



## Association of vaccine-related attitudes and beliefs between parents and health care providers



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### ABSTRACT

**Objectives:** Health care providers influence parental vaccination decisions. Over 90% of parents report receiving vaccine information from their child's health care provider. The majority of parents of vaccinated children and children exempt from school immunization requirements report their child's primary provider is a good source for vaccine information. The role of health care providers in influencing parents who refuse vaccines has not been fully explored. The objective of the study was to determine the association between vaccine-related attitudes and beliefs of health care providers and parents.

**Methods:** We surveyed parents and primary care providers of vaccinated and unvaccinated school age children in four states in 2002–2003 and 2005. We measured key immunization beliefs including perceived risks and benefits of vaccination. Odds ratios for associations between parental and provider responses were calculated using logistic regression.

**Results:** Surveys were completed by 1367 parents (56.1% response rate) and 551 providers (84.3% response rate). Parents with high confidence in vaccine safety were more likely to have providers with similar beliefs, however viewpoints regarding disease susceptibility and severity and vaccine efficacy were not associated. Parents whose providers believed that children get more immunizations than are good for them had 4.6 higher odds of holding that same belief compared to parents whose providers did not have that belief.

**Conclusions:** The beliefs of children's health care providers and parents, including those regarding vaccine safety, are similar. Provider beliefs may contribute to parental decisions to accept, delay or forgo vaccinations. Parents may selectively choose providers who have similar beliefs to their own.

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### 1. Introduction

Vaccines were one of the greatest public health achievements of the 20th century, dramatically reducing morbidity and mortality from many infectious diseases [1]. As a result of this success, the majority of health care providers and parents have no or minimal experience with many vaccine-preventable diseases. Meanwhile, concern over potential adverse reactions from immunizations has contributed to an increase in parents seeking non-medical exemptions from school immunization requirements for their children [2,3]. Pockets of unimmunized and underimmunized children have

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been associated with disease outbreaks in recent years [4–9]. Freed et al. surveyed parents on their vaccine-related attitudes and beliefs and found that over 11% of parents refused at least one vaccine for their child and half were concerned about serious adverse effects of vaccines [10].

This study builds on previously published research, which demonstrated that parents of children with an exemption to school immunization requirements and parents of non-exempt children have different vaccine knowledge, attitudes, and beliefs [2]. Parents of fully vaccinated children were more likely to report that children benefit moderately or a great deal from vaccination than parents of exempt children, and held higher overall perceptions of disease severity, disease susceptibility, vaccine efficacy, and vaccine safety. Vaccine safety was the most common factor in parents' self-reported reasons for not vaccinating their child. The majority of all parents trusted their health care provider and over 90% identified their health care provider as the most frequently used source for vaccine information.

A follow-up survey was conducted to evaluate the vaccine related attitudes and beliefs of providers of these exempt and non-exempt children [11]. While providers of exempt and non-exempt children shared mostly similar beliefs, providers of children with exemptions were more likely to report concerns about vaccine safety and decreased perceived benefit of immunization compared to providers of vaccinated children. The majority of both exempt and non-exempt parents trusted their child's health care provider, used them for information, and thought that they are a good source for vaccine-related information. Other literature has shown that providers are one of the best sources of information for parents [12–14]. The health care provider could be an important influence on parents' beliefs about the benefit and safety of vaccines [14]. This study aims to investigate the association between parental and provider vaccine attitudes and beliefs.

