
Parent Attitudes Toward Immunizations and Healthcare Providers

The Role of Information

Deborah A. Gust, PhD, MPH, Allison Kennedy, MPH, Irene Shui, MPH, Philip J. Smith, PhD, Glen Nowak, PhD, Larry K. Pickering, MD

Background: Lack of information has been associated with patient anxiety or concern in a number of healthcare areas.

Objectives: (1) Identify the proportion of parents who agreed, were neutral, and disagreed that they had access to enough information to make a decision about immunizing their child; (2) examine how parents who agreed and disagreed differed with respect to sociodemographic characteristics, and their attitudes about immunizations, their child's healthcare provider, immunization requirements/exemptions, and immunization policymakers; and (3) identify if differences exist in specific immunization concerns.

Methods: A sample of parents with at least one child aged ≤ 6 years ($n = 642$) was analyzed using data from the HealthStyles survey conducted during July and August 2003. Odds ratios and the Mantel-Haenszel chi-square test were used for analysis.

Results: Response rate for HealthStyles was 69% (4035/5845). The largest proportion of parents agreed they had access to enough information (67%) compared to parents who were neutral (20%) or who disagreed (13%). Compared to parents who agreed, parents who disagreed were more likely to be less confident in the safety of childhood vaccines (odds ratio [OR]=5.4, 95% confidence interval [CI]=3.3–8.9), and to disagree that their child's main healthcare provider is easy to talk to (OR=10.3, 95% CI=3.7–28.1). There was a significant linear trend in the percentage of parents expressing immunization concerns among those who agreed, were neutral, and who disagreed they had access to enough information ($p < 0.05$; $df = 1$).

Conclusions: While most parents agreed that they had access to enough immunization information, approximately a third did not. Perceived lack of information was associated with negative attitudes about immunizations and toward healthcare providers. Basic information about the benefits and risks of vaccines presented by a trusted provider could go a long way toward maintaining and/or improving confidence in the immunization process. (Am J Prev Med 2005;29(2):105–112) © 2005 American Journal of Preventive Medicine

Introduction

We have entered a new era of immunizations in the United States. Most parents have little or no firsthand knowledge of the diseases that childhood vaccines prevent and many physicians have not cared for children with vaccine-preventable diseases. Moreover, because of high immunization coverage and an expanded childhood immunization schedule, reports of post-immunization adverse events, both

vaccine related and coincidental, have increased 46% for children aged ≤ 6 years of age from 1991 to 2001 (Centers for Disease Control and Prevention [CDC], unpublished data, 2005). This has contributed to an increased focus on vaccine safety.¹

Associated with the decline in disease prevalence is an increase in the visibility and perhaps number of advocacy groups that question the safety of vaccines. The internet has helped to promote the messages of these groups. In assessing the likelihood of finding an antivaccination site on the internet, Davies et al.² found that of 100 sites that carried vaccination messages, 43% were antivaccination, as defined by emphasizing the dangers of vaccination or encouraging vaccination refusal. Concurrently, there has been a changing culture of physician-patient interaction wherein most people want to be informed about their illnesses.³ Providing

From the Epidemiology and Surveillance Division (Gust, Kennedy, Shui), Immunization Services Division (Smith), and Office of the Director (Nowak, Pickering), National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia

Address correspondence and reprint requests to: D. Gust, National Immunization Program, Centers for Disease Control and Prevention, 1600 Clifton Rd., Mailstop E-61, Atlanta GA 30333. E-mail: dgg6@cdc.gov.

information has been shown to be one factor in positively influencing a sense of control in patients with rheumatoid arthritis,⁴ while conversely, lack of information in patients with cancer may cause anxiety and negative treatment outcomes.⁵

Because of the above factors associated with this new era, healthcare providers need to understand if patients or their parents are satisfied with the immunization information they receive. The purpose of this study was to (1) identify the proportion of parents who agreed, were neutral, and disagreed that they had access to enough immunization information to make a decision about immunizing their child; (2) examine how parents who agreed and parents who disagreed that they had access to enough information differed regarding sociodemographic characteristics, and their attitudes about immunizations, their child's healthcare provider, immunization requirements/exemptions, and immunization policymakers; and (3) identify whether differences existed among parents who agreed, were neutral, and who disagreed that they had access to enough information regarding their specific immunization concerns.

