias. All analyses were conducted with SAS 9.2 (SAS Institute, Inc. Cary, NC).

RESULTS

Focus Group Results

Twenty-four parents who either refused or delayed vaccinations for their children participated in the 7 focus group discussions. Five main themes related to the vaccine decision making process and confidence and trust in their provider's vaccination advice emerged from the discussions.

Vaccine decision making—Three themes emerged when parents described their vaccine decision making process. Theme one focused on the timing of their vaccine decisions. Most parents reported making their vaccine decisions regarding their infant either during pregnancy or while making their birth plans (theme one). However, parents also described their vaccine decision-making as a continuously evolving process – something they constantly re-evaluate (theme two). One parent who delayed vaccinations for her child explained that:

“It’s not that I’ve necessarily made my decision this is how it’s going to be.”

Other parents described their decision to either delay or refuse vaccination as something they constantly think about and fear:

“But it is a difficult decision not to vaccinate because you’re on like hyper alert.”

“That’s a real fear that I’ve lived with in making this decision. Oh my gosh, if she contracts something, then it’s my fault for not vaccinating her.”

“I decided that I’m not vaccinating them at this time, you still have that fear in the back of your mind that, oh my God, what if he did get whooping cough and die. I would feel horrible if there was something that I could have done.”

For the third theme, parents also described seeking multiple sources of vaccine information as part of their evolving decision making process (theme three). One parent expressed a high level of anxiety around trying to find reliable information sources:

“I am stressed about this. This whole topic is stressing me out more than you can even believe. I mean, half the stuff I can’t even understand, but it’s totally frustrating and stressful to think that, oh, great, now we have to worry about this. There are so many other things to worry about, too. I don’t know, I wish we could have more choices.”

Trust and confidence in physician’s advice—The fourth and fifth themes emerged when parents discussed trust and confidence in their physician’s advice. Most notably, the fourth theme focused on a clear distinction between overall trust in the pediatrician and trust in pediatricians’ advice on vaccines (theme four). Below is a quote by a parent who respected her pediatrician’s advice in many topic areas, but did not have a high level of confidence in the vaccine information that her pediatrician provided:

“I know my doctor has been great. She’s very low-key and we have great conversations about several things. But this is just one of those areas [vaccination] where they don’t give the information that I think I would like.”

The last theme focused on how their physicians presented vaccine information (theme five). Most parents did not believe pediatricians were adequately educated on vaccines and thought their vaccine information was one-sided. One parent described a lack of confidence in her pediatrician’s knowledge about vaccines:

“I think they’re uneducated to be honest with you. I think that the doctors that advise us to have vaccinations aren’t the ones that have done the research.”

Many parents also expressed a desire for a more balanced approach to receive their vaccine information:

“As long as it’s going to be one of those hot topics that’s out there, there’s going to be huge differing opinions. I mean, it’s-- every person should just be educated on both sides, to make their own decision.”

“As a healthcare provider and as a physician, you should know all sides of all the different arguments to be able to advise your patients.”

“I think in the ideal world physicians would have both sides of the coin. I think that they would have access or even be required to have access to information on either side of the issue.”

Regarding the issue of balance, parents generally wanted providers to explicitly discuss the risk of vaccination. Below is an example quote by one parent describing her dissatisfaction with her provider’s discussion of risk:

“It’s just very disingenuous when they (providers) say there’s no risk, because there is a risk.”

Survey Results

Survey response and demographics—Surveys were mailed to 854 parents, 443 (52%) of which responded. The response rate varied by vaccine group, with 47 (37%) of the vaccine refusers, 136 (60%) of the vaccine delayers, and 260 (52%) of the vaccine acceptors

returning completed surveys. A majority of the parents were female, white, married, college educated, and had an annual household income greater than \$70,000 (Table 2). Three of these variables – race/ethnicity, education and household income – differed across the vaccine groups. In the sub-analysis comparing survey responders to non-responders, stratified by vaccine behavior, there were no significant differences in age, income and home clinic between the two groups (data not shown).

