

Parents With Doubts About Vaccines: Which Vaccines and Reasons Why

Deborah A. Gust, PhD, MPH^a, Natalie Darling, MPH^a, Allison Kennedy, MPH^a, Ben Schwartz, MD, MPH^b

^aNational Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; ^bNational Vaccine Program Office, Washington, DC

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What's Known on This Subject

Public attention has focused on vaccine safety in the past 2 decades, because of real and coincidental adverse events after immunization, decreases in vaccine-preventable diseases, high safety standards for vaccines, and increased interest in obtaining complete information about medical care.

What This Study Adds

This study adds to the existing literature on parental vaccine concerns in that it identifies the specific vaccines that prompted vaccine doubt or concern and the reasons why.

ABSTRACT

OBJECTIVES. The goals were (1) to obtain national estimates of the proportions of parents with indicators of vaccine doubt, (2) to identify factors associated with those parents, compared with parents reporting no vaccine doubt indicators, (3) to identify the specific vaccines that prompted doubt and the reasons why, and (4) to describe the main reasons parents changed their minds about delaying or refusing a vaccine for their child.

METHODS. Data were from the National Immunization Survey (2003–2004). Groups included parents who ever got a vaccination for their child although they were not sure it was the best thing to do (“unsure”), delayed a vaccination for their child (“delayed”), or decided not to have their child get a vaccination (“refused”).

RESULTS. A total of 3924 interviews were completed. Response rates were 57.9% in 2003 and 65.0% in 2004. Twenty-eight percent of parents responded yes to ever experiencing ≥ 1 of the outcome measures listed above. In separate analyses for each outcome measure, vaccine safety concern was a predictor for unsure, refused, and delayed parents. The largest proportions of unsure and refused parents chose varicella vaccine as the vaccine prompting their concern, whereas delayed parents most often reported “not a specific vaccine” as the vaccine prompting their concern. Most parents who delayed vaccines for their child did so for reasons related to their child’s illness, unlike the unsure and refused parents. The largest proportion of parents who changed their minds about delaying or not getting a vaccination for their child listed “information or assurances from health care provider” as the main reason.

CONCLUSIONS. Parents who exhibit doubts about immunizations are not all the same. This research suggests encouraging children’s health care providers to solicit questions about vaccines, to establish a trusting relationship, and to provide appropriate educational materials to parents. *Pediatrics* 2008;122:718–725

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Key Words

parents, vaccine concern, doubt, refusal, delay, unsure

Abbreviation

NIS—National Immunization Survey

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Address correspondence to Deborah A. Gust, PhD, MPH, National Center for HIV, Viral Hepatitis, STD and TB Prevention, Mail Stop E-45, Atlanta, GA 30333. E-mail: dgust@cdc.gov

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IMMUNIZATION COVERAGE AMONG children in the United States is at or near all-time high levels.¹ In the past 2 decades, however, concern about vaccine safety has increased,^{2–5} in part because of the decrease in the prevalence of once-common childhood illnesses. Also contributing is the fact that vaccines have properties that cause the public to have high safety standards. Specifically, vaccines are given to healthy individuals to prevent disease, they are most often given to children, and they are frequently mandated for school and day care.⁶ With the number of states allowing philosophical exemptions to immunizations increasing,⁷ immunization concerns can translate into parents’ decisions to decline vaccines for their children. Therefore, it is necessary that public health professionals understand the various characteristics of parents with doubts about vaccines and the reasons for the doubts, so that they can be effectively addressed. The goals of this study were (1) to obtain national estimates of the proportions of parents who have doubts about their child receiving a vaccine (ie, they ever got a vaccination for their child although they were not sure it was the best thing to do, delayed a vaccination for their child, and/or decided not to have their child get a vaccination); (2) to identify factors associated with these parents, compared with parents reporting no vaccine doubts; (3) to identify the specific vaccines that prompted doubts and the reasons why; and (4) to describe the main reasons parents changed their minds about delaying or refusing a vaccine for their child.