Methods

Surveys

Data are based on responses to questions administered through the 2003 HealthStyles mail survey. HealthStyles has been administered every year since 1995 by Porter Novelli, a public relations firm, as a follow-up survey to consumer mail panel surveys (e.g., ConsumerStyles), and takes place during July and August.⁶ The ConsumerStyles survey covers a wide variety of consumer behaviors including shopping habits, media choices, and general health attitudes, while the HealthStyles survey supplements the ConsumerStyles survey by asking more in-depth questions dealing with specific health issues. The 2003 ConsumerStyles survey was sent to a stratified random sample of 10,000 potential respondents from a panel of 600,000 households representing a range of demographic characteristics and who have agreed to respond to surveys.

Respondents are recruited to join the panel through a four-page survey, and are given small gifts for their participation (phone cards, entry into a sweepstakes with a grand prize of \$1000). The HealthStyles survey is sent to the same individuals completing the ConsumerStyles survey (Figure 1). The 2003 survey data were poststratified and weighted to the U.S. Census Current Population Survey on five demographic variables (gender, age, income, race/ethnicity, and household size). Survey weights were scaled to add to unweighted sample sizes.

Responses to HealthStyles questions have been shown to favorably compare to responses to similar questions from the Behavioral Risk Factor Surveillance System (BRFSS) survey, which uses a probability sampling technique to track health risks in the United States. Specifically, nine items on the HealthStyles survey were comparable to the BRFSS survey⁷ from 1995 to 2001, yielding 34 same-year data pairs where the two surveys could be compared directly. The average differ-

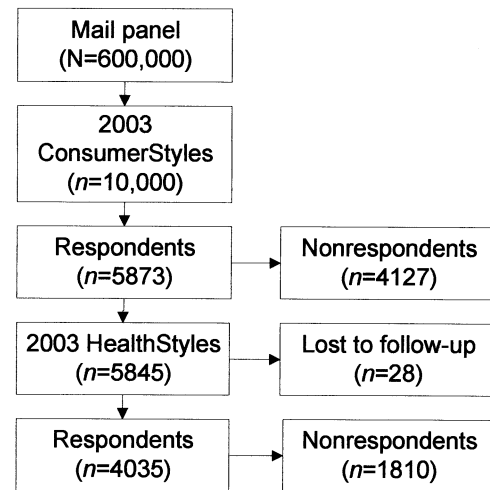


Figure 1. Flowchart indicating selection of respondents for the 2003 HealthStyles survey.

ence for the 34 pairs of percentages was 2.4 percentage points, and the correlation between the 34 pairs was $r=0.99$.⁸

Statistical Analyses

Data were analyzed in 2004 and 2005 from parents with at least one child aged ≤ 6 years. This group was chosen because children receive most of their immunizations early in childhood, this would be the most critical time for parents to have enough immunization information, and school vaccination entry requirements have the greatest impact on this group. This research focused on responses to the statement, "I have access to all the information I need to make good decisions about immunizing my children." Respondents used a 5-point Likert scale to indicate whether they strongly disagreed, disagreed, were neutral, agreed, or strongly agreed. Using weighted data, the responses were divided into three groups: (1) disagree (defined as disagree/strongly disagree), (2) neutral, and (3) agree (defined as agree/strongly agree). However, in the first phase of the analysis, frequencies and percentages of only the parents who agreed and disagreed that they had access to enough immunization information (excluding those who were neutral) were compared, stratified by sociodemographic characteristics (gender, age, race/ethnicity, education, income, marital status, household size) and by questions pertaining to attitudes of parents regarding immunizations, their child's provider, immunization requirements/exemptions, and immunization policymakers. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to compare parents who agreed that they had enough information and those who disagreed in terms of their attitudes and sociodemographic characteristics. In the second phase of the analysis, the Mantel-Haenszel chi-square test was used to evaluate whether there was a linear trend in the percentage of parents who expressed specific immunization concerns (children get too many vaccines, vaccines may cause chronic illnesses, vaccines may cause learning disabilities, ingredients in vaccines are unsafe, vaccines are not tested enough for safety, vaccines are given to children to prevent diseases that they are not likely to get) across parent groups (i.e., parents who disagreed, were neutral, and agreed that

Table 1. Responses of parents of at least one child aged ≤ 6 years to the HealthStyles Survey question “I have access to all the information I need to make good decisions about immunizing my children” ($n = 642$)

Response	<i>n</i> (%)
Disagree	83 (13.0)
Strongly disagree	20 (3.1)
Disagree	63 (9.9)
Neutral	126 (19.8)
Agree	427 (67.2)
Agree	191 (30.1)
Strongly agree	236 (37.1)
Missing	5
Total	642 ^a

^aBecause data are weighted, numbers have been rounded to the nearest whole number and may not add to the total (642).

they had access to all the information that they needed to make a good decision about immunizing their children).