Parents who had either refused or delayed vaccines for their children were more likely to be white than parents who accepted vaccines for their children ($P=0.0003$). Parents who delayed vaccines had the highest proportion of households earning \$70,000 or more per year (71%), followed by parents who accepted vaccines (61%) and parents who refused vaccines (51%) ($P=0.007$).

Vaccine decision making—Regardless of their vaccine choices, parents reported that they first began thinking about vaccines before their child was born, either during pregnancy or before pregnancy (Table 3). In the multivariable regression analysis, parents who refused or delayed vaccinations were approximately 2-times more likely to report that they first began to think about vaccines before their child was born than parents who accepted vaccines (Table 4).

The proportion of parents who reported that they either occasionally or constantly re-evaluate their vaccine decisions varied significantly by parental vaccination behavior. In the multivariable regression analysis, parents who refused or delayed vaccines were approximately 8-times more likely to report that they constantly re-evaluate their vaccine decisions than parents who accepted vaccines.

Trust and confidence in provider's advice—Parents tended to report a high level of trust in their pediatrician's advice on their child's nutrition, physical examination and behavior and development. However, parents who refused vaccines reported a lower level of trust in their pediatrician's advice on nutrition (70%) and behavior and development (80%) when compared to parents who either delayed or accepted vaccines (92–96%, $P<0.0002$). Although parents who accepted vaccination reported a high level of trust in their pediatrician's vaccine advice (97%), only 69% of parents who delayed vaccines and 38% of parents who refused vaccines expressed a high level of trust in their pediatrician's advice on vaccines ($P<0.0001$). In the multivariable regression analysis, the odds ratios for *trust* were large, but the associated 95% confidence intervals were wide. For example, parents who refused vaccines were 34-times more likely (95% CI, 9.0 – 127.1) and parents who delayed vaccines were 8-times more likely (95% CI, 2.2 – 29.7) to express a low level of trust in their pediatrician's vaccine advice than parents who accepted vaccinations.

Regarding vaccine advice, parents generally felt that they had enough time to discuss vaccination with their pediatrician but did not believe their pediatrician's vaccine information was balanced. A majority of parents reported that their pediatrician discussed the benefits but not the risks of vaccination, and these proportions varied significantly by parental vaccination behavior ($P<0.006$).

Lastly, between 54–70% parents were either very or absolutely confident that they had enough information to make vaccine decisions for their children. In the multivariable regression analysis, parents who delayed vaccines were 45% less likely to report that they had the necessary information to make vaccine decisions than parents who accepted vaccines (Table 4).

DISCUSSION

For this mixed methods study, we used electronic medical records to identify strata of parents across a range of vaccination behaviors. We engaged a sample of these parents through focus groups, which allowed us to inductively identify themes related to the vaccine decision-making process and patient-provider trust. We were then able to examine these themes quantitatively with a survey administered to a stratified sample of parents who were also identified through a medical record review. In our analyses comparing responses across groups of parents who either accepted, delayed or refused vaccines for their children, we observed significant differences in the timing of their vaccine decisions, confidence in vaccine information and trust in their pediatrician's medical advice.

While some of the themes identified in our study have been described previously, others are new. Studies have shown that parent-provider trust in general is an important factor associated with vaccine hesitancy^{3, 4, 18-20}. Another study using focus group discussions demonstrated a desire among parents for more "balanced" written educational immunization materials²¹. In addition to expanding upon these themes using a mixed methods approach, our study presents new information on the timing of parental vaccination decisions and shows that parents who delay or refuse childhood vaccination tend to constantly re-evaluate their decisions.