METHODS

Survey

The National Immunization Survey (NIS) is conducted by the Centers for Disease Control and Prevention, to obtain accurate national and state-specific estimates of vaccination coverage. Each quarter, the NIS samples children 19 to 35 months of age by using list-assisted, random-digit-dialing methods. A parent or guardian (hereafter referred to as parent) is interviewed by telephone to determine demographic and socioeconomic information. At the end of the interview, consent to contact all vaccination providers for the child is requested. Once consent is obtained, mail surveys are sent to the vaccination providers, who report the child's vaccination history from their records. The design of the NIS has been described elsewhere.⁸

Survey Module

A survey module attached to the NIS in 2003 (quarters 2–4) and 2004 (quarters 2–4) was designed to obtain national estimates of parents with concerns about immunizations. Interviewers questioned parents regarding concerns about immunizations, the specific vaccines that prompted doubt, the reasons for doubt, and, for those who changed their minds about delaying or refusing a vaccine for their child, what made them change their minds (survey available on request).

A randomly selected subset of parents who completed the NIS was asked to respond to the module. The randomization algorithm oversampled households that contained Hispanic children or non-Hispanic black children, to give these populations larger proportions of representation in the sample than in the overall population. If a household contained ≥ 2 age-eligible children, then the youngest age-eligible child in the household was identified as the focus of the module interview. Parents with a completed module interview received a module interview weight that incorporated adjustments for interview nonresponse. The weighting methods followed the approach used for previous NIS modules.^{8,9} Briefly, data were weighted to adjust for households with multiple telephone lines, household nonresponse, nonassessment of households without telephones, and known population-control totals. Provider-verified vaccination information (ie, vaccination records obtained by surveying health care providers) was not used in this analysis.

Variables of Interest

The dependent variables were indicators of doubt about vaccines. For purposes of analysis, parents were classified according to the greatest level of doubt expressed, in increasing order, that is, (1) got vaccination for their child although they were not sure it was the best thing to do ("unsure"), (2) delayed a vaccination for their child ("delayed"), or (3) decided not to have their child get a vaccination ("refused"). Specifically, parents who responded yes to >1 of the questions of interest were counted only as responding to the one indicating the greatest level of doubt. A comparison group included parents who responded no to all 3 questions of interest

(no doubts). Independent variables included demographic characteristics and levels of concern about 2 vaccine-related issues, as follows. (1) "How concerned are you that a vaccination might not prevent the disease?" (2) "How concerned are you that a vaccination might not be safe or might have serious side effects?" Responses to these questions were dichotomized from 4 choices (very concerned, somewhat concerned, not too concerned, or not at all concerned) to identify those who were concerned (very concerned or somewhat concerned) and those who were not concerned (not too concerned or not at all concerned).

Statistical Analyses

We described the proportions of parents who responded yes to the 3 questions of interest and the proportions who responded yes to >1 . We also described (1) the vaccines associated with the doubt indicators (sample question: "The last time you had your child vaccinated although you were not sure it was the best thing to do, which vaccinations did your child have?"), (2) the reasons parents had doubts about specific vaccines (sample question: "The last time you had your child vaccinated although you were not sure it was the best thing to do, what were you concerned about?"), and (3) the main reason parents changed their minds about delaying or refusing a vaccination for their child ("What would you say is the main reason you changed your mind and had your child vaccinated after planning to delay or not get a vaccination for your child?").

On the basis of parents' greatest level of doubt, Pearson χ^2 tests were used to test for associations (defined as $P < .05$) between behaviors indicating doubt about vaccines and demographic characteristics and the 2 specific vaccine-related issues that might have been of concern. Logistic regression analysis was used to build a full model for each of the behaviors indicating doubt about vaccines, compared with the group with no doubts. Selected demographic characteristics and the 2 vaccine concern variables were entered in each model regardless of whether they were significant in bivariate analyses.

Sample size was calculated by using 2002 NIS data to determine the expected distribution of respondents, according to their child's race/ethnicity, in a national sample. Precision and data collection costs were considered in determining the final target sample size. All statistical analyses were conducted by using SUDAAN 9.0.0, to account for the complex sampling design of the NIS.

RESULTS

Response Rate

During 2003 (quarters 2–4) and 2004 (quarters 2–4), 3924 parents responded to the survey module. In 2003, the module completion rate was 94.3% among randomly selected parents who completed the NIS interview. When NIS nonresponse was taken into account, the overall response rate was 57.9%. In 2004, the module completion rate was 95.8% and the overall response rate was 65.0%.

