Overview
Special Focus Vaccine Acceptance

Kristen A Feemster

Children's Hospital of Philadelphia; University of Pennsylvania Perelman School of Medicine; Philadelphia, PA USA

At the World Economic Forum in 2010, The Gates Foundation announced the "Decade of Vaccines," a $10 billion commitment to increase access to existing and new childhood vaccines. It is estimated that this effort could save 6.4 million lives and avert 426 million illnesses.[1,2] Achieving these goals will require a significant effort among global health agencies, non-governmental organizations, industry and national governments to support vaccine development and ensure a strong infrastructure for sustainable vaccine delivery. Vaccines are one of the most important public health achievements in history, resulting in significant decreases in the prevalence of many childhood diseases. However, persistent disparities exist in the adoption of new vaccines and sustained vaccination rates in both developed and developing countries. Decreasing vaccination rates in some communities have resulted in outbreaks of vaccine-preventable diseases. Disparities may be due to vaccine supply, poor infrastructure, or low prioritization of vaccines for public health spending. However, another crucial contributor to the success of vaccination programs is vaccine acceptance.

The decision to receive a vaccine is based upon a dynamic assessment of the risks associated with vaccination vs. the risk of not being vaccinated, i.e., the risk-benefit ratio. As the prevalence of vaccine-preventable diseases decreases, individuals may be more concerned about vaccine safety than about the risk of developing a disease that is rarely seen. This risk-benefit assessment is greatly influenced by socio-cultural and political contexts that drive health beliefs, economic priorities and ones relationship with the health care system.[3,4] The complexity of these relationships has made it difficult to identify the key drivers of vaccine acceptance and incorporate vaccines into immunization programs. The goal of this Special Focus is to: (1) provide a conceptual framework for understanding the multiple factors that impact on vaccine acceptance, (2) explore strategies for effective vaccine communication, particularly in an era of increasing access to information, and (3) consider the implications of advocacy and policy approaches to address vaccine hesitancy.

First, it is important to clearly define what is meant by vaccine acceptance. Vaccine acceptance represents a spectrum of behaviors and beliefs from rejection of all vaccines to active support of immunization recommendations. Within this spectrum lies vaccine hesitancy, through which individuals may question the safety of or need for a particular vaccine. The proportion of parents reporting concerns about vaccines has increased

significantly—these changing trends are described in the first review by Gowda and Dempsey.[5] In the US, a majority of physicians report at least one vaccine refusal per month, and it is estimated that 1–2% of parents refuse all vaccines. When considering the millions of children eligible to receive vaccines each year, the number of unvaccinated children is substantial. An even higher proportion of parents reports refusing at least one vaccine or delaying vaccination through request for alternative schedules. However, not all parents who report vaccine-related concerns refuse vaccination. Gowda et al. describe different approaches to classify vaccine-hesitant parents in a way that can predict future vaccination behavior. This is followed by a thorough exploration of prominent factors that influence these concerns, including risk perception, beliefs about natural immunity, frequent changes to the immunization schedule, and contextual factors such as income, education, and information source. Targeted communication strategies that incorporate these considerations may effectively address concerns from hesitant parents

The second review by Dube et al.[6] also provides a conceptual framework to describe the determinants of vaccine decision-making and explores additional factors including trust, past experiences with vaccination services, and social pressure. This review then broadens the discussion with an exploration of the political and socio-cultural contexts within which vaccine decision-making takes place. Vaccine hesitancy is described as a reflection of beliefs regarding science, expertise and medical authority; these beliefs have shifted with the rise of consumerism, in which individuals play a more active role in healthcare decision-making. These trends also illustrate the growing influence of popular media through which misinformation is easily propagated. The power of misinformation about vaccines is striking- Dube et al. provide a phenomenological explanation based on denialism in which rhetorical arguments are used to create a debate even if all evidence indicates there is no debate. To counter misinformation, this review calls upon the public health community to more effectively communicate information about vaccine safety and changes in immunization schedules. The influence of health professionals' beliefs is also highlighted. Recommendations from a healthcare provider have long been cited as a key determinant of vaccine acceptance, but health professionals may be vaccine hesitant themselves, or they may feel inadequately prepared to answer specific questions from patients.

