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A clear plastic syringe with a needle and a cap lying on a dark, textured surface. The syringe has markings on the barrel and a plunger. The needle is pointed upwards and to the left. The cap is lying next to the syringe.

# An Analysis of Vaccine Hesitancy in the United States: Contributing Factors and Healthcare Response

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## BIOGRAPHY

Hannah Kent is a fourth year undergraduate in cognitive science at Case Western Reserve University and will be pursuing a Master of Arts in Bioethics. Hannah hopes to go on to complete a doctorate in Ethics and work with institutions and organizations on real-world dilemmas concerning health and public policy.

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## Introduction

Before the advent of vaccines, diseases such as diphtheria, pertussis, measles, mumps, rubella, and chickenpox were extremely prevalent worldwide and impacted the health of many, including the vulnerable populations of children and the elderly. Now, vaccines provide a safe and effective method of protecting the population from a number of highly infectious diseases, making them uncommon in developed nations such as the United States (Chen et al., 1994). However, recent levels of vaccination have dropped, due to vaccine hesitancy, which is described as real or perceived concerns of vaccine-adverse events among parents in the developed world, making them unwilling to vaccinate their children (Sadaf, Richards, Glanz, Salmon, & Omer, 2013). Ironically, due to their widespread success, vaccines may lead parents and caregivers to underestimate the severity of the diseases vaccines prevent. Additionally, modern pathways of information dissemination can portray a skewed picture of rare cases where vaccines show adverse effects, as well as inaccurate information about the contents and effects of vaccines in general (Connolly & Reb, 2011; Sadaf et al., 2013; Brown et al., 2010; Edwards, Hackell, Committee on Infectious Diseases, & Committee on Practice and Ambulatory Medicine, 2016). These, and other aspects, influence public and individual understanding and attitudes toward vaccines, leading some parents to refuse vaccinating their children (Hendrix, Strum, Zimet, & Melsin, 2015). While a majority of caregivers do choose to vaccinate, the small subset of those who do not can majorly affect the health of the general population by reducing protective factors of herd immunity (Connolly & Reb, 2011). This work explores the history of vaccine refusal, important factors that contribute to vaccine hesitancy and refusal, reasons why parents are hesitant, the factors that influence their behavior, the response of physicians and healthcare professionals, the role of public

health and ethics, and the ways in which anthropological contributions can affect the discussion by making recommendations for future research and tangible solutions.

*“...real or perceived concerns of vaccine-adverse events among parents in the developed world...”*

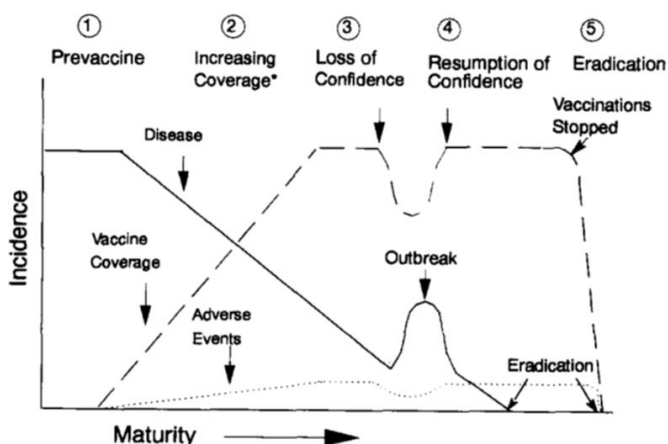
### Analysis of disease incidence and vaccine uptake in the lifetime of a vaccine

Chen et al. (1994) analyzes a timeline of events that outline disease incidence, vaccine uptake, adverse events, and the way the population perceives a vaccine throughout the stages of its introduction (Figure 1).

- **Stage 1:** No vaccine exist and disease incidence is high.
- **Stage 2:** Vaccine is introduced and its implementation increases. As a result, incidence and prevalence of the disease decreases.
- **Stage 3:** Marked by a reduction of confidence in vaccines. The probability that an adverse event is associated with vaccines in a causal rather than a temporal relation increases, even if the association lacks scientific evidence (Chen et al., 1994).
- **Stage 4:** Salience of the importance of vaccines and confidence in vaccines increases.
- **Stage 5:** Eradication of the disease since there are no available hosts and there is no more risk of contracting the disease.