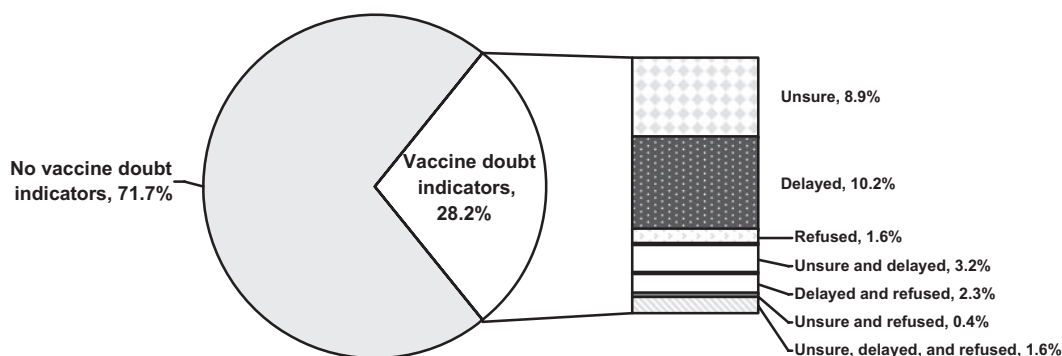


FIGURE 1
Proportions of parents who reported vaccine doubt indicators.

Parents With Doubts About Vaccines

A total of 28.3% of parents responded yes to ≥ 1 of the 3 questions about vaccine doubt indicators (Fig 1). When parents were classified according to the greatest level of doubt expressed, 8.9% reported accepting the vaccination although they were not sure it was the best thing to do (unsure), 13.4% reported delaying their child's vaccination (delayed), and 6.0% reported refusing a vaccination for their child (refused).

Demographic Characteristics and Specific Vaccine Concerns of 3 Groups of Parents With Vaccine Doubts

Several demographic variables showed differences across groups. It was notable that, compared with unsure and refused parents, a larger proportion of delayed and no-doubt parents reported that the mother was < 30 years of age (median age of 26 years for mothers in each of the doubt indicator groups and 27 years for mothers in the group with no vaccine doubt indicators), married, had a high school education or less, and had an income of \$0 to \$30 000 (Table 1). With regard to maternal race/ethnicity, white parents constituted the greatest proportion of refused (83.9%), compared with delayed (65.2%) and unsure (65.7%), doubt indicators. With analysis of each race separately, white parents had the largest proportion of refused parents (9.7%), followed by other (5.0%), black (2.8%), and Hispanic (1.5%), whereas black parents had the largest proportion of unsure parents (11.0%), followed by white (10.7%), other (7.6%), and Hispanic (5.4%). Concerns that a vaccination might not be safe or might have serious side effects differed among the 4 groups (Table 2). The no-vaccine doubt group had the largest proportion reporting not concerned. A total of 2390 respondents were not eligible to respond to the question because they did not answer yes to the question, "Have you heard or read anything about vaccines for children sometimes not preventing disease?" A total of 1469 respondents were not eligible to respond to the question because they did not answer yes to the question, "Have you heard or read anything about vaccines for children not being safe or having serious side effects?"

Multivariate Analyses of the 3 Groups of Parents With Doubts

Table 3 shows the results of the logistic regression analyses. Unsure status was significantly associated with ma-

ternal age, maternal race/ethnicity, child's age, census region, and concern that a vaccination might not be safe. Delayed status was significantly associated with child's age, number of children in the household, maternal marital status, and concern that a vaccination might not be safe. Finally, refused status was associated with child's age, maternal race/ethnicity, and concern that a vaccination might not be safe.

Vaccines That Prompted Doubts and Reasons for the Doubts

Of unsure and refused parents, the largest proportions chose varicella vaccine and the second largest proportions chose "not a specific shot" as the vaccine causing doubts. The largest proportion of delayed parents chose the option of not a specific shot as prompting doubts, followed by varicella and measles-mumps-rubella vaccines. Measles-mumps-rubella vaccine was ranked third by unsure and delayed parents and fifth by refused parents as a vaccine prompting doubts (Fig 2).

The largest proportions of unsure and refused parents, although not delayed parents, reported safety/side effects as the main reason for their doubts for virtually all vaccines, including varicella vaccine. The largest proportion of delayed parents chose the option of "child was ill" as the main reason for most vaccines. It is of note that, for varicella vaccine, parents also chose effectiveness as a reason for concern (unsure: 35.3%; refused: 45.8%; delayed: 26.4%) (Table 4).