Trust is a key driver of vaccine acceptance, and the rise of vaccine hesitancy is often described as the vaccine confidence gap. Trust may influence how information is interpreted, ones relationship with their healthcare provider, beliefs about social responsibility, or beliefs about the motives of public health institutions. The role of public trust is explored in a review of vaccine acceptance from an international perspective by Ozawa et al.[7] Vaccines are a public health tool; as such, improving their acceptability will require trust in the effectiveness of vaccines as well as trust in the health system. The factors that influence trust differ across specific sociocultural and political contexts and should be considered when developing communication strategies. This review suggests that as individuals consider the risks of vaccination vs. no vaccination, an important message in any context is to emphasize the benefits of vaccination. Effectively communicating this message in a way that restores trust and helps close the vaccine confidence gap requires involvement from all stakeholders. Ozawa et al. recommend improving awareness of the benefits of vaccination among parents, policy makers and healthcare providers through grass-roots campaigns to influence population-wide, not just individual, beliefs.

These considerations are explored further in the commentary by Heidi Larson.[8] The rise of vaccine hesitancy globally has led to the establishment of a Vaccine Hesitancy Working Group by the World Health Organization Strategic Advisory Group of Experts (SAGE) in April 2012. The objectives of the Working Group are to determine the scope of vaccine hesitancy, establish a monitoring infrastructure, and identify strategies to address vaccine hesitancy. As a first step, the Working Group has defined vaccine hesitancy as a behavior influenced by three primary domains: confidence (trust in a vaccine or healthcare provider), complacency (perceived need), and convenience (accessibility). The definition also recognizes the heterogeneity in vaccination behaviors associated with hesitancy explored in the first two reviews by Gowda et al.[5] and Dube et al.[6] Since hesitancy may not result in vaccine refusal or delay, it is difficult to measure the prevalence and content of vaccine-related concerns. It is therefore challenging to understand how individuals balance trust, perceived need and accessibility when making decisions about vaccination. The SAGE Working Group will bring together perspectives and expertise to synthesize what we know about changing beliefs and drivers of acceptance to determine what will impact behavior and help close the vaccine confidence gap.

The SAGE Working Group also emphasizes the role media plays in vaccine acceptance. Larson cites an analysis showing that nearly one-third of media reports about vaccines in 2011–2 were negative. It is evident that effective communication has become an important barrier to vaccine acceptance. We have access to a wide range of information sources—many of these sources may include inaccurate information that leads to misperceptions which in turn can drive vaccination behavior. Wheeler et al.[9] present data from a private pediatric practice illustrating the relationship between vaccine-related beliefs, information source, and intention to request an alternative immunization schedule. Parents who turned to non-physician sources for vaccine information were more likely to report specific vaccine concerns and

to request an alternative immunization schedule. If individuals increasingly look to a wide range of sources outside of the health system for vaccine information, how can health systems and vaccine advocates harness information in support of vaccination?

Two advocacy perspectives presented in the next two commentaries by Hagood and Herlihy[10] as well as Shelby and Ernst[11] provide potential approaches. Hagood and Herlihy share their insight as an educator and as a parent. They identify three different types of vaccine-hesitant parents: vaccine-rejecters who hold strong beliefs against vaccination and little trust in public institutions, vaccine-resistant who have significant specific concerns about vaccine safety, and vaccine-hesitant parents who have more generalized anxiety regarding vaccination. While the provision of information is unlikely to move strongly held beliefs among vaccine-rejecters, they suggest approaches that may be effective for vaccine-resistant and -hesitant parents including motivational interviewing and the C.A.SE method that incorporates both empathy-based and fact-based approaches to make fact-based information more acceptable. Their work also emphasizes the importance of providing education in multiple venues – healthcare encounters are often too short to allow clinicians to adequately hear and respond to concerns. Additionally, messages that come from a variety of voices may be increase their salience.