Reaching the fifth and final stage indicates that the population no longer needs to be vaccinated as the disease is no longer a threat. However, in most cases, the disease will not be eradicated from the world, and vaccination will need to continue indefinitely. As the authors note, public acceptance of immunization is at risk when adverse events

are linked to vaccines, either by coincidence or as a legitimate negative consequence of immunization (Chen et al., 1994). This framework and understanding of the public opinion and its interaction with the public health intervention of vaccines is crucial in analyzing the anti-vaccine movement (Chen et al., 1994).



**Figure 1.** Stages 1-5 outline the relative incidence of disease associated with the maturity or life of the vaccine. Peaks and valleys of disease incidence are driven by factors such as public opinion and favor of the vaccine as well as recent outbreaks (Chen et al 1996).

One important caveat to note is that there is a difference between attitudes and behaviors regarding vaccinations (Hendrix et al., 2015). One may vaccinate and still be hesitant about the effects and efficacy of the vaccine, and one may have positive attitudes about vaccines and yet not vaccinate due to lack of access to care; neither situation is driven by the caretaker's beliefs. This is important when considering that there is a spectrum of beliefs on vaccination. In fact, many parents are not entirely polarized to one end or the other; the decision to vaccinate is an involving process and has many factors that may interact with one another, so solely analyzing the resulting action is only a partial picture of the vaccine controversy (Brown et al., 2010). Even those who do choose to vaccinate and have generally positive attitudes on vaccination may still have reservations.

*“...the decision to vaccinate is an involving process and has many factors that may interact with one another...”*

### The decision-making process

As with many complex medical decisions, vaccination can be a difficult and involving process. Brunson (2013) studied the behavioral patterns of parents in the process of making vaccination decisions and found that there are different stages of decision-making, as well as different tactics for addressing each state. Firstly, in the awareness state, the actual decision-making begins, and parents start to think about vaccination. The second state is assessing, when parents analyze vaccine-related issues. This state contains the most variation in decision-making tactics; parents break out into three ‘general assessment groups’ including acceptors, who generally accept social norms but tend to be uninformed due to lack of exploration; reliers, who depend on their social networks for information and direction but tend to be uncritical of the received advice; and searchers, who are aware of social norms but do their own research and continually assess different perspectives while being critical of the sources (Brunson, 2013). Assessment may occur on a continuum as the decision-making process can lead to accepting vaccinations or rejecting them as well as delaying the vaccine schedule. Each decision process results in one of these three options for every available vaccine. At the conclusion of the decision-making process, there are still options for future action: the parent can either lapse into stasis where the parent's decision remains the same; reassess their decision, where the parent's decision can transition from not vaccinating to vaccinating or vice versa; or continually assessing the situation (Brunson, 2013). Now that the decision-making process has been outlined, it is important to explore

what factors affect these decisions and understandings in the first place.

### Why parents hesitate or refuse

Parents act on the basis of their perceived best interests for their children. However, when acting on false or skewed information, their perception of best interest may be unrealistic. Some parents are concerned about the pain of immunization, which can easily be addressed with certain techniques and distraction tools, while others are unsure of the effects vaccines are speculated to be associated with, a pervasive idea that cannot necessarily be eradicated (Edwards et al., 2016). Specific concerns also differ by vaccine as the HPV vaccine was thought to trigger early sexual activity, while the MMR vaccine was feared to be linked with autism and developmental disorders (Edwards et al., 2016). While there are some obvious contributions to the anti-vaccine movement, such as the Wakefield et al. (1998) study, other underlying factors are important to consider and serve to portray a more informed account of the reasons for vaccine hesitancy. Of these include structural and political factors, the role of popular culture, and the crucial interaction of web-based resources on vaccine decision-making.