Main Reasons Parents Changed Their Minds

The largest proportion of parents who changed their minds about delaying or refusing a vaccination for their child listed "information or assurances from health care provider" as the main reason (Fig 3).

DISCUSSION

Parents who have doubts about childhood vaccines can express this doubt in a variety of ways. They can have their child vaccinated although they are not sure it is the best thing to do, they can delay the immunization, and/or they can simply decide not to have their child get the vaccine. Our study presents the first nationally representative estimates of these 3 vaccine doubt-related indicators among parents and shows that concern about vaccine safety was associated with all parent groups,

TABLE 1 Demographic Characteristics of Parents Who Reported Vaccine Doubt Indicators (Unsure, Delayed, or Refused) and Those Who Did Not

Characteristic	n (%)				P
	No Doubt Indicators	Unsure	Delayed	Refused	
Total	2815	349	526	234	
Gender of child ^a					
Male	1418 (50.8)	176 (53.0)	268 (52.3)	113 (48.3)	.87
Female	1397 (49.2)	173 (47.0)	258 (47.7)	121 (51.7)	
Age of child ^a					
19–24 mo	1046 (34.3)	148 (37.4)	221 (42.6)	90 (30.7)	.03
25–29 mo	836 (29.6)	102 (35.3)	136 (22.6)	70 (32.7)	
30–35 mo	933 (36.1)	99 (27.3)	169 (34.8)	74 (36.6)	
First-born child ^a					
Yes	1050 (38.7)	145 (40.6)	177 (32.8)	93 (38.3)	.39
No	1765 (61.3)	204 (59.4)	349 (67.2)	141 (61.7)	
Age of mother ^a					
<30 y	1382 (52.4)	110 (28.3)	238 (48.5)	83 (33.0)	<.01
≥30 y	1433 (47.6)	239 (71.7)	288 (51.5)	151 (67.0)	
Income ^a					
\$0 to \$30 000	1167 (39.8)	115 (30.1)	214 (40.0)	71 (27.3)	<.01
\$30 001 to \$50 000	465 (18.6)	57 (18.1)	99 (21.5)	56 (27.6)	
\$50 001 to \$75 000	374 (12.3)	60 (20.4)	74 (10.7)	41 (13.0)	
\$75 001 or more	434 (14.8)	91 (23.8)	90 (15.9)	51 (27.2)	
Do not know/refused	375 (14.5)	26 (7.6)	49 (11.9)	15 (4.9)	
Education of mother ^a					
≤12 y	1437 (57.4)	127 (37.9)	235 (54.2)	71 (33.9)	<.01
Some college	492 (19.7)	70 (24.4)	102 (19.5)	56 (30.5)	
College graduate	886 (22.9)	152 (37.7)	189 (26.3)	107 (35.6)	
No. of children in household ^a					
1	732 (27.8)	104 (26.2)	118 (21.2)	59 (24.3)	.27
2 or 3	1734 (59.7)	199 (62.7)	321 (60.9)	139 (60.2)	
≥4	349 (12.5)	46 (11.1)	87 (17.9)	36 (15.5)	
Mother's marital status ^a					
Married	1903 (67.3)	262 (76.8)	366 (66.5)	184 (80.5)	<.01
Not married	912 (32.7)	87 (23.2)	160 (33.5)	50 (19.5)	
Maternal race/ethnicity ^{a,b}					
Non-Hispanic white	1102 (51.1) (62.7)	197 (65.7) (10.7)	276 (65.2) (16.7)	158 (83.9) (9.7)	<.01
Non-Hispanic black	538 (14.0) (75.9)	52 (15.0) (11.0)	81 (9.1) (10.3)	29 (5.6) (2.8)	
Hispanic	996 (28.2) (82.3)	82 (13.8) (5.4)	131 (17.7) (10.8)	37 (5.4) (1.5)	
Other	179 (6.7) (69.8)	18 (5.5) (7.6)	38 (8.0) (17.6)	10 (5.1) (5.0)	
Census region ^a					
Northeast	399 (15.8)	58 (20.0)	72 (17.4)	38 (19.3)	.02
Midwest	519 (19.6)	84 (22.9)	130 (28.0)	65 (31.2)	
South	1169 (39.4)	121 (31.0)	200 (33.2)	67 (26.7)	
West	728 (25.2)	86 (26.1)	124 (21.4)	64 (22.8)	
Respondent's relationship to child					
Mother	2430 (84.4)	305 (86.7)	459 (86.9)	207 (88.9)	.02
Father	282 (10.6)	33 (12.0)	44 (9.0)	26 (9.6)	
Other	103 (5.0)	11 (1.3)	23 (4.1)	1 (1.5)	

