Parental Vaccine Safety Concerns in 2009

WHAT'S KNOWN ON THIS SUBJECT: Vaccine safety concerns can diminish parents' willingness to vaccinate their children, and the prevalence of specific concerns can change over time.

WHAT THIS STUDY ADDS: Although parents overwhelmingly share the belief that vaccines are a good way to protect their children from disease, these same parents express concerns regarding the potential adverse effects and especially seem to question the safety of newer vaccines.

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KEY WORDS
vaccine, immunization, safety, concerns

ABBREVIATIONS
MMR—measles, mumps, rubella
HPV—human papillomavirus
OR—odds ratio
CI—confidence interval

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abstract

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OBJECTIVE: Vaccine safety concerns can diminish parents' willingness to vaccinate their children. The objective of this study was to characterize the current prevalence of parental vaccine refusal and specific vaccine safety concerns and to determine whether such concerns were more common in specific population groups.

METHODS: In January 2009, as part of a larger study of parents and nonparents, 2521 online surveys were sent to a nationally representative sample of parents of children who were aged ≤17 years. The main outcome measures were parental opinions on vaccine safety and whether the parent had ever refused a vaccine that a doctor recommended for his or her child.

RESULTS: The response rate was 62%. Most parents agreed that vaccines protect their child(ren) from diseases; however, more than half of the respondents also expressed concerns regarding serious adverse effects. Overall, 11.5% of the parents had refused at least 1 recommended vaccine. Women were more likely to be concerned about serious adverse effects, to believe that some vaccines cause autism, and to have ever refused a vaccine for their child(ren). Hispanic parents were more likely than white or black parents to report that they generally follow their doctor's recommendations about vaccines for their children and less likely to have ever refused a vaccine. Hispanic parents were also more likely to be concerned about serious adverse effects of vaccines and to believe that some vaccines cause autism.

CONCLUSIONS: Although parents overwhelmingly share the belief that vaccines are a good way to protect their children from disease, these same parents express concerns regarding the potential adverse effects and especially seem to question the safety of newer vaccines. Although information is available to address many vaccine safety concerns, such information is not reaching many parents in an effective or convincing manner. *Pediatrics* 2010;125:654–659

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Concerns regarding the safety of vaccines have existed in the United States since the first smallpox immunization campaigns in the 18th century. Over time, the public's specific concerns have changed as new vaccines have been developed and research into vaccine safety has been conducted.

Vaccine safety concerns are important to consider regarding public health efforts, because such concerns can diminish parents' willingness to vaccinate their children.[1–5] Decreased immunization reduces an individual's protection from vaccine-preventable diseases. In addition, public health strategies to control vaccine-preventable diseases rely on a critical percentage of the population to be vaccinated.[6] When immunization rates fall below those thresholds, the risks for outbreaks increase.[7]

Physicians and public health officials are often at the forefront in addressing parental concerns regarding vaccine safety; however, national or individual educational efforts and the development of information materials for the public must be responsive to the specific concerns that are most prevalent at a given time. It follows, therefore, that information regarding current concerns should be used to guide these educational efforts to ensure their greatest relevance.[7]

To characterize the current prevalence of parental vaccine refusal and specific vaccine safety concerns, we conducted a study among a national sample of parents to assess how widely held certain beliefs about vaccines and their safety may be. We also sought to determine whether such concerns were more common in some population groups than in others.

METHODS

Panel Design

The survey sample was drawn by a survey vendor (Knowledge Networks, Menlo Park, CA) from a national online panel. The panel is a standing pool of ~50 000 potential respondents. Respondents from this pool are drawn by probability sampling for individual surveys. Households were selected for recruitment to the panel by random-digit telephone dialing, on the basis of a sample frame of the US residential telephone population. Telephone exchanges that are shown in the 2000 Census to have a high concentration of black and Hispanic households were sampled at a higher rate than those without this high concentration. Probability sampling was used, and adjustments were applied to sampling weights to account for the oversampling of minority households and the selection of 1 adult per household.

Incentives

Households who consented to join the panel and who did not already have Internet access were provided with free Internet access. Those who already had Internet access and were recruited to the panel were asked to use their own hardware and Internet connections but were given points that were redeemable for cash for completing surveys.

Sample

This study is based on a nationally representative sample of parents of children who were aged ≤17 years and were drawn from the panel described. Only 1 adult per household was included in the sample. Participants were asked to verify whether they were a parent at the start of the survey. Each panel member has his or her own unique username and password to respond to the survey request.