### Recent outbreaks due to low vaccine uptake

Recent outbreaks include measles, mumps, whooping cough, and chickenpox, to name a few. In the case of measles, which has been vaccinated against since 1963, there were 668 cases across 27 states in 2014; this is an extreme amount considering that measles were classified as eradicated from the United States since 2000 (Medscape, 2015a). In January of 2015, there was an outbreak of measles in California, a state with both religious and ideological exemptions for vaccination, wherein about 3.1% of kindergarteners had a non-medical exemption. The vaccine for whooping cough has been available since the 1940s, and yet annual incidence has actually

increased since the 1980s with outbreaks every three to five years (Medscape, 2015a; 2015b). Traditionally, vaccines were mandated requirements for school and childcare centers (Edwards et al., 2016). However, with the rise of the anti-vaccination movement, there have been more policies that allow non-medical exemptions, including religious and ideological objections.

*“...with the rise of the anti-vaccination movement, there have been more policies that allow non-medical exemptions...”*

Reasons for low vaccine uptake include but are not limited to: general side effect and safety concerns, poor perception of vaccine effectiveness and importance, false belief that vaccines cause autism, personal and others' experiences of vaccines and vaccine adverse events, preference for and belief in safety of single vaccines, false belief in the danger of immune overload, thinking about vaccine in advance of it being due, and a general belief that children receive too many shots (Brown et al., 2010). In many cases, these factors result in nonmedical exemptions which are highly utilized. Rates for nonmedical exemption in states that allowed philosophical exemptions were 2.5 times higher than states that only allowed religious exemptions (Omer, Richards, Ward, & Bednarczyk, 2012). The main themes of the specific philosophical exemptions include vaccine safety, lack of necessity of vaccines, and freedom of choice (Edwards et al., 2016).

### Structural and political factors in vaccine hesitancy: advocates of bad science

Some structural factors include the policies surrounding vaccination and action taken by public health organizations in response to the rise in vaccine hesitancy. Non-medical exemptions reinforce the belief that personal



choice and autonomy in medical decision-making is more important than regulated public health policy, especially when those exemptions are due to ideological stances that are based in false or skewed information. As one would expect, increasing the options for obtaining nonmedical exemptions increases the likelihood of parents obtaining exemptions for their children (Sadaf et al., 2013). Additionally, some actions can imply the legitimacy of certain claims; after Brian Deer reported that thimerosal in vaccines contributed to autism spectrum disorder, a claim since proven false, there was a significant increase in vaccine hesitancy and refusal (Rao & Andrade, 2011). The uproar concluded in the removal of thimerosal from all but the influenza vaccine (CDC, 2015). This action only validated the disproven science and detracted from the public's views of the safety of vaccines.

Political factors include the involvement of many prominent political figures. In March of 2014, then-businessman Donald Trump posted on Twitter, "Healthy young child goes to doctor, gets pumped with massive shot of many vaccines, doesn't feel good and changes - AUTISM. Many such cases" (Trump, 2014). Dr. Ben Carson, a pediatric neurosurgeon that ran for the Republican nomination for president in 2016, made his stance on the issue unclear when asked to refute Mr. Trump, vaguely referring to science and evading a solid stance in either direction (Miller, 2015). This public discussion contributed only conflicting information, often politicizing the issue and eliciting emotional responses without addressing real concerns with valid science.

The most prominent study indicating that vaccines could have extremely adverse effects was the 1998 Wakefield study. *Lancet* published the study that suggested that the MMR vaccine had a causal role in behavioral regression and a pervasive developmental disorder, ultimately suggesting that the

vaccine predisposed children to autism spectrum disorder (Wakefield et al., 1998; Rao & Andrade, 2011). The paper had an unusually small sample size, and was eventually found to have been unethically performed; the General Medical Council noted that Wakefield acted "dishonestly and irresponsibly" and that the methods of the study were done with "callous disregard for the distress and pain" the children suffered from procedures that were "against their best clinical interest" (Triggle, 2010). The study was initially retracted by 10 of the 12 original authors, and in February of 2010 the journal retracted the paper due to inaccurate science (Rao & Andrade, 2011). Eventually, Wakefield was found guilty of ethical violations, scientific misrepresentation, and deliberate fraud for money, as it was discovered that Andrew Wakefield had been funded by lawyers engaged in lawsuits against companies that produce vaccines (Rao & Andrade 2011). This was an incredibly influential study and vaccination rates dropped even after its retraction. Many studies since have disproven the proposed causal link, but the Wakefield study is still cited as a main argument against vaccines.