## 2. Methods

### 2.1. Design

This study investigated associations between parental and provider vaccine-related attitudes and beliefs using the same parents surveyed in the study noted above [2,11]. Parents of 815 elementary school children who were exempt from at least one school immunization requirement and 1630 randomly selected, fully vaccinated children in Colorado, Massachusetts, Missouri, and Washington were mailed a survey between 2002 and 2003 that examined factors associated with parental vaccination refusal [2]. Parents were asked to identify their child's primary health care provider(s) when the child was 2 and 5–6 years of age as these are two age windows typically marked by increased vaccination of children (age 2) and when school entry requirements apply (ages 5–6). Parents identified 806 unique providers. Surveys were mailed in 2005 to 712 of these parent-identified providers for whom contact information could be found [11]. One hundred fifty-eight parents identified multiple providers and 159 providers were identified by multiple parents. The data analyzed here are linked responses from parents and providers to examine their associations. The Committee on Human Research at Johns Hopkins University approved this study.

### 2.2. Survey

Both parents and providers responded to questions on a 5-point Likert scale concerning their attitudes and beliefs regarding immunization. For each of the vaccine-preventable diseases studied, parents and providers were asked questions about their beliefs

on disease susceptibility, disease severity, vaccine safety, and vaccine efficacy. These four constructs are predictors of vaccination according to the Health Belief Model [15,16]. The provider questions included “How likely do you think an unimmunized child in the United States is to get the following diseases during the next ten years?”, “If an 8-year old got these diseases, how likely is the child to be seriously ill?”, “How well do you think each of these vaccines prevents disease?”, and “How safe do you think these vaccines are?”. Vaccines and diseases studied in both parents and providers included diphtheria, pertussis, tetanus, measles, mumps, rubella, polio, *Haemophilus influenzae type b (Hib)*, varicella, and hepatitis B. Providers, but not parents, were questioned about invasive pneumococcal and influenza due to the addition of these diseases and vaccines on only the provider survey. Responses were averaged across vaccine or disease to create four overall constructs (disease susceptibility, disease severity, vaccine efficacy, and vaccine safety) on a 5-point Likert-scale.

Other questions examined key immunization beliefs, such as “vaccines strengthen the immune system.” Providers were asked to specify: their most advanced clinical degree, their type of clinical practice (pediatric, family medicine, internal medicine), and practice setting (urban, rural, suburban).

### 2.3. Data analysis

Constructs, previously described, were created for beliefs on disease susceptibility, disease severity, vaccine safety, and vaccine efficacy [2,11,17]. Responses for each set of questions were averaged across diseases and vaccines and the resulting score was dichotomized by 1 to <4 vs.  $\geq 4$ , consistent with previous studies [2,11,17]. Responses for “who benefits when a child is fully vaccinated” and “key immunization beliefs” were dichotomized by 1–3 (strongly disagree, disagree, and neither agree nor disagree) vs. 4 and 5 (agree and strongly agree). Responses of “don't know” were counted as missing data and excluded from the analysis.

Associations between provider and parental responses were explored using logistic regression and estimated using Generalized Estimating Equations (GEE) to control for clustering of parents within providers [18]. For this analysis, parental responses were set as the dependent variables and provider responses as the independent variables to test for association between provider and parental responses. Results are interpreted as the odds that a parent and a provider share a particular belief compared to the odds that a provider and parent do not share that belief. Secondary analyses tested differences in provider characteristics by a parent's dichotomized belief in vaccine safety. Results were considered to be statistically significant if the *P*-values were  $\leq 0.05$ . All analyses were conducted using the Stata v.10.1 (Stata Corp, College Station, TX).

## 3. Results

For the parental survey, 1367 of 2435 surveys were completed for a response rate of 56.1% (48.6% rate for parents of exempt children vs. 59.9% rate for parents of non-exempt children). Of the 712 provider surveys sent, 44 did not reach the provider due to death, retirement, or a closed practice and 14 were sent to a non-health care provider. Of the remaining 654 providers, 103 declined to participate. Surveys were returned by 551 providers (84.3% response rate). The dataset consists of 705 unique parents linked to 551 unique providers.

Parental and provider perceived benefits to a fully vaccinated child were highly associated (Table 1). For example, parents had 45 times higher odds of agreeing that the community benefits from having children fully vaccinated if their provider agreed, compared

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