Results

Response Rate

The response rate for the 2003 ConsumerStyles survey was 59% (5873/10,000), and for the 2003 HealthStyles survey was 69% (4035/5845) (Figure 1). The smaller denominator for the HealthStyles survey was caused by attrition (e.g., some respondents were lost because they moved between surveys). Parents who had at least one child aged ≤ 6 years numbered 642 (weighted) (15.9% of sample).

Parents and Perceived Access to Enough Immunization Information

Responses to the question of interest, “I have access to all the information I need to make good decisions about immunizing my children” numbered 636. These responses were divided initially into three groups: (1) parents who agreed ($n = 427$; 67.2%); (2) parents who were neutral ($n = 126$; 19.8%); and (3) parents who disagreed ($n = 83$; 13.0%) (Table 1).

Demographic Differences Between Two Parent Groups: Parents Who Agreed and Disagreed That They Had Enough Immunization Information

There were few demographic differences between parents who agreed and parents who disagreed they had access to enough immunization information. Only two demographic variables, education and household size, were significantly associated with parents who disagreed that they had enough immunization information (Table 2). Parents with < 12 years of education were more likely to disagree compared to parents with graduate school education (OR=4.1, 95% CI=1.2–14.4), and parents in households with two to three

members were more likely to disagree than parents in households with six or more members (OR=2.3, 95% CI=1.0–6.1).

Attitude Differences Between Two Parent Groups: Parents Who Agreed and Disagreed They Had Enough Immunization Information

Attitude questions in four categories were associated with parents who disagreed that they had access to enough immunization information: immunizations, providers, immunization requirements/exemptions, and trust in immunization policymakers (Table 3). Compared to parents who agreed, parents who disagreed were more likely to feel somewhat or not confident in the safety of childhood immunizations (OR=5.4, 95% CI=3.3–8.9); to believe that immunizations are not important (OR=2.9, 95% CI=1.2–7.2); to disagree that they trust their child’s healthcare provider’s vaccine advice (OR=5.2, 95% CI=2.2–12.9); to disagree that their child’s main healthcare provider is easy to talk to (OR=10.8, 95% CI=3.7–28.1); to report that they would not have their child immunized if it were not required by law (OR=4.2, 95% CI=2.1–8.2); to believe states should grant exemptions based on religious (OR=2.4, 95% CI=1.4–4.1) and personal beliefs (OR=2.7, 95% CI=1.6–4.9); and to not trust the government (OR=4.1, 95% CI=2.3–7.5) or the Centers for Disease Control and Prevention (OR=4.5, 95% CI=2.2–9.2) to establish policy for childhood immunizations. Importantly, compared to parents who agreed, parents who disagreed that they had access to enough immunization information were more likely to believe that parents should be allowed to obtain exemptions for their child even if it raised the risk of disease for everyone else (OR=2.2, 95% CI=1.2–3.9).

Concerns Associated with Three Parent Groups: Parents Who Agreed, Were Neutral, and Who Disagreed That They Had Enough Immunization Information

Parents were asked to respond to nine areas of potential concern plus an option of “no concerns” regarding the question, “Which concerns, if any, do you have about childhood immunizations?” There was a significant linear trend among parents who agreed, were neutral, and who disagreed they had access to enough information (Mantel–Haenszel chi-square test; $p < 0.05$; $df = 1$) for six of the nine areas of potential concern (Figure 2). A greater proportion of parents who disagreed that they had access to enough immunization information had specific concerns about immunizations compared to parents who were neutral or who agreed (e.g., I am concerned vaccines may cause chronic diseases: disagree 40%, neutral 19%, agree 12%). The three concerns that were not statistically

Table 2. Demographic characteristics of parents of at least 1 child ≤ 6 years ($n = 642$) who disagreed and agreed that they had access to enough information to make a good decision about immunizing their children.