For purposes of analysis, parents were classified according to the greatest level of doubt expressed, in increasing order, that is, got a vaccination for their child even although they were not sure it was the best thing to do ("unsure"), delayed a vaccination for their child ("delayed"), or decided not to have their child get a vaccination ("refused"). Specifically, parents who responded yes to >1 of the questions of interest were counted only as responding to that indicating the greatest level of doubt. P values are significant at <.05.

^a Factors were included in the logistic regression model.

^b Row percentage values also are listed for maternal race/ethnicity.

although most parents who delayed vaccines for their child did so for reasons related to a child's illness. These parents were different from the unsure and refused parents in terms of reasons for their vaccine doubt. Results of this study emphasize the need for a strong physician-parent relationship, so that any doubts parents harbor

about childhood vaccines can be brought forth and addressed in a respectful manner.

Compared with parents who reported no vaccine doubt indicators, the unsure, delayed, and refused parents were all more likely to report vaccine safety concern, although they differed with respect to demo-

TABLE 2 Specific Concerns of Parents Who Did and Did Not Report Vaccine Doubt Indicators (Unsure, Delayed, or Refused)

Concern	n (%)				P
	No Doubt Indicators	Unsure	Delayed	Refused	
A vaccination might not prevent the disease ^a					
Concerned	584 (58.3)	98 (57.9)	134 (60.2)	70 (55.8)	.08
Not concerned	400 (40.9)	84 (41.4)	106 (39.8)	53 (44.2)	
Do not know/refused	3 (0.8)	1 (0.7)	1 (0.0)	0 (0.0)	
A vaccination might not be safe or might have serious side effects ^a					
Concerned	982 (59.0)	230 (82.5)	270 (75.9)	150 (78.8)	<.01
Not concerned	619 (40.2)	56 (17.4)	93 (24.1)	42 (21.2)	
Do not know/refused	12 (0.8)	1 (0.0)	0 (0.0)	0 (0.0)	

P values were significant at <.05.

^a Factors were included in the logistic regression model.

graphic characteristics. The odds of being unsure were higher for respondents who reported a maternal age of ≥ 30 years and for parents living in the western region of the United States and were lower for Hispanic parents than white parents, perhaps because of the greater acceptance of vaccines among the former group, as measured by immunization coverage.¹ Similarly, in another study, a greater proportion of mothers ≥ 40 years of age fell into a segment most worried about immunizations for their children, perhaps because these women have a tendency to be more protective and/or are more confi-

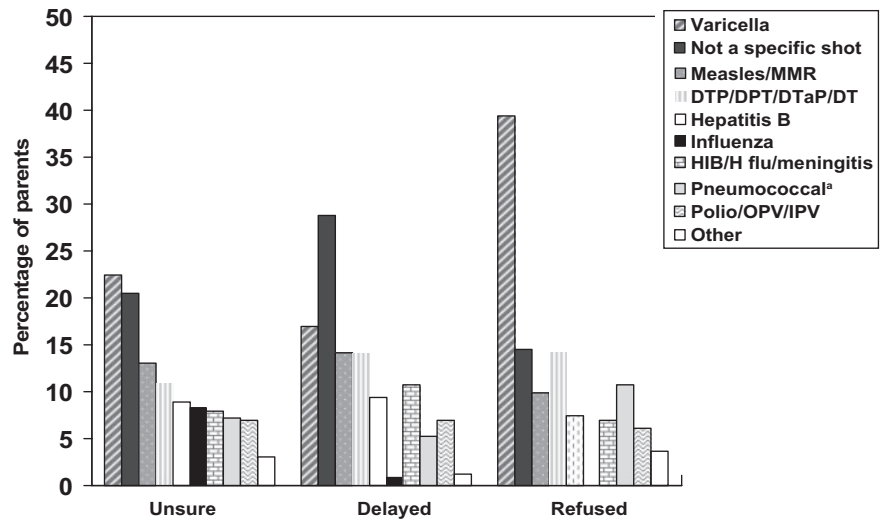
dent in resisting the established system.¹⁰ Personal or philosophical exemptions are available disproportionately in the Western region, compared with the rest of the country, which could influence parental attitudes about immunizations.¹¹ The odds of a mother being in the refused category were lower for non-Hispanic black and Hispanic parents than for white parents. This supports previous research showing that US children who receive no vaccines tend to be white.¹² One reason for this may be that a larger proportion of white parents, compared with black or Hispanic parents, homeschool