It is important to consider the timing of vaccine decision-making when designing interventions to address parental vaccination concerns. While more than half of all parents in our study said they began thinking about vaccines before their children were born, the proportion increased significantly across the groups of parents who accepted, delayed or refused vaccines for their children. This suggests that concerned parents who go on to delay or refuse vaccines start to make their vaccine decisions earlier than parents who accept vaccines. It is therefore reasonable to assume that the latter group relies more heavily on their pediatrician for vaccine advice, while the former tend to seek other sources of vaccine information during pregnancy. Although a recent study failed to show an association between providing vaccine information to the mother before the 2-month well-child vaccination visit and parental vaccine attitudes²², our data suggests that interventions should be designed to engage obstetricians and target vaccine hesitant parents earlier in the decision-making process.

In addition to starting their decision-making early, parents who refused or delayed vaccines were more likely to report that they occasionally or constantly re-evaluate their vaccine decisions than parents who accepted vaccines. In our focus groups, many of these vaccine hesitant parents described their vaccine decision-making as a continuously evolving process because of the anticipated regret they would feel if their child contracted a vaccine preventable disease. Prior research has suggested that parental vaccine hesitancy may be attributed, in part, to a cognitive bias known "omission bias", where the harm resulting from inaction (not vaccinating) is considered to be more acceptable than harm resulting from action (vaccinating)²³⁻²⁷. While omission bias may influence vaccine behaviors, our data shows that parents also fear the harm that may result from their inaction, thus leading them to constantly wrestle with their vaccine decisions. For future interventions, these results suggest that concerned parents should be engaged at multiple time points as they contemplate the consequences of their decisions to forgo vaccination for their children.

Parents tend to cite physicians and health care providers as their most trusted source of vaccine information^{3, 4, 18, 19}. Our data show that parents across all groups of vaccine behaviors tended to trust their pediatrician's advice on nutrition, the physical examination and on behavior and development. However, our data also demonstrate that trust in

physician vaccine information varies significantly by vaccine behavior, where a large majority of parents who accepted vaccines, a modest proportion of parents who delayed vaccines and a small proportion parents who refused vaccines reported trusting their pediatrician's vaccine advice. Therefore, while parents across a range of vaccine beliefs generally expressed a high level of trust in their pediatrician's medical advice, these data suggest that physicians may need additional training on risk-communication strategies during and after residency to help hesitant parents with their vaccination decisions.

Across all vaccine behavior groups, parents reported that their pediatrician was much more likely to discuss the benefits of vaccination than the risks. Vaccine hesitant parents in particular appeared to be looking for more "balanced" vaccine information from their physicians. Although these parents were clear about wanting physicians to emphasize the risks of vaccination in their discussions, our results are limited by the fact that parents were not specific about what types of adverse reactions they wanted described. For example, physicians may want to present the risks of minor acute conditions, while parents may want to hear about potential long-term serious outcomes. Clearly, additional study on how physicians can effectively convey balanced vaccination information is needed.

This study has additional limitations. Most notably, our study population was sampled from a single health plan in Colorado, and the survey response rate was 52%. While this may limit the generalizability of our findings, the KPCO health plan is a large integrated healthcare delivery system that is demographically representative of the state of Colorado. Colorado is also one of 21 states that allow non-medical, personal belief exemptions to school immunization requirements⁵, thus making it an ideal environment to study vaccine hesitancy. In addition, our sub-analysis comparing responders to non-responders did not reveal any significant differences, and our overall survey response rate was consistent with response rates from several other national survey studies on parental vaccination beliefs^{3, 4, 28-32}.

Not surprisingly, the lowest stratum-specific participation rate in our survey was among parents who refused vaccinations (37%), as prior research has suggested that these parents tend to be less trusting of medical and public health professionals than parents who accept vaccinations³. In addition, prior research has shown that about 1% and 13% of parents in the US refuse or delay childhood vaccinations for personal, non-medical reasons, respectively^{4, 6, 30, 31}. In our study, we used the electronic health record and a manual medical record review to target, sample and compare distinct groups of parents based on their actual vaccine behavior. With this method, we were able to identify 227 parents who delayed vaccinations and 127 parents who refused vaccinations. National estimates of refusal and delay suggest that we would have had to sample more than 12,000 households in order to obtain a nationally representative population with this many parents who either refused or delayed vaccines.