Demographic variables	Disagreed had access to enough information <i>n</i> (%)	Agreed had access to enough information <i>n</i> (%)	Disagreed vs agreed unadjusted OR (95%CI)
Gender			
Female	55 (66.3)	245 (57.4)	Referent
Male	28 (33.7)	182 (42.6)	0.7 (0.4–1.1)
Age (years)			
18–29	39 (47.6)	160 (37.5)	Referent
30–39	32 (39.0)	192 (45.0)	0.7 (0.4–1.1)
40 and over	11 (13.4)	75 (17.6)	0.6 (0.3–1.2)
Race/ethnicity			
White	47 (56.6)	250 (58.5)	Referent
African American	7 (8.4)	64 (15.0)	0.6 (0.3–1.4)
Hispanic	20 (24.1)	89 (20.8)	1.2 (0.7–2.1)
Other	9 (10.8)	24 (5.6)	1.9 (0.8–4.3)
Education			
Less than 12 years	7 (9.2)	13 (3.1)	4.1 (1.2–14.4)*
12 years	19 (25.0)	95 (22.7)	1.5 (0.6–3.9)
Some college	31 (40.8)	181 (43.3)	1.2 (0.5–3.1)
College graduate	13 (17.1)	83 (19.9)	1.2 (0.4–3.2)
Graduate school	6 (7.9)	46 (11.0)	Referent
Household income			
\$0–29,999	28 (33.7)	122 (28.6)	1.7 (0.7–4.2)
\$30,000–49,999	17 (20.5)	121 (28.4)	1.0 (0.4–2.7)
\$50,000–74,999	22 (26.5)	75 (17.6)	2.2 (0.9–5.7)
\$75,000–99,999	9 (10.8)	57 (13.4)	1.2 (0.4–3.5)
\geq \$100,000	7 (8.4)	51 (12.0)	Referent
Marital status			
Married	65 (79.3)	348 (81.7)	Referent
Widowed/divorced/separated	6 (7.3)	27 (6.3)	1.2 (0.5–3.0)
Never married	11 (13.4)	51 (12.0)	1.2 (0.6–2.4)
Household size			
2–3	44 (52.4)	161 (37.7)	2.3 (1.0–6.1)**
4–5	34 (40.5)	215 (50.4)	1.4 (0.5–3.6)
6 or more	6 (7.1)	51 (11.9)	Referent

* $p < 0.05$ (bolded).

** $p < 0.1$ (bolded).

Agree = strongly agree and agree; CI, confidence interval; Disagree = strongly disagree and disagree; OR, odds ratio.

significant among parent groups were: “I am concerned that my child will not be vaccinated on time because there is not enough of some vaccines”, “I am concerned that it is painful for children to receive so many shots during one doctor’s visit”, and “I am concerned that vaccines are given to children to prevent diseases that are not serious” (data not shown). With respect to the “no concern” option, here again there was a significant linear trend (disagree 15%, neutral 24%, agree 33%; $p < 0.01$).

Discussion

This study found that 67% of parents agreed that they had access to enough information to make a good decision about immunizing their children. However, this study also found that 33% of parents disagreed or were neutral. As the findings repeatedly illustrated, a number of important and significant differences existed between parents who believed that they had access

to enough information to make a good decision about immunizing their children and parents who did not.

These differences in perceptions regarding information access had relatively little association with demographic variables, and instead were more associated with attitudes regarding immunizations and healthcare providers. In this study, having less education and having fewer people living in the household were associated with parents who disagreed that they had access to enough information about vaccines. It may be that parents with less education find it difficult to pose questions to healthcare providers. Parents with less education also have been shown to report concerns about vaccine safety and a higher level of distrust toward medical professionals.⁹ Parents reporting fewer people in the household may not have had as many opportunities to become familiar with the immunization process through older children compared to parents reporting more people in the household. With regard to attitudes, parents who disagreed that they had

Table 3. Parents who disagreed (strongly disagreed/disagreed) and agreed (strongly agreed/agreed) that they had access to enough information to make a good decision about immunizing their children