TABLE 3 Final Multivariate Analysis of Variables Influencing Unsure, Delayed, and Refused Parents

Predictor Variable	Adjusted Odds Ratio (95% Confidence Interval)		
	Unsure	Delayed	Refused
Mother's age			
<30 y	1.00 (reference)		
≥ 30 y	2.82 (1.46–5.47)		
Maternal race/ethnicity			
Non-Hispanic white	1.00 (reference)		1.00 (reference)
Non-Hispanic black	1.09 (0.45–2.65)		0.12 (0.04–0.39)
Hispanic	0.36 (0.15–0.85)		0.15 (0.04–0.49)
Other	0.47 (0.11–2.09)		0.78 (0.17–3.58)
Age of child			
19–24 mo	1.00 (reference)		1.00 (reference)
25–29 mo	0.94 (0.50–1.75)		2.76 (1.30–5.88)
30–35 mo	0.53 (0.29–0.98)		2.60 (1.30–5.19)
Census region			
South	1.00 (reference)		
West	2.39 (1.22–4.65)		
Midwest	1.15 (0.58–2.27)		
Northeast	1.49 (0.76–2.95)		
Vaccination might not be safe or might have serious side effects			
Not concerned	1.00 (reference)		1.00 (reference)
Concerned	2.20 (1.10–4.41)		2.25 (1.03–4.93)
No. of children in household			
1	1.00 (reference)		
2 or 3	3.46 (1.41–8.48)		
≥ 4	5.18 (1.66–16.20)		
Maternal marital status			
Married	1.00 (reference)		
Not married	2.14 (1.08–4.26)		

FIGURE 2

Vaccines that prompted parents to have their child get a vaccine although they were not sure it was the best thing to do (unsure), to delay their child getting a vaccine (delayed), or not to have their child get a vaccine (refused). MMR indicates measles-mumps-rubella; DTP/DPT/DTaP/DT, diphtheria-tetanus-pertussis/diphtheria-tetanus-tetanus/diphtheria-tetanus-acellular pertussis/diphtheria-tetanus; Hib, *Haemophilus influenzae* type B; H flu, *H influenzae*; OPV, oral polio vaccine; IPV, inactivated polio vaccine. Pneumococcal refers to pneumococcal conjugate vaccine.



their children; some states do not enforce the school immunization requirements for homeschooled children.¹³ Finally, the odds of being in the delayed category were higher for unmarried mothers and parents with >1 child. Delayed immunization has been associated with, among other factors, having a larger number of children.^{14,15} Having multiple children may increase the chance of illness in the home, and it may be difficult for unmarried women to keep medical appointments for the children because of lack of child care support from a spouse. Parental immunization concern was associated

with all 3 groups and was associated with not receiving immunizations in other studies.¹⁶⁻¹⁸

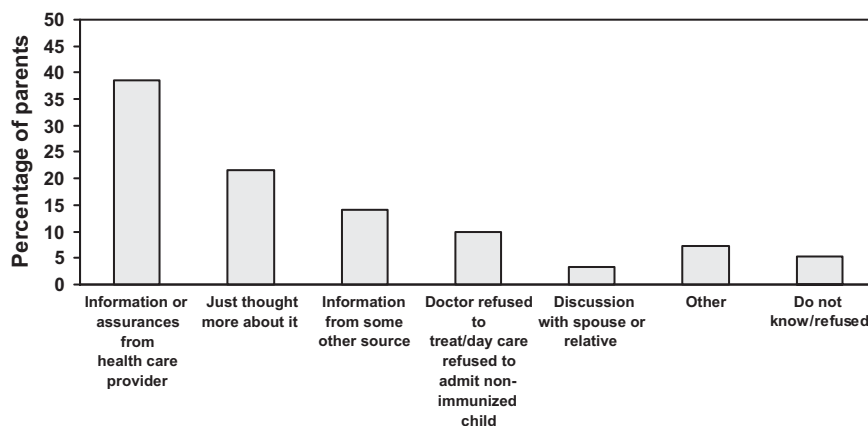
Varicella vaccine was named as the vaccine that prompted doubt by the largest proportion of the unsure and refused groups. Similarly, Salmon et al¹⁹ found that, among parents of children with nonmedical vaccine exemptions, varicella was the most common vaccine not received. The largest proportions of those 2 groups chose safety/side effects as the main reason for concern about varicella vaccine (and most other vaccines). It is likely that those parents were making a calculated risk/benefit

