



## Vaccine hesitancy Causes, consequences, and a call to action



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### A B S T R A C T

Vaccine hesitancy reflects concerns about the decision to vaccinate oneself or one's children. There is a broad range of factors contributing to vaccine hesitancy, including the compulsory nature of vaccines, their coincidental temporal relationships to adverse health outcomes, unfamiliarity with vaccine-preventable diseases, and lack of trust in corporations and public health agencies. Although vaccination is a norm in the U.S. and the majority of parents vaccinate their children, many do so amid concerns. The proportion of parents claiming non-medical exemptions to school immunization requirements has been increasing over the past decade. Vaccine refusal has been associated with outbreaks of invasive *Haemophilus influenzae* type b disease, varicella, pneumococcal disease, measles, and pertussis, resulting in the unnecessary suffering of young children and waste of limited public health resources. Vaccine hesitancy is an extremely important issue that needs to be addressed because effective control of vaccine-preventable diseases generally requires indefinite maintenance of extremely high rates of timely vaccination. The multifactorial and complex causes of vaccine hesitancy require a broad range of approaches on the individual, provider, health system, and national levels. These include standardized measurement tools to quantify and locate clustering of vaccine hesitancy and better understand issues of trust; rapid, independent, and transparent review of an enhanced and appropriately funded vaccine safety system; adequate reimbursement for vaccine risk communication in doctors' offices; and individually tailored messages for parents who have vaccine concerns, especially first-time pregnant women. The potential of vaccines to prevent illness and save lives has never been greater. Yet, that potential is directly dependent on parental acceptance of vaccines, which requires confidence in vaccines, healthcare providers who recommend and administer vaccines, and the systems to make sure vaccines are safe.

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### 1. Introduction

Vaccine hesitancy reflects concerns about the decision to vaccinate oneself or one's children. Concerns that contribute to hesitancy may be based upon the perceived need for vaccination as well as the perceived risks and benefits of vaccination. A recent report from the Strategic Advisory Group of Experts (SAGE) on Immunization of the WHO defines vaccine hesitancy as “delay in acceptance or refusal of vaccines despite availability of vaccinations services. Vaccine hesitancy is complex and context specific, varying across time, place, and vaccines. It is influenced by factors such as complacency, convenience, and confidence” [1]. Although this definition only includes people who delay or refuse vaccines, some individuals may have

concerns about the decision to vaccinate while still fully vaccinating themselves and/or their children on time according to the recommended schedule or standard of care. For example, a parent may be concerned about adverse events associated with the vaccine yet recognize the value of vaccinating to protect their children from infectious diseases. This parent may vaccinate their child on time yet still have concerns, so this decision was made with hesitancy.

Hesitant individuals include those who refuse some or all vaccines, delay some vaccines perhaps according to an “alternative schedule,” or accept all vaccines but remain concerned. Hesitancy is on a continuum and can be measured by assessing attitudes and beliefs toward infectious diseases and the vaccines used to prevent them. Although attitudes and beliefs that measure concerns are associated with vaccine acceptance, delay, and refusal, they do not perfectly predict vaccination decisions, as other factors such as ease of access, competing priorities, social norms, and compliance with provider recommendations and vaccination requirements for school or work can also be influential. The immediate epidemiologic risks of hesitancy are a result of vaccine delay and refusal;

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however, parents who are vaccinating on time despite concerns may be particularly vulnerable to misinformation, with the potential of being swayed to delay or refuse future vaccines.

In this article, we review the causes, prevalence, reasons for, impact, and relevance of vaccine hesitancy. We also include a call to action to address vaccine hesitancy and improve vaccine confidence. Although our focus is on pediatric vaccines in the U.S., many of the issues discussed below also have important implications internationally.

## 2. Causes of vaccine hesitancy

There is a broad range of factors contributing to vaccine concerns among parents. Vaccines have been victims of their own success. Because vaccines have effectively controlled many once-common childhood infectious diseases, parents of young children are no longer familiar with these diseases. Instead, fear has shifted to alleged vaccine reactions that typically include childhood health problems that occur around the time that many vaccines are given. Thus, a coincidental temporal relationship exists between when vaccines are administered and when an adverse health outcome of concern is identified. Parents are susceptible to the logical fallacy of “post hoc ergo propter hoc” or “after this, therefore because of this.” Autism is a very visible example of this phenomenon, but it is also seen with diabetes, allergies, and autoimmune diseases. Although the etiology of autism is poorly understood, it is thought to involve genetic susceptibility and an undefined environmental exposure. Parents see examples of infants who had autism diagnosed after vaccine administration. Autism diagnoses have increased in prevalence, and parents notice a population-level relationship between this increase in prevalence coinciding with an increase in the number of vaccines given, as the number of vaccines recommended before age 2 years has increased from 15 protecting against nine diseases in 1995 to 24 protecting against 14 diseases in 2015. Taken together, these factors make vaccines a natural suspect for the cause of many infant and childhood diseases.