The use of anecdote has proven to be a powerful mechanism for communicating messages. Shelby and Ernst present storytelling as a strategy that has been embraced by the anti-vaccine movement to effectively disseminate messages and create virtual communities who endorse similar beliefs. Stories present information in a way that may be more tangible and engaging than scientific facts alone. Stories that are difficult to refute can become the evidence that drives decision-making. Anecdote could therefore be an equally powerful tool for messages in support of vaccination. Shelby and Ernst provide compelling examples of stories that convey a clear and salient message that can be combined with facts about vaccines or vaccine-preventable diseases. These examples also illustrate the importance of partnering with advocates from a range of disciplines and perspectives. Social norms significantly impact attitudes and beliefs and these norms may be driven by messages from other parents or community members.

The rise of social media reflects the proliferation of technology in our daily lives. Health information technology (health IT) may be an additional means to improve vaccination rates through multiple avenues, including better tracking of immunization status, decision-support tools, and dissemination of educational information. This potential is comprehensively explored in the review by Stockwell and Fiks.[12] The capacity of health information technology to influence health behaviors and clinical practice has been demonstrated for other outcomes. Incorporating principles from a conceptual framework for vaccine hesitancy with lessons learned from implementation of health IT initiatives may result in a potentially powerful array of tools. This is especially relevant as more health systems adopt health IT and as more consumers turn to social media for information exchange.

While effective communication is a key focus in these reviews, all acknowledge that strongly held beliefs are difficult to influence with information alone. Policy approaches may be needed to

influence immunization behavior. The goal of an immunization program is to prevent infection AND transmission–a decision not to vaccinate impacts not only you or your child but also impacts your neighbor. What can society reasonably compel an individual to do for public benefit? These challenges and the ethical dimensions of vaccination policy are explored by Rentmeester[13] and Ropeik.[14] Ropeik presents vaccine acceptance from the perspective of risk perception. Concerns about vaccines are difficult to address with information alone because: "risk perception is subjective, a product of both the facts and how those facts feel." Several unique characteristics about vaccination contribute to their perceived risks. In light of entrenched fear, Ropeik suggests specific actions: stricter vaccine exemption laws, economic incentives such as increased health insurance costs for unvaccinated individuals, restricted social activities for unvaccinated individuals, and broader mandatory vaccine policies especially for certain groups like healthcare workers. These initiatives require limitations to individual choice, but they are also consistent with other regulations employed in many settings to protect public safety such as no smoking in restaurants or the workplace. As vaccine hesitancy continues to rise, the acceptability and feasibility of such strategies are worth exploring.

A policy pursued by some pediatric healthcare providers is family dismissal in the setting of vaccine refusal. This approach presents a dilemma to clinicians. On one hand, they want to preserve a relationship with the child's family. On the other hand, they want to provide the best care possible to the child. Rentmeester presents an ethical framework for this conflict and offers suggestions for ways in which clinicians can confront this dilemma while maintaining the principle of professionalism and fidelity. In her commentary, Rentmeester describes anti-intellectualism as a rising trend that often underlies the clinician-family conflict when vaccine refusal occurs. Common-ground communication, when both clinicians and families can focus upon the ultimate goal of protecting the health of the child, may provide an avenue to maintain open communication and eventually change behavior.

Rentmeester suggests that family dismissal may not be the most effective way for clinicians to advocate for their patients. The paper by Buttenheim et al.[15] also suggests that family dismissal may have unintended consequences that could be detrimental to the unvaccinated child. Using an agent-based model, Buttenheim et al. illustrate the potential impact of a range of provider dismissal policies on clustering of unvaccinated children. In a zero-tolerance practice, all children within that practice would be vaccinated; however, children in families who were dismissed will be clustered within practices that are more tolerant. These practices may then have increased risk for disease transmission for all of their patients. Based upon their results, Buttenheim et al. suggest that policies may be needed to limit provider dismissal policies to avoid these unintended consequences. Constricting clinicians' options for responding to vaccine refusal may redistribute risk, but an important question is whether such an approach would help preserve the provider-family relationship and increase vaccine acceptability.