TABLE 4 Reasons for Parents Reporting Vaccine Doubt Indicators (Unsure, Delayed, or Refused), for Specific Vaccines

Reasons	n (%)									
	DTaP Vaccine	Polio Vaccine	MMR Vaccine	Hib Vaccine	Hepatitis B Vaccine	Varicella Vaccine	PCV	Not Specific	Other Vaccine	Influenza Vaccine
Unsure (n = 349)										
Child was ill	8 (9.9)	3 (7.9)	1 (0.2)	2 (6.6)	1 (2.9)	2 (0.6)	0 (0)	13 (13.4)	3 (16.8)	2 (5.1)
Safety/side effect	25 (63.9)	18 (60.5)	41 (87.7)	21 (82.8)	14 (49.5)	45 (64.1)	21 (94.3)	44 (75.6)	5 (81.3)	14 (60.3)
Effectiveness	6 (21.0)	4 (31.6)	4 (11.1)	3 (7.4)	8 (34.6)	36 (35.3)	2 (3.9)	2 (2.1)	0 (0)	5 (30.7)
Cost	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.6)	0 (0)
Other	2 (2.9)	0 (0)	1 (0.3)	0 (0)	1 (13.0)	0 (0)	0 (0)	4 (3.0)	0 (0)	0 (0)
Do not know/refused	2 (2.3)	0 (0)	1 (0.7)	2 (3.2)	0 (0)	0 (0)	0 (0)	7 (4.3)	1 (1.9)	1 (3.9)
Missed/could not get appointment	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.8)	0 (0)	0 (0)	0 (0)
Delayed (n = 526)										
Child was ill	36 (51.1)	16 (43.4)	32 (44.2)	20 (41.0)	22 (55.5)	25 (28.0)	17 (50.9)	57 (49.1)	2 (39.1)	1 (25.9)
Safety/side effect	18 (21.2)	10 (35.7)	32 (40.8)	12 (27.5)	11 (22.9)	32 (35.0)	8 (19.3)	15 (9.2)	2 (26.0)	2 (23.9)
Effectiveness	1 (0.5)	2 (1.1)	1 (0.4)	2 (10.4)	4 (3.9)	21 (26.4)	1 (0.2)	5 (7.3)	0 (0)	1 (50.2)
Cost	7 (7.3)	5 (10.4)	2 (2.8)	5 (8.2)	4 (8.7)	0 (0)	4 (12.5)	11 (5.5)	0 (0)	0 (0)
Other	6 (8.7)	0 (0)	0 (0)	1 (3.7)	0 (0)	1 (0.3)	1 (0.7)	9 (10.6)	2 (30.9)	0 (0)
Do not know/refused	3 (1.0)	3 (7.0)	0 (0)	1 (0.9)	1 (1.0)	1 (0.6)	2 (14.8)	11 (3.0)	1 (4.0)	0 (0)
Missed/could not get appointment	8 (10.2)	3 (2.4)	11 (11.8)	6 (8.3)	6 (8.0)	10 (9.7)	2 (1.6)	28 (15.3)	0 (0)	0 (0)
Refused (n = 234)										
Child was ill	8 (22.6)	3 (14.4)	1 (3.9)	6 (9.3)	1 (5.3)	4 (2.4)	3 (8.0)	5 (8.4)	1 (6.8)	0 (0)
Safety/side effect	14 (67.4)	11 (82.4)	23 (93.9)	10 (76.5)	10 (62.2)	37 (49.6)	13 (65.5)	22 (51.6)	5 (69.3)	7 (34.8)
Effectiveness	2 (1.1)	1 (1.5)	2 (1.7)	2 (3.2)	6 (26.9)	34 (45.8)	7 (25.1)	4 (7.5)	1 (4.7)	9 (53.3)
Cost	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.9)	0 (0)	2 (13.6)	0 (0)	0 (0)
Other	2 (8.4)	2 (1.7)	1 (0.5)	2 (11.0)	2 (5.6)	3 (1.3)	1 (0.5)	1 (0.5)	1 (16.9)	1 (10.5)
Do not know/refused	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (12.7)	1 (2.3)	1 (1.4)
Missed/could not get appointment	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.9)	1 (5.7)	0 (0)	0 (0)