### **The role of popular culture in vaccine hesitancy**

Popular culture is an inescapable aspect in the interplay between parental decision making and vaccination. Famous opponents often take to the media in spreading their viewpoints, while scientific and research-based sources are often centralized in scholarly journals or federal websites. Jenny McCarthy is perhaps the biggest name in the anti-vaccination movement, although she prefers the term 'pro-safe vaccine.' She expressed in an interview that she suspected "[the] compilation of so many shots to a kid that obviously [has] some autoimmune disorders" contributed to the development of her son's autism diagnosis (Frontline, 2010). The *New Yorker* took offense to the ABC show, *The View*, for hiring McCarthy as a host,

accusing the network of giving her a “regular platform on which she can peddle denialism and fear to the parents of young children who may have legitimate questions about vaccine safety” (Specter, 2013). Alternatively, Mark Zuckerberg, founder of Facebook, posted to social media that he was vaccinating his daughter in a subtle attempt to promote vaccination (Alter, 2016). People with a platform can either affirm or denounce the anti-vaccination movement and the claims of its spokespeople, portraying a public debate as relatively two-sided, while the scientific argument is in favor of vaccination.

### The role of web 2.0 in vaccine hesitancy

McCarthy also expressed the use of the internet in assessing her son’s circumstance:

Google is one of the most incredible breakthroughs that we have today. Yes, it can scare a lot of patients, thinking we’re all dying because we look up something on Google. But there’s also a lot of anecdotal information from parents, firsthand accounts of what they did for their own child (Frontline, 2010).

In fact, access to first-hand accounts is an extremely important factor when making decisions, as personal anecdotes from other concerned parents are more powerful persuaders than statistics and symptoms of diseases prevented by vaccines. Online, anti-vaccination videos have a significantly higher prevalence of personal stories, including video montages of normal children apparently regressing into autism after vaccination, interviews of people who themselves claimed to have suffered following vaccination, and parents of affected children coming forward with their experiences (Venkatraman, Garg, & Kumar, 2015). In an effort to utilize the same emotional appeal, pro-vaccination

and anti-anti-vaccination websites such as JennyMcCarthyBodyCount.com, use scare tactics to portray how many preventable deaths have resulted from the anti-vaccination movement (Bartholomaus, 2015). Both viewpoints utilize modern technology and the ability to quickly share information via the internet.

The internet has played a major role in information dissemination and affects the vaccine discussion more than most other factors. Firstly, the internet enables the shifting emphasis of decision-making authority, as the physician’s credentials and reliability are undermined by the widespread availability of fast information (Venkatraman, Garg, & Kumar, 2015). One study analyzed the interaction of the internet, specifically Web 2.0, in vaccine views. Web 2.0 refers to websites that feature a lot of user-generated content, even from non-credentialed sources such as YouTube and Wikipedia, and is highly connected with the idea of freedom of speech (Venkatraman, Garg, & Kumar, 2015). In an analysis of four web sources, YouTube, Google, Wikipedia, and PubMed, authors found that the more freedom of speech allotted in the source, defined by the likelihood that posts would be kept on the site and available to be seen, the more hits correlated with anti-vaccine views specifically with regard to the vaccine-autism controversy (Venkatraman, Garg, & Kumar, 2015). In some ways, the increased freedom is beneficial and makes health communication more accessible, but the authors also noted that the unchecked nature of web-based sources “diluted the voice of science in the public arena” (Venkatraman, Garg, & Kumar, 2015). This is increasingly important as refusing vaccination is often due to beliefs

*“...the internet enables the shifting emphasis of decision-making authority...”*

formed from false information or lack of understanding of vaccines (Hendrix et al., 2015). Their findings suggested that editorial control could contain and restrict inaccurate and alarmist information, extending to a media that is required to pass editorial review (Venkatraman, Garg, & Kumar, 2015).