Attitude variables	Disagreed had access to enough information n (%)	Agreed had access to enough information n (%)	Disagreed vs agreed unadjusted OR (95% CI)
Immunization attitudes			
How confident are you in the safety of routinely received childhood immunizations?			
Very confident/confident	38 (45.8)	349 (82.1)	Referent
Somewhat confident/not at all confident	45 (54.2)	76 (17.9)	5.4 (3.3–8.9)*
In general, how important do you think immunizations are for keeping children healthy? (1–10 scale)			
Important (6–10)	75 (90.4)	412 (96.5)	Referent
Not important (1–5)	8 (9.6)	15 (3.5)	2.9 (1.2–7.2)*
Provider attitudes			
I trust the vaccine advice my child's main health care provider gives me			
Agree/neutral	73 (88.0)	416 (97.4)	Referent
Disagree	10 (12.0)	11 (2.6)	5.2 (2.2–12.9)*
My child's main healthcare provider is easy to talk to			
Agree/neutral	71 (86.6)	421 (98.6)	Referent
Disagree	11 (13.4)	6 (1.4)	10.8 (3.7–28.1)*
Immunization requirement/exemption attitudes			
Would you have your child fully immunized if it were not required in order to enter daycare and/or school?			
Yes	43 (72.9)	361 (91.9)	Referent
No	16 (27.1)	32 (8.1)	4.2 (2.1–8.2)*
Parents should be allowed to get a religious or philosophical vaccine exemption for their child even if it were clear that it raised the risk of disease for everyone else			
Disagree/neutral	62 (75.6)	363 (87.1)	Referent
Agree	20 (24.1)	54 (12.9)	2.2 (1.2–3.9)*
Should states grant childhood vaccination exemptions for parents based on <i>religious</i> beliefs?			
No	38 (56.7)	263 (76.0)	Referent
Yes	29 (43.3)	83 (24.0)	2.4 (1.4–4.1)*
Should states grant childhood vaccination exemptions for parents based on <i>personal</i> beliefs?			
No	40 (62.5)	288 (81.8)	Referent
Yes	24 (37.5)	64 (18.2)	2.7 (1.6–4.9)*
Trust in those responsible for immunization policy attitudes			
Do you trust the government to set policy for childhood vaccines?			
Yes	27 (49.1)	274 (79.9)	Referent
No	28 (50.9)	69 (20.1)	4.1 (2.3–7.5)*
Do you trust public health agencies like the Centers for Disease Control and Prevention to set policy for childhood vaccines?			
Yes	48 (76.2)	343 (93.5)	Referent
No	15 (23.8)	24 (6.5)	4.5 (2.2–9.2)*

* $p < 0.05$ (bolded)

Agree = strongly agree or agree; CI, confidence interval; Disagree = strongly disagree or disagree; OR, odds ratio.

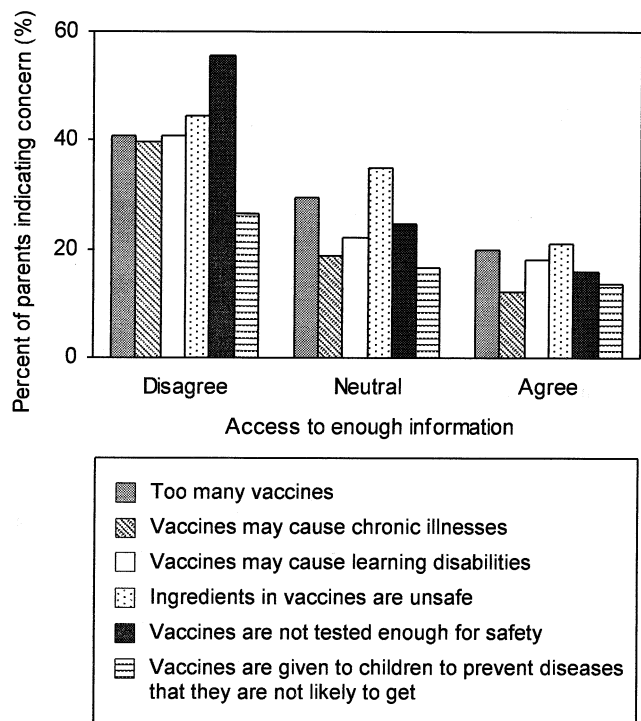


Figure 2. Responses to the question (percent of total), “Which concerns, if any, do you have about childhood immunizations?” that were grouped by parents who disagreed, were neutral, or agreed that they had access to all the information that they need to make a good decision about immunizing their children. Multiple options could be chosen. Disagree represents strongly disagree and disagree; and agree, strongly agree and agree.

enough vaccine information had negative attitudes in all four attitude categories analyzed: immunizations, providers, immunization requirements/exemptions, and trust in people responsible for immunization policy. While immunization status was not measured in this study, another study found that almost 15% of under-immunization is attributable to parental attitudes, beliefs, and behaviors.¹⁰