These mixed methods results have implications for future interventions. Whether developing written educational materials, web-based resources, decision aids or risk-communication messages for providers, the content of the material as well as the timing and frequency with which it is applied must be carefully considered. Our data suggest that the effectiveness of interventions could be enhanced if they are applied early (during pregnancy), often (pregnancy through infancy), and in a balanced manner with sufficient information on the risks of vaccination.

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What's New

This mixed methods study provides unique insight into the parental vaccine decision making process and parent-pediatrician trust. The results from this study have implications for future interventions designed to reduce parental vaccination concerns.

Table 1

Survey questions/statements*

<p>When did you first begin thinking about vaccinations?</p> <p>Before pregnancy</p> <p>During pregnancy</p> <p>At or around the time of my child's first well child visit</p> <p>After my child's first well child visit</p> <p>To what extent do you re-evaluate your decision on vaccination for your child?</p> <p>I never re-evaluate my decision to vaccinate</p> <p>I re-evaluate my decision to vaccinate rarely</p> <p>I re-evaluate my decision to vaccinate occasionally</p> <p>I am constantly re-evaluating my decision to vaccinate</p> <p>I trust my pediatrician's advice on my child's vaccinations.</p> <p>Strongly disagree</p> <p>Somewhat disagree</p> <p>Neither agree nor disagree</p> <p>Somewhat agree</p> <p>Strongly agree</p> <p>I trust my pediatrician's advice on my child's nutrition.</p> <p>Strongly disagree</p> <p>Somewhat disagree</p> <p>Neither agree nor disagree</p> <p>Somewhat agree</p> <p>Strongly agree</p> <p>I trust my pediatrician's advice on my child's physical examination.</p> <p>Strongly disagree</p> <p>Somewhat disagree</p> <p>Neither agree nor disagree</p> <p>Somewhat agree</p> <p>Strongly agree</p> <p>I trust my pediatrician's advice on my child's behavior and development.</p> <p>Strongly disagree</p> <p>Somewhat disagree</p> <p>Neither agree nor disagree</p> <p>Somewhat agree</p> <p>Strongly agree</p> <p>I had enough time to discuss vaccination with my pediatrician.</p> <p>Strongly disagree</p> <p>Somewhat disagree</p> <p>Neither agree nor disagree</p> <p>Somewhat agree</p> <p>Strongly agree</p>

My child's pediatrician discussed the risks of vaccination.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

My child's pediatrician discussed the benefits of vaccination.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

My child's pediatrician is knowledgeable about vaccines.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

How confident are you that you have the necessary information to make decisions about vaccination for your child?

- Not at all confident
- Somewhat confident
- Moderately confident
- Very confident
- Absolutely confident

* In addition, parents were asked about their demographic information including gender, race/ethnicity, education, income and marital status

Table 2

Demographic characteristics of the survey population, by vaccine group (n=443)