Vaccine acceptance is influenced by a complex relationship among factors that drive individual decision-making behavior, and socio-cultural and political contexts, including the rapid proliferation of information technology. This Special Focus comprehensively explores these dimensions and highlights key factors that can be leveraged to reverse the trend of increasing vaccine hesitancy and meaningfully strengthen vaccine acceptance. This is imperative so that the profound public health impact of vaccination to protect the health of individuals and communities worldwide can continue to be realized.

References

1. Stack ML, Ozawa S, Bishai DM, Mirelman A, Tam Y, Niessen L, Walker DG, Levine OS. Estimated economic benefits during the 'decade of vaccines' include treatment savings, gains in labor productivity. Health Aff (Millwood) 2011; 30:1021-8; PMID:21653952; http://dx.doi.org/10.1377/hlthaff.2011.0382

2. Ozawa S, Stack ML, Bishai DM, Mirelman A, Friberg IK, Niessen L, Walker DG, Levine OS. During the 'decade of vaccines,' the lives of 6.4 million children valued at $231 billion could be saved. Health Aff (Millwood) 2011; 30:1010-20; PMID:21653951; http://dx.doi.org/10.1377/hlthaff.2011.0381

3. Stanton BF. Assessment of relevant cultural considerations is essential for the success of a vaccine. J Health Popul Nutr 2004; 22:286-92; PMID:15609781

4. Munira SL, Fritzen SA. What influences government adoption of vaccines in developing countries? A policy process analysis. Soc Sci Med 2007; 65:1751-64; PMID:17644230; http://dx.doi.org/10.1016/j.socscimed.2007.05.054

5. Gowda C, Dempsey AF. The rise (and fall?) of parental vaccine hesitancy. Hum Vaccin Immunother 2013; 9:1755-62; PMID:23744504; http://dx.doi.org/10.4161/hv.25085

6. Dubé E, Laberge C, Guay M, Bramadat P, Roy R, Julie A. Bettinger. Vaccine hesitancy: An overview. Hum Vaccin Immunother 2013; 9:1763-73; http://dx.doi.org/10.4161/hv.24657

7. Ozawa S, Stack ML. Public trust and vaccine acceptance-international perspectives. Hum Vaccin Immunother 2013; 9:1774-8; PMID:23733039; http://dx.doi.org/10.4161/hv.24961

8. Heidi J. Larson. Negotiating vaccine acceptance in an era of reluctance. Hum Vaccin Immunother 2013; 9:1779-81

9. Wheeler M, Alison M. Buttenheim. Parental vaccine concerns, information source, and choice of alternative immunization schedules. Hum Vaccin Immunother 2013; 9:1782-9; http://dx.doi.org/10.4161/hv.25959

10. Allison Hagood E. Stacy Mintzer Herlihy. Addressing heterogeneous parental concerns about vaccination with a multiple-source model: A parent and educator perspective. Hum Vaccin Immunother 2013; 9:1790-94

11. Shelby A, Ernst K. Story and science: How providers and parents can utilize storytelling to combat anti-vaccine misinformation. Hum Vaccin Immunother 2013; 9:1795-801; PMID:23811786; http://dx.doi.org/10.4161/hv.24828

12. Melissa S. Stockwell, Alexander G. Fiks. Utilizing health information technology to improve vaccine communication and coverage. Hum Vaccin Immunother 2013; 9:1802-11

13. Christy A. Rentmeester. Professionalism, fidelity and relationship-preservation: Navigating disagreement and frustration in clinical encounters. Hum Vaccin Immunother 2013; 9:1812-4

14. Ropeik D. How society should respond to the risk of vaccine rejection. Hum Vaccin Immunother 2013; 9:1815-8; PMID:23807359; http://dx.doi.org/10.4161/hv.25250

15. Alison M. Buttenheim, Sarah T. Cherng, David A. Asch. Provider dismissal policies and clustering of vaccine-hesitant families: An agent-based modeling approach. Hum Vaccin Immunother 2013; 9:1819-24