A larger percentage of parents who reported they did not have access to enough information about vaccines also had several specific vaccine concerns compared to parents who were neutral or agreed that they had access to enough information. It may be that when there is a void of accurate, trusted information, doubts about vaccines may arise and/or misinformation is more readily accepted. Other studies have demonstrated the effect of providing information on the well-being of patients. For example, information is one factor that has been shown to positively influence a sense of control in patients with rheumatoid arthritis,⁴ and perceived lack of information among mothers was one reason contributing to nonimmunization of children in India.¹¹ It is of note that risks that are perceived to be controlled by others are perceived as greater than risks perceived as under one’s own control.¹²

A previously published study showed that most parents report receiving immunization information from a physician.¹³ In this study, 67% of parents agreed that they have access to all the immunization information that they need, suggesting that providers overall are doing a good job of presenting immunization information to parents. However, for 33% of parents, more or different information is needed. In this study, not trusting the advice of the child’s provider, and the perception that the provider is not easy to talk to were other key factors associated with the parental belief that they did not have access to enough information to make a good decision about immunizing their children. Additionally, one of the factors influencing parents who choose not to vaccinate their children for pertussis is doubt about the reliability of the vaccine information.¹⁴

Trustworthiness develops from a long-term relationship where communication has been a mainstay. In this modern age of health care, patients switch physicians more frequently than in the past and the length of the office visit has declined, both of which reduce opportunities to communicate and establish trust.¹⁵ Trust also may be influenced by a physician’s communication style. This is underscored by the finding that specific communication behaviors such as telling patients about what to expect, use of humor, and facilitation of discussion by soliciting opinions and asking for understanding are associated inversely with physician’s risk of a malpractice suit.¹⁶ The results showed that provider communication is related strongly to the parental belief that they do not have access to enough immunization information. Parents who disagreed (vs agreed) that they had access to enough information were more likely to believe that their child’s provider is not easy to talk to. While it is clear that physicians have little time to communicate with parents, including informing parents of the benefits and risks of immunizations and answering questions,¹⁷ a pilot study showed that implementation of an educational intervention for physicians and nurses increased immunization discussion with parents during the visit with only a slight increase in time.¹⁸ This kind of direct presentation of information provides an opportunity to establish trust and improve the physician–patient relationship.

Because of the success of vaccines, we are in a new era marked by low prevalence of many previously common vaccine-preventable diseases. Healthcare providers cannot rely on the presence of disease to motivate parents to immunize their children and can no longer treat parents as though they have no choice in immunization. Nineteen states allow philosophical exemptions to vaccination for school entry. Because vaccines are mandated for school entry, medical and public health professionals have an ethical responsibility to provide appropriate information to parents. In this study, not having access to

What This Study Adds . . .

Satisfaction with the amount and quality of information provided by healthcare providers may be an important factor in whether immunization schedules are optimized for children.

In this study of a nationally representative sample of parents with children under the age of 6 years, only two thirds felt that they had enough information on immunizations for their children.

enough immunization information was associated with the parental attitude that they would not have their child immunized if not required to do so, parental support for immunization exemption laws, and concerns about vaccine safety. Importantly, previous research has demonstrated that attitudes, beliefs, and behaviors indicative of vaccine safety concerns contribute substantially to underimmunization.^{10,19} The suggestion that parents who believe that they do not have enough immunization information may be susceptible to deciding not to vaccinate their children provides a practical reason, apart from an ethical one, to make a concerted effort to provide the immunization information parents need in a way that parents want to receive it. Providers can make a huge impact on vaccine acceptance by assessing the information needs of parents and providing them with the appropriate materials and advice in advance of their child's immunizations²⁰ through print material or referral to websites (e.g., www.cdc.gov/nip/kidstuff). This has the potential to improve the quality of the physician-parent relationship, thus resulting in a cascading effect where providing information can increase trust, and increasing trust can lead to greater acceptance of and confidence in vaccines.