Characteristic	Proportion of parent sample, n (%)			p-value
	Refused vaccines ^a n=47	Delayed vaccines ^a n=136	Accepted vaccines ^a n=260	
Gender				0.3
Female	45 (95.7)	122 (89.7)	227 (87.3)	
Missing/Non-Response	0	0	1 (0.4)	
Race or Ethnic Group				0.0003
Native American/Alaskan Native	0	0	1 (0.4)	
Asian/Pacific Islander	0	1 (0.7)	12 (4.6)	
Black/African-American	0	2 (1.5)	6 (2.3)	
Hispanic/Latino	0	1 (0.7)	32 (12.3)	
White	47 (100)	130 (95.6)	201 (77.3)	
Other	0	0	4 (1.5)	
Declined/Non-Response	0	2 (1.5)	4 (1.5)	
Education				0.09
Some High School or less	1 (2.1)	0	5 (1.9)	
Graduated from High School	3 (6.4)	1 (0.7)	14 (5.4)	
Some College	8 (17.0)	20 (14.7)	40 (15.4)	
Graduated from College	20 (42.6)	42 (30.9)	100 (38.5)	
Graduate/Professional School after College	15 (31.9)	71 (52.2)	98 (37.7)	
Declined/Non-Response	0	2 (1.5)	3 (1.2)	
Income				0.002
Less than \$30,000	0	0	13 (5.0)	
\$30,000 – \$50,000	6 (12.8)	10 (7.4)	30 (11.5)	
\$50,001 – \$70,000	13 (27.7)	17 (12.5)	39 (15.0)	
\$70,001 – \$90,000	14 (29.8)	34 (25.0)	43 (16.5)	
More than \$90,000	10 (21.3)	63 (46.3)	116 (44.6)	
Declined/Non-Response	4 (8.5)	12 (8.8)	19 (7.3)	
Marital Status				0.5
Married	44 (93.6)	130 (95.6)	241 (92.7)	
Separated/Divorced/Widowed	2 (4.3)	4 (2.9)	5 (1.9)	
Single	1 (2.1)	2 (1.5)	13 (5.0)	
Missing/Non-Response	0	0	1 (0.4)	

^aNumbers represent n and column percentage

Numbers in bold indicate significant p-value

Table 3

Responses to the survey questions, by vaccine group

Question/Statement	Proportion of parents, %			p-value
	Refused vaccines	Delayed vaccines	Accepted vaccines	
When did you first begin thinking about vaccinations? Before the child was born	87.2	76.4	63.6	0.0007
To what extent do you re-evaluate your decision on vaccination for your child? Constantly/occasionally	68.1	70.6	19.8	< 0.0001
I trust my pediatrician's advice on my child's vaccinations Strongly/somewhat agree	37.8	69.2	96.9	< 0.0001
I trust my pediatrician's advice on my child's nutrition Strongly/somewhat agree	70.5	91.7	96.1	< 0.0001
I trust my pediatrician's advice on my child's physical examination Strongly/somewhat agree	93.2	99.3	97.2	0.08
I trust my pediatrician's advice on my child's behavior and development Strongly/somewhat agree	79.6	93.2	96.1	0.0002
I had enough time to discuss vaccination with my pediatrician Strongly/somewhat agree	80.0	71.4	75.1	0.5
My child's pediatrician discussed the risks of vaccination Strongly/somewhat agree	26.7	41.7	51.0	0.006
My child's pediatrician discussed the benefits of vaccination Strongly/somewhat agree	88.9	90.2	76.0	0.001
My child's pediatrician is knowledgeable about vaccines Strongly/somewhat agree	54.6	74.4	79.1	0.002
How confident are you that you have the necessary information to make decisions about vaccination for your child? Absolutely/very confident	58.7	54.4	70.4	0.005

Numbers in bold indicate significant p-value

Odds ratio estimates for parent responses on questions related to vaccine decision making and trust/confidence in provider's advice, by vaccine group

Table 4

Question/Statement	Parents who refused vs. accepted vaccines		Parents who delayed vs. accepted vaccines	
	Adjusted OR ^a	95% CI	Adjusted OR ^a	95% CI
First began thinking of vaccinations before the child was born	3.2	1.2–8.0	2.3	1.4–4.0
Constantly or occasionally re-evaluate vaccination decision for their child	8.1	3.8–17.4	9.2	5.4–15.7
Absolute or very confident about having necessary information to make vaccine decisions for their child	0.7	0.3–1.4	0.5	0.3–0.8
Strongly disagree or disagree to trust their child's pediatrician's advice on vaccinations	35.7	10.7–119.3	8.4	2.5–28.0

Abbreviations: OR, odds ratio; CI, confidence interval

^a Adjusted for demographic characteristics (age of parent, gender, race/ethnicity, education, income and marital status) Numbers in bold indicate significant p-value