DTaP indicates diphtheria-tetanus-acellular pertussis; MMR, measles-mumps-rubella; Hib, *Haemophilus influenzae* type B; PCV, pneumococcal conjugate vaccine; not specific, not a specific shot.

FIGURE 3
Main reasons parents who planned to delay or not to get a vaccine for their child changed their minds.



assessment, in that they did not want to expose their child to the risk of a new vaccine when they did not consider varicella to be a serious disease.³ In contrast, the largest proportion of delayed parents chose the option of not a specific shot or vaccines in general as prompting their doubt and, as for most immunizations, the main reason was that the child was ill. This indicates that parents who delayed a vaccination for their child were different from the other 2 groups, in terms of the reason for their doubts. It seems these parents were more concerned about potential negative effects of their child being ill and receiving a vaccine at the visit than about the general safety of the vaccine.

Most often, parents who changed their minds after considering delaying or refusing a vaccine for their child gave the credit to the child's health care provider. This underscores the fact that health care providers are key to the immunization program and can affect the decisions of parents who have doubts about vaccines. Other research also found that health care providers who are able to communicate effectively and with respect can positively affect patient satisfaction and adherence,²⁰ as well as reducing their chances of being sued.²¹ Conversely, the parental attitude that the child's provider is not easy to talk to is associated with the belief that the parents do not have access to enough immunization information.²² Therefore, a trusting, respectful, provider-patient relationship can help offset the negative impact of misinformation on parents' decisions concerning immunizations for their children. Coordinating efforts with and providing educational materials to medical professional associations should be or should continue to be a high priority for national, state, and local immunization programs.

Our study results must be interpreted in the context of several potential limitations. Response rates for both years were relatively low; however, weighting methods compensated for differences between responders and nonresponders. There also might have been recall bias, in that parents might have had difficulty remembering their vaccine doubts and the specific vaccines that prompted their doubts. We included only 2 vaccine attitude/concern questions; other factors, such as trust in the government or medical system, might have played a

role but were not included in this study. The primary strengths of this study are the large sample size, the ability to weight responses on the basis of the statistical sampling methods, and data that allow partitioning of doubt indicators and linkage of the indicators to the specific vaccines and reasons for doubts.

CONCLUSIONS

We identified parents with different doubt indicators, identified the vaccines that prompted their doubts and the reason for their doubts, and found that receiving information or assurances from health care providers was the main reason parents changed their minds about delaying or refusing a vaccine. The next step suggested from this research, as well as previous research, is to work with medical professional societies and other partners to encourage children's health care providers to solicit questions and to provide appropriate educational materials and recommendations to parents. For health care providers to be able to fill this important role optimally, additional attention must be paid to (1) communication training in medical schools and residencies, as well as for medical and public health professionals,²³ and (2) adequate reimbursement for health education from health maintenance organizations and other medical insurance organizations.^{24,25} One step forward is the development of a tutorial for primary care providers to help them address parental concerns. In a pilot test, this CD-ROM-based tutorial was effective in improving the general knowledge of residents, as well as their attitudes toward parents who have vaccine doubts.²⁶ In addition, the Centers for Disease Control and Prevention, in collaboration with the Association for Prevention Teaching and Research, offers modules designed to teach medical students and residents about vaccines (Teaching Immunizations in Medical Education; available at: www.aptrweb.org/education/TIME/time). Although the modules do not address communication skills specifically, they may help increase physician confidence regarding the relevant information and help them to be more comfortable talking with parents. For successful health protection interventions,²⁷ there must be an unbroken chain from research to intervention development and

evaluation to the modification of practices needed to address parental immunization doubts and concerns.

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Parents With Doubts About Vaccines: Which Vaccines and Reasons Why

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