This study has at least five limitations. There may be a nonresponse bias due to the fairly low response rates of the HealthStyles survey and its preceding survey. Nonresponders may have been different than responders in their vaccine-related attitudes and concerns. Second, data are cross-sectional; thus, causality cannot be determined. Specifically, it cannot be said definitely, but rather only suggested, that lack of information leads to negative attitudes about immunization, providers, immunization requirements, and immunization policymakers. Third, the number of people who disagreed that they had access to enough immunization information was not large enough to conduct multivariate logistic regression analysis; thus, the most parsimonious model to identify associations between independent or explanatory variables and the dependent variable, having access to enough immunization information, could not be determined. Fourth, the surveys did not use a prob-

ability sampling technique, although results of this survey have been shown to be comparable to the BRFSS, which does use a probability sampling technique.⁸ Finally, while data indicated the parents' perception of their access to immunization information, they did not constitute a quantitative measure of the information that they actually received. These limitations should be considered in the interpretation of results.

We live in a world already benefiting from existing vaccines, and there is the promise of more vaccines to come. The challenge that we have now is to make sure that the promise is not lost because we did not present the benefits and risks of vaccines in a meaningful way acceptable to the public. In light of this, CDC, in conjunction with major professional societies, currently is working on a new educational program for healthcare providers. The ultimate goal is to have the parent act as an informed partner in the immunization process.

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References

1. Chen RT. Vaccine risks: real, perceived and unknown. *Vaccine* 1999; 17(suppl 3):S41-6.
2. Davies P, Chapman S, Leask J. Antivaccination activists on the World Wide Web. *Arch Dis Child* 2002;87:22-5.
3. Benbassat J, Pilpel D, Tidhar M. Patients' preferences for participation in clinical decision making: a review of published surveys. *Behav Med* 1998;24:81-8.
4. Ryan S, Hassell A, Dawes P, Kendall S. Control perceptions in patients with rheumatoid arthritis: the impact of the medical consultation. *Rheumatology (Oxford)* 2003;42:135-40.
5. Mossman J, Boudioni M, Slevin ML. Cancer information: a cost-effective intervention. *Eur J Cancer* 1999;35:1587-91.
6. Maibach E, Maxfield A, Laden K, Slater M. Translating health psychology into effective health communication: the American Healthstyles Audience Segmentation Project. *J Health Psychol* 1996;1:261-77.
7. Nelson DE, Holtzman D, Bolen J, Stanwyck CA. Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Social Prev Med* 2002;46(suppl 1):S3-42.
8. Pollard WE. Use of consumer panel survey data for public health communication planning: an evaluation of survey results. American Statistical Association 2002 proceedings, Section on Health Policy Statistics, New York, NY, 2002:2120-4.
9. Prislun R, Dyer JA, Blakely CH, Johnson CD. Immunization status and sociodemographic characteristics: the mediating role of beliefs, attitudes, and perceived control. *Am J Public Health* 1998;88:1821-6.
10. Gust DA, Strine TW, Maurice E, et al. Underimmunization among children: effects of vaccine safety concerns on immunization status. *Pediatrics* 2004;114:e16-e229.
11. Manjunath U, Pareek RP. Maternal knowledge and perceptions about the Routine Immunization Programme—a study in a semiurban area in Rajasthan. *Indian J Med Sci* 2003;57:158-63.
12. Covello VT, Peters RC, Wojtecki JG, Hyde RC. Risk communication, the West Nile virus epidemic, and bioterrorism: responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *J Urban Health* 2001;78:382-91.
13. Gellin BG, Maibach EW, Marcuse EK. Do parents understand immunizations? A national telephone survey. *Pediatrics* 2000;106:1097-102.

14. Meszaros JR, Asch DA, Baron J, Hershey JC, Kunreuther H, Schwartz-Buzaglo J. Cognitive processes and the decisions of some parents to forego pertussis vaccination for their children. *J Clin Epidemiol* 1996;49:697-703.
15. Gilligan T, Raffin TA. Physician virtues and communicating with patients. *New Horizons* 1997;5:6-14.
16. Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. *JAMA* 1997;277:553-9.
17. LaBaron CW, Rodewald L, Humiston, S. How much time is spent on well-child care and vaccinations? *Arch Pediatr Adolesc Med* 1999;153:1154-9.
18. Davis TC, Fredrickson DD, Bocchini C, et al. Improving vaccine risk/benefit communication with an immunization education package: a pilot study. *Ambul Pediatr* 2002;2:193-200.
19. Smith PJ, Chu SY, Barker LE. Children who have received no vaccines: who are they and where do they live? *Pediatrics* 2004;114:187-95.
20. Clayton EW, Hickson GB, Miller CS. Parents' responses to vaccine information pamphlets. *Pediatrics* 1994;93:369-72.