Survey Design

Survey topics of interest for this study included parental opinions on vaccine safety and whether the parent had ever refused a vaccine that a doctor recommended for his or her child. Other questions examined specific concerns that parents may have about vaccines in general and with specific reference to 4 vaccines (measles, mumps, rubella [MMR]; varicella, meningococcal conjugate, and human papillomavirus [HPV]).

Questions that were used for other research projects were also included in this survey. These topics included food allergies, bicycle helmet use, health insurance, and teen alcohol use.

In December 2008, the survey vendor pilot tested the draft survey with 100 respondents and sent the deidentified responses to the survey team as an electronic file. The research team revised items when respondent comments suggested that an item was poorly understood.

Data Collection

In January 2009, as part of a larger national study of parents and nonparents, 2521 online surveys were sent to panel members. Panel members who had been selected for the pilot version of the survey were not eligible to be selected for the main survey data collection.

A 31-day field period (January 2009) was used for data collection. During this period, up to 4 e-mail reminders were sent to panel members who were selected for this survey sample but had not yet responded. Respondent gender, race, and income data were taken from panel profile data collected during panel enrollment and verified annually. At the close of data collection, the survey vendor sent deidentified survey and demographic data to the research team as an electronic file. The study was approved by the University of Michigan medical institutional review board.

Data Analysis

All analyses were conducted by the research team by using SAS 9.1 (SAS In-

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stitute, Inc, Cary, NC) and Stata 10 (Stata Corp, College Station, TX). To correct for underrepresentation or overrepresentation in the sample of certain demographic groups, once data were collected, we calculated poststratification weights by comparing the demography of the respondents with US Current Population Survey data. Weights were applied in each case to ensure that demographic groups were represented in the same fraction as the national population with regard to gender, age, race/ethnicity, education, census region, and metropolitan area. Frequency distributions were calculated on all items. We conducted Bivariate analyses (χ^2) on the weighted items to test the relationships between survey responses and demographic variables.

We then conducted a logistic regression to assess the independent association of our demographic variables with parental responses to attitudinal questions. We made each survey item measuring parents' opinions about vaccines into a dichotomous variable indicating parents' agreement or lack of agreement with the item. We also created dummy variables from the measures of respondents' gender, race/ethnicity, education, household income, age, and region of the country shown in Table 1. We then fit logistic regression models that predicted agreement to each of the dichotomous vaccine items in turn from the set of dummy demographic variables.

RESULTS

Study Sample

Of the 2521 surveys fielded, 1552 parents responded to the survey for a 62% response rate. Demographic characteristics of the respondents are shown in Table 1.

TABLE 1 Characteristics of Study Sample

Characteristic	%
Parent gender	
Female	58
Parent race and ethnicity	
White	67
Black	11
Hispanic	15
Other	7
Parent education	
Less than high school	10
High school	29
Some college	31
Bachelor's degree or more	30
Household income	
Less than $30 000	20
$30 000–60 000	33
$60 000–100 000	30
More than $100 000	17
Parent age, y	
<30	20
30–40	39
>40	41
Region of the country	
Northeast	15
Midwest	23
South	38
West	23

Parental Perspectives Regarding Vaccines

Parental attitudes regarding vaccines are shown in Table 2. Most parents agreed with the statement that vaccines are a good way to protect their child(ren) from diseases and that they generally do what their doctor recommends regarding vaccines; however, more than half of the respondents also expressed concerns regarding serious adverse effects of vaccines.

When examining differences among specific groups of parents, several findings arise. In bivariate analyses, women were more likely to be concerned about serious adverse effects (60% vs 46%; $P = .0007$), to believe that some vaccines cause autism in healthy children (29% vs 17%; $P = .0008$), and to have ever refused a vaccine for their child(ren) that a doctor recommended (14% vs 8%; $P = .0011$).

In bivariate analyses, Hispanic (37%) parents were more likely than white (22%) or black (23%) parents to believe that vaccines cause autism in healthy children ($P = .01$). Black (15%) parents were more likely than white (12%) or Hispanic (5%) parents to have ever refused a vaccine recommended by their child's physician ($P = .04$). Other sociodemographic factors were not associated with parental perspectives on vaccines.

Parents' Refusal of Vaccines for Their Children

Overall, 11.5% of parents had refused at least 1 vaccine that their doctor had recommended for their child(ren). Of those who had refused a vaccine, HPV was the most commonly refused (56%), followed by varicella, meningococcal conjugate, and MMR (Table 3).

Assessments of the reason for the refusal of each vaccine are shown in Table 4. Parents expressed variation in the reasons for the refusal for each vaccine.