### **How Physicians Respond: Ethics**

Clinical and professional ethics such as the ideals of distributive justice, autonomy, beneficence, and nonmaleficence, are involved in responding to families that refuse to vaccinate (Hendrix et al., 2015). There is a constant conflict between the ability of the parents to deny care, and the responsibility of the physician to enforce actions that achieve the best health outcomes for their patient. Distributive justice weighs the benefits and burdens of those involved in the situation. While it is beneficial to respect the ideals and values of the parents, it is generally more beneficial to consider the health of the population in terms of herd immunity. Herd immunity is the reduction of disease carriers, which results in the overall protection of the community, including vulnerable populations who may not be able to protect themselves; when herd immunity is not compromised, benefits of protection extend to those who cannot be vaccinated, are immunocompromised, are undergoing chemotherapy, or have incomplete vaccination status. There is a very real danger for highly transmittable diseases like measles, which needs a 96-99% vaccination rate to achieve maximum herd immunity, undermining the argument that a small portion of unvaccinated children are harmless to public health (Hendrix et al., 2015).

Maintaining the effect for the common good requires that every eligible community member get vaccinated and mandates can be effective in this goal (Hendrix et al., 2015; Sadaf et al., 2013). Contrasting distributive justice is the individual's right to autonomy. Individuals

are capable of making their own decisions, and in the case of dependents, parents and guardians retain the ability to make decisions for those that they are responsible for. If the guardian so chooses, they are able to deny care for the dependent, just as they are able to accept treatments. Mandatory vaccine laws would infringe upon this right. Lastly, the medical principles of beneficence and nonmaleficence, two fundamental values of the health care profession, are also at play. Physicians must weigh the risks of allowing individual patients and families to go unvaccinated for that particular family and for the population.

Care providers should be available and open to discussing specific parental questions about vaccines, including the production, composition, and effects. However, addressing families' concerns can be an involving and time consuming process that many physicians may not be able to afford. Two ways to navigate this issue are for physicians to schedule longer appointments to individually address parents' concerns, or omit the discussion and concede to the parent's preference to defer, delay, or skip vaccines in the recommended schedule (Edwards et al., 2016). Consequences of these actions include suboptimal care from a delayed vaccine schedule, the need for multiple care visits which can be difficult for some families, and a compromised herd immunity. The decision lies with the physician.

Some physicians address these dilemmas by dismissing ideologically based vaccine-refusing families from their practice. While dismissal is technically legal, regulations vary from state to state and often require official notification, information for finding a new physician, and obligatory continued care for a reasonable period. This decision is not one to be made lightly, and some practice settings may limit the possibility of dismissal including in areas where there is limited access to care or insurance restrictions (Edwards et al.,



2016). A compounding factor is the increased density of unvaccinated individuals into fewer waiting rooms, exacerbating their risk for contracting vaccine-preventable diseases (Costill, 2015).

Additionally, the physician is often the only medical professional that parents can consult in their decision-making process. Refusing to

*“While it is beneficial to respect the ideals and values of the parents, it is generally more beneficial to consider the health of the population in terms of herd immunity.”*

see the family not only damages the physician-patient relationship, but also restricts the availability of scientifically sound information (Edwards et al., 2016).

Physicians who do not dismiss vaccine-hesitant families have a number of options to navigate the parents’ understanding of vaccinations and subsequently their ultimate decisions. Physicians should continually remind themselves that most vaccine-hesitant parents are not opposed to vaccinating their children, but do need reassurance and guidance about issues surrounding vaccination such as the complex schedule and the number of vaccines required. Physicians may take a presumptive strategy, where they assume compliance to vaccination and act as though the decision has already been made to vaccinate, rather than opening discussion; research has shown that presenting vaccination as a required treatment encourages the majority of parents to vaccinate their children (Edwards et al., 2016). The presumptive approach may lead to less resistance among parents as they no longer have to undergo the decision-making

process. The physician may also utilize the participatory or the guiding approach wherein, respectively, the physician either solicits the family’s input on whether or not to vaccinate or addresses the parent’s specific concerns by assuming an active role in the decision to vaccinate (Hendrix et al., 2015).