Heuristics that impact perceptions of risk also add to parental vaccine concerns. As depicted in Table 1, the compulsory nature of vaccines for children, the inability of parents to control the risks of adverse reactions, the manmade nature of vaccines, and the unpredictability of adverse reactions, which are dreaded and seemingly exotic, result in parents perceiving the risks of vaccines to be greater than they actually are. A preference for errors of omission over errors of commission can also be a factor, that is, a preference for adverse health outcomes due to disease after not vaccinating rather than due to vaccinating [3,4]. Moreover, parents can become anguished when witnessing their infants receiving multiple injections, especially those with an aversion to needles.

A confluence of other contemporary issues further contributes to parental concerns. Trust in institutions is low, whether in the

corporations that produce vaccines or the public health agencies that purchase and promote them [5]. Taken together, the public has long expressed fears of the pharmaceutical–industrial complex. There is a growing parental and public interest in natural products, leading some to call for efforts to “green our vaccines” [6]. The medical model is changing, whereby parents are often interested in shared decision making with pediatricians for child health rather than the more traditional paternalistic medical model whereby pediatricians tell parents what to do in the best interest of their child. The growth of the Internet has allowed allegations of vaccine injury to rapidly spread around the world [7].

## 3. The prevalence of vaccine concerns

There is no standardized tool to measure vaccine hesitancy that has been widely used; however, Opel et al. [8] recently developed and tested the validity and reliability of such a tool, and WHO’s SAGE working group recently recommended a series of survey questions in order to improve the measurement of hesitancy [1]. Although these survey questions could prove useful in developing a uniform measure for vaccine hesitancy, they need to be field tested and validated. Further limiting our ability to assess the level of vaccine concerns in the U.S. is a lack of standardized methods allowing for comparisons of changes over time.

There have been a number of cross-sectional surveys over the past two decades that have measured vaccine concerns using a variety of sampling methods. A nationally representative telephone survey of parents of children aged 6 years or younger conducted in 1999 found that although a majority of parents (87%) considered immunization extremely important, a substantial minority believed that their child’s immune system could be weakened by too many vaccines (25%) or that children get more immunizations than are good for them (23%) [9]. The most recent published national data on vaccine concerns from the 2010 HealthStyles Panel of parents with children aged 1–6 years found that 77% of parents reported a vaccine concern [10]. Many of these concerns (not mutually exclusive) were relatively minor, such as pain related to receiving shots (38%) and the possibility of fevers (32%). However, many parents had more-serious concerns such as the number of vaccines given at one doctor’s visit (36%) or during the first 2 years of life (34%); the possibility that vaccines may cause learning disabilities such as autism (30%); that vaccine ingredients may be unsafe (26%); and that vaccines are not tested enough for safety (17%). Although the majority of these parents report vaccinating with the recommended schedule (83%) or planning on doing so (11%), 5% reported selectively vaccinating and 2% reported forgoing vaccination for their children altogether. A more nuanced view of parental vaccine attitudes indicates different groups of parents such as immunization advocates (actively pursue vaccines); go along to get along parents (follow the advice

**Table 1**  
Risks perception and the impact on vaccine hesitance.

Less risk		More risk	Impact on vaccine hesitance
Voluntary	versus	Involuntary	Vaccines are mandatory for school entrance
Individual control	versus	System control	Risk of adverse reactions are not in control of parent
Omission	versus	Commission	Preference for adverse health outcomes due to disease (errors of omission: not vaccinating) than vaccinating (error of commission: vaccinating)
Natural	versus	Manmade	Disease risks are “natural,” whereas vaccine risks are “manmade”
Predictable	versus	Unpredictable	Difficult to predict risks of very rare but serious adverse reactions
Not dreaded	versus	Dreaded	Once-common diseases like varicella are not dreaded whereas very rare but serious adverse reactions are dreaded
Familiar	versus	Exotic	Parents are more familiar with common health problems that are alleged (without scientific support) to be caused by vaccines, like autism, than diseases they are not familiar with, such as polio, measles, and diphtheria

Note: Adapted with permission from Taylor and Francis Group LLC Books [2].

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