Results of Regression Analysis

Results of the regression analysis were consistent with the results of the bivariate analyses. Women were more likely than men to be concerned about serious adverse effects (odds ratio [OR]: 1.75 [95% confidence interval (CI): 1.28–2.39), to believe that some

TABLE 2 Parental Perspectives on Vaccines

Perspective	% That Strongly Agreed or Agreed With Statement
Getting vaccines is a good way to protect my child(ren) from disease.	90
Generally I do what my doctor recommends about vaccines for my child(ren).	88
I am concerned about serious adverse effects of vaccines.	54
New vaccines are recommended only if they are as safe as older vaccines.	51
Parents should have the right to refuse vaccines that are required for school for any reason.	31
Some vaccines cause autism in healthy children.	25
My child(ren) does(do) not need vaccines for diseases that are not common anymore.	11

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TABLE 3 Parental Vaccine Refusal

Parameter	%
Have you refused a vaccine for your child(ren) that a doctor recommended?	11.5
Of those who have refused any vaccines, the following specific vaccines were refused:	
MMR	17.7
Varicella	32.3
Meningococcal conjugate	31.8
HPV	56.4

TABLE 4 Parents Experiences and Attitudes About Childhood Vaccines According to Parental Refusal of Specific Vaccines

Statement	Of Those Who Refused Each Specific Vaccine, % Who Agreed With Each Statement			
	MMR	Varicella	Meningococcal Conjugate	HPV
I personally know of someone who experienced a harmful adverse effect.	40	18	9	3
I have read or heard about problems with this vaccine.	81	47	54	55
My insurance does not cover this vaccine.	6	4	5	13
My children are at low risk for this disease(s).	36	23	50	59
The risk for adverse effects from this vaccine is too great.	80	49	72	59
There has not been enough research on this vaccine.	42	55	67	78
I would rather have my child get this disease.	27	78	—	—
This vaccine has not been on the market long enough.	16	39	54	75
I do not think this vaccine is effective in preventing this disease(s).	23	53	33	37
I have moral/ethical concerns regarding this vaccine.	—	—	—	51

vaccines cause autism in health children (OR: 1.9 [95% CI: 1.31–2.79]), and to have ever refused a vaccine for their child(ren) that their doctor recommended (OR: 2.52 [95% CI: 1.65–3.85]).

Hispanic parents were more likely to report that they generally do what their doctor recommends about vaccine for their children (OR: 2.5 [95% CI: 1.13–5.16]) and less likely to have ever refused a vaccine for their child(ren) that their doctor had recommended (OR: 0.47 [95% CI: 0.24–0.93]). Hispanic parents were also more likely to be concerned about serious adverse effects of vaccines (OR: 1.68 [95% CI: 1.01–2.79]) and to believe that some vaccines cause autism in healthy children (OR: 2.24 [95% CI: 1.29–3.90]).

DISCUSSION

Among the most important findings from our study is that almost 1 (12%) in every 8 parents has refused at least 1 vaccine recommended by their children's physician. The reasons for these refusals were often vaccine specific; parents may have more concerns regarding 1 vaccine than another. Newer vaccines (varicella, meningococcal conjugate, and HPV) were more likely to be refused than older vaccines (MMR), despite safety concerns expressed by many parents regarding vaccination in general. Parents also had varying perspectives on the effectiveness of individual vaccines and the diseases that they were targeted to prevent.

One current specific immunization safety concern has been the spurious association of vaccines with autism. Although peer-reviewed original scientific research and multiple expert committees that have reviewed all available data on this issue have failed to show any association between vaccines and autism, anecdotally the concern continues to affect parents.[8] Our study indicates that a disturbingly high proportion of parents, >1 in 5, continue to believe that some vaccines cause autism in otherwise healthy children. This finding indicates that current public health education campaigns on this issue have not been effective in allaying the concerns of many parents. Officials must attempt to develop more effective and targeted education campaigns that focus directly on this issue if their goal is to match parents' level of concern with the available scientific evidence. Recently, the use of newer social marketing techniques have been suggested as potential strategies to address vaccine safety concerns.[9,10]

Overall, parents in our study overwhelmingly shared the belief that vaccines are a good way to protect their children from disease (90%) and do what their doctor recommends regarding the provision of vaccines for their children (88%); however, many of these same parents did express concerns regarding the potential adverse effects of immunizing their child and especially seemed to question the safety of newer, as compared with older, vaccines. Importantly, parents have the right and responsibility to be adequately informed of any procedure, medication, or vaccine that is administered to their child. It is also the responsibility of health care providers to be informed of the evidence base to address fully any parental concerns.