### **Input from the American Academy of Pediatrics**

The American Academy of Pediatrics (AAP) has a stance on the treatment of anti-vaccine families. Initially, they discouraged refusing care, instead insisting on dialogue between physicians and families to reach a middle ground. Every encounter with vaccine-hesitant parents is an opportunity to express the importance of vaccination, potentially determining the result of their vaccine decisions (Hendrix et al., 2015). As Edwards and Hackell (2016) note, “the single most important factor in getting parents to accept vaccines remains the one-on-one contact with an informed, caring, and concerned pediatrician” (p. 7). Personal anecdotes of vaccine success are crucial, and physicians can share their own experiences with families regarding the safety, importance, and efficacy

*“...the most vaccine-hesitant parents are not opposed to vaccinating their children, but do need reassurance and guidance...”*

of vaccines. However, recently, the AAP has altered their stance to include an acceptance of the refusal of patients as last resort. They continue to recommend initiating dialogue but concede that individual physicians are the most appropriate actors to ultimately decide for their practice. Furthermore, the AAP strongly recommends against deviating from the current vaccine schedule, but situational deviation is acceptable if it is the only route

to immunization after all other reasonable attempts to convince hesitant parents (Edwards et al., 2016). Other contributions the AAP notes include refraining from vaccine deferral and eliminating all non-medical exemptions for vaccines—a position concurrent with the American Medical Association and the Infectious Diseases Society of America (Edwards et al., 2016).

### **Anthropological approach to monitoring policies and effectiveness**

Anthropology can play an important role in navigating the anti-vaccine movement in public health and public policy. Policymakers should analyze non-medical exemption policies and consider how they would affect families, practitioners, and communities if there were to be a mandate for vaccines. Considering that there are different requirements due to state-based regulations,

*“...the AAP strongly recommends against deviating from the current vaccine schedule, but situational deviation is acceptable...”*

research could be conducted on the influences that different policies have on the population. Given that 47 of the 50 states have personal-belief exemptions, there may be insights that anthropological viewpoints can supply in the effort to vaccinate (Hendrix et al., 2015; Haelle, 2016). California has removed the option of ideological exemptions, and the ramifications of this amendment should be carefully examined. Research must target how parents assess vaccination, their own knowledge, attitudes, beliefs, and levels of hesitancy (Brunson, 2013).

### **Re-evaluate how to address hesitancy and analyze proposed solutions**

Research is unanimous in the view that a one-size-fits-all approach to vaccine interventions is inappropriate (Brunson, 2013; Connolly & Reb, 2011; Edwards et al., 2016; Hendrix et al., 2015). Instead, public health officials and health care workers must identify and address specific, overarching factors in vaccine hesitancy. To do so, anthropological work can clarify the structural, political, and interpersonal factors contributing to vaccine hesitancy and apply the data to frameworks that focus on the role of the caretaker and the influence of decision-making practices in medicine. Demographics of vaccine-hesitant families are also useful, but should be analyzed further to include social influences as prevalence seems to vary by geography. For instance, highly-educated white families are more likely to refuse, even though research has shown that lack of education about vaccines can contribute to hesitancy (Edwards et al., 2016). Anthropologists could reveal other concurrent factors that explain this seemingly incongruent phenomenon.

Training on communication and guidance for healthcare professionals regarding vaccine-hesitant parents is another proposed intervention as physicians are effectively at the front lines of the controversy. Currently, only 55% of practitioners routinely explain the possible adverse effects and the rationale behind vaccines, but nearly half of the hesitant families accept vaccination after this discussion (Opel et al., 2013). While training physicians to communicate with their patients is vital, the importance of vaccines in the process of medical training itself should be reiterated. Recent graduates are less likely to believe in the safety and effectiveness of vaccines than senior practitioners (Edwards et al., 2016). Medical professionals in training must be educated on the value, safety, and efficacy of vaccines in order to express this to



patients. The anthropology of public health can address the medical training system to identify the reasons behind the sentiments of recent graduates, highlight areas in which the training system may be improved, and study the culture of the healthcare system itself.

The internet will also be an important tool in addressing vaccine hesitancy. Examining the ease of access, freedom of speech, and lack of reliable information that parents find on the web is crucial. The relative novelty of this access can be met with anthropological approaches to studying culture. The internet has a culture of its own, and emulating the types of information pools that vaccine-hesitant parents interact with or identifying ways to portray the validity of internet-based information would be extremely useful. For example, while Edwards et al. (2016) found that web-based vaccine hesitancy interventions were largely ineffective and may actually increase misconceptions about vaccines, Venkatraman, Garg, & Kumar (2015) propose the use of user-generated sites that are similar to Wikipedia pages but which are moderated by experts in the field; this could be a possible compromise between freedom of speech, quality, and accurate information. Connolly and Reb (2011) propose a tri-level software decision aid that includes ways for users to explore a decision tree that they navigate to receive an action recommendation. In order

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for this to be effective, there must be two-way communication between users and developers to ensure accessibility and transparency.

Anthropological work can promote research on decision aids in analysis for effectiveness, cultural relevance, and social influence. The sheer amount of information available must be streamlined to make an informed decision. Even if parents have access to credible information, they can easily be overwhelmed when attempting to convert information into action (Connolly & Reb, 2011).

### **The next stages of the movement and necessary future policy**

Moving forward, there are many steps that would benefit health care and public policy as it relates to vaccinations. The aforementioned training for health professionals should continue to focus on the safety and effectiveness of vaccines and then target improvements with communication and satisfaction with vaccine consultations (Brown et al., 2010). Future policy should also work to promote trusting relationships with patients. Alterations to policy should be careful to ensure that the resulting changes do not harm the majority of the population that already vaccinates while also meeting the needs of the minority that does not (Brown et al., 2010). Additionally, interventions should continue to remove barriers for those who have positive vaccine attitudes but cannot vaccinate due to other factors. Interventions must also be careful not to overlook this factor when focusing on the ideologically opposed population of vaccine-hesitant parents (Brown et al., 2010).

Another approach could be to omit the option of non-vaccination by eliminating non-medical exemptions, or making the process for a non-medical exemption more complex. Mandates would enforce herd immunity and there is support that increased difficulty in obtaining an exemption reduces the unvaccinated population (Sadaf et al., 2013). In addition to increasing procedural complexity of the exemption process, there is room to revise the informed consent process

*“Therefore, public health must continually improve its approach in addressing vaccine hesitancy.”*

to be more inclusive. Policies could make informed consent applicable to those refusing or deferring vaccines so that they are fully aware of the implications of their choices (Hendrix et al., 2015). A revised informed consent process coupled with individualized

approaches from physicians is more powerful than generic material (Brown et al., 2010).

Research must focus on the fundamental reasons for vaccine hesitancy while also keeping in mind that the observed lifetime of a vaccine includes stages wherein confidence is expected to lessen. This research focus will help to develop cost-effective interventions that promote the health of the whole population while maintaining caregivers’ control of their child’s health. Interventions should be multi-component and address specific determinants that drive vaccine hesitancy, specific to the needs of the community in question (WHO 2014).

## Conclusions

Vaccines continue to be a safe, effective, highly regulated, preventative measure in public health, and yet continue to be controversial in some contexts. The lifetime of a vaccine indicates that there will be stages in which public support may decrease, leading to outbreaks of vaccine-preventable diseases, but that the resulting change in outlook will restore confidence. However, it is likely that the risk of confidence loss will continue indefinitely for diseases that cannot be eradicated worldwide (Chen et al., 1994). Therefore, public health must continually improve its approach in addressing vaccine hesitancy. Due to the complex decision making process, there are multivariate factors

that contribute to vaccine hesitancy, including structural and political factors, influence of popular culture, and perhaps most influential, the widespread availability of information via the internet. Physicians can respond in a multitude of ways, but they are ultimately the front lines in addressing hesitancy and so should thoroughly consider their actions when interacting with parents who refuse vaccinations. Anthropological study of the decision-making process, the factors that influence public and individual opinion and understanding of vaccines, and the public policy used to navigate vaccine hesitancy will be beneficial in addressing future instances of reduced confidence.

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