It is likely that parents would benefit from educational programs that highlight the manner in which safety assessments are conducted before the licensure and subsequent recommendation of new vaccines. In general, studies have shown that parents who believe that they personally have a lack of knowledge regarding vaccines are more likely to have negative attitudes regarding immunization.[11] It is likely that physicians also would benefit from such information in their efforts to discuss vaccine safety with the parents of their patients. This is especially important, because our data clearly support the notion that physicians are

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a frequent and well-trusted source of immunization information.

Similar to previous studies,[1,12] we found variation among parents in their beliefs regarding vaccines. For example, our study found gender differences with regard to vaccine safety concerns. Women were more likely than men to be concerned about the potential for serious adverse effects from vaccines. They were also more likely to believe that some vaccines cause autism in healthy children and to have ever refused a vaccine for their child. These differences may be helpful to those who develop educational materials for parents and for physicians to tailor their messages to match the concerns of the parents whom they see in their practices.

Whereas others have reported variation in immunization refusal among religious groups,[13] we found significant differences according to race/ethnicity of our respondents. Hispanic individuals were more likely than white or black individuals to believe that some vaccines cause autism in healthy children. This is consistent with the findings of Shui et al,[14] who found Hispanic individuals to have a higher rate of negative attitudes toward immunization than white individuals. Because Hispanic individuals are now the largest and the fasting growing minority population in the United States, our findings are especially important to guide future educational efforts to this community. Such efforts are necessary to address what could be a growing concern that may have a significant impact on immunization rates, both in specific geographic areas and nationwide.

It is somewhat reassuring that we also found that Hispanic individuals currently have the lowest rate of vaccine refusals compared with black and white individuals. This may be indicative of a lag between perception regarding vaccine safety and action. Another possibility is that safety concerns may currently be outweighed by the societal pressure within this community to vaccinate their children; however, addressing this concern explicitly before it has an impact on immunization rates should be strongly considered by both public health officials and private providers in these communities.

In contrast to previous studies[1,15] that found varicella to be the vaccine most likely to be refused by parents, our results demonstrated HPV in that position with varicella and meningococcal conjugate refused at roughly similar rates. The previous studies did not include HPV and meningococcal conjugate vaccines because they were not licensed and recommended at the time that the studies were conducted. Our findings also indicated a smaller proportion of parents refusing the MMR and varicella vaccines than found by Gust et al.[1] Our results are likely a reflection of parental response to these newer, less trusted vaccines and the complex issues surrounding their provision, especially HPV.

This study has certain limitations. There is the potential for selection bias in our sampling. Recruitment to the study panel was limited to those who could be reached through random-digit dialing. This would exclude US households without telephones and potentially those who use software to block calls from unknown numbers. As a self-administered survey, it is subject to response bias. The investigators attempted to minimize this bias as it relates to immunization practices and attitudes by inviting panel members to participate with a description of the survey that did not mention specific topics and by including the vaccination questions among questions on other, unrelated topics. Findings in this study that are comparable to previous studies suggest that this study was not more affected by response bias than similar surveys in the past. Although sensitive questions about attitudes and practices were asked, the respondents knew that their identities would be protected and therefore had maximal likelihood of answering truthfully.

CONCLUSIONS

Despite that vaccine safety concerns are held by a significant number of parents, the vast majority continue to immunize their children as recommended by their physicians. Although information is available to address many vaccine safety concerns,[16,17] such information is not reaching parents in an effective or convincing manner. Public health officials should construct and redesign vaccine information programs to address current safety concerns in a manner that is more targeted and tailored to specific subgroups of parents. Continued high childhood immunization rates will be at risk if current safety concerns are not addressed effectively and increase in the future, resulting in more parents' refusing vaccines.

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The Online Surgical House Call: *Some plastic surgeons around the country are now offering "virtual consultations" on their own or collaborative web sites without a face to face visit. Patients can send photos or use webcams to ask physicians they have never met before if they should pursue plastic surgery, and do so with anonymity if they so desire. Surgeons can offer these prospective patients opinions and even price quotes. According to an article in* The New York Times *(Saint Louis C, January 21, 2010), the Federation of State Medical Boards believe this online consult may violate state laws if the surgeon isn't licensed in the home state of the patient. While most plastic surgeons opt not to do this, some do, and some even charge for their online opinion. Of note, the American Academy of Family Physicians has recently established guidelines that include the stipulation that a physician "should evaluate only established patients virtually, and 'only over safe, secure online communication systems.'"*

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