Assessing the State of Vaccine Confidence in the United States: Recommendations from the National Vaccine Advisory Committee

Approved by the National Vaccine Advisory Committee on June 10, 2015

NATIONAL VACCINE ADVISORY COMMITTEE

Chair

Walter A. Orenstein, MD, Emory University, Atlanta, GA

Designated Federal Official

Bruce G. Gellin, MD, MPH, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC

Public Members

Richard H. Beigi, MD, MSc, Magee-Womens Hospital, Pittsburgh, PA

Sarah Despres, JD, Pew Charitable Trusts, Washington, DC

Ruth Lynfield, MD, Minnesota Department of Health, St. Paul, MN

Yvonne Maldonado, MD, Stanford University, Palo Alto, CA

Charles Mouton, MD, MS, Meharry Medical College, Nashville, TN

Wayne Rawlins, MD, MBA, Aetna, Hartford, CT

Mitchel C. Rothholz, RPh, MBA, American Pharmacists Association, Washington, DC

Nathaniel Smith, MD, MPH, Arkansas Department of Health, Little Rock, AR

Kimberly Thompson, ScD, University of Central Florida, College of Medicine, Orlando, FL

Catherine Torres, MD, Former New Mexico Secretary of Health, Las Cruces, NM

Kasisomayajula Viswanath, PhD, Harvard School of Public Health, Boston, MA

Representative Member

Philip Hosbach, Sanofi Pasteur, Swiftwater, PA

EXECUTIVE SUMMARY

As 2014 ended and 2015 began, measles, a disease no longer considered endemic in the United States, was infecting dozens of people in this country and threatening to infect hundreds more. While the initial case likely was the result of measles being brought into the United States from another country, the first exposures came at a popular tourist destination, which meant it would not take long for the virus to be transmitted to other people. From January 1 to May 1, 2015, nearly 170 cases of measles had been reported in 20 U.S. states and the District of Columbia.[1]

The latest measles cases provided yet another reminder of the importance of vaccines and timely vaccination. Although the source case traced to the tourist destination is not known, the first identified case stemmed from an individual who had not been vaccinated against measles, and most of the subsequent infections involved people who were unvaccinated. Unfortunately, in many cases the unvaccinated children were likely unvaccinated by choice. The recommended measles vaccination must have been delayed or declined, a choice that left the children vulnerable and the rest of the unvaccinated population susceptible to measles. Children too young to be vaccinated, as well as children who cannot be vaccinated because of health conditions, depend on high levels of vaccination coverage for protection against infectious diseases such as measles. Immunity is often silent or invisible until it is tested—and measles is one of the most sensitive stress tests we have.

The need to maintain the nation's high childhood immunization rates, along with evidence that more parents are hesitant about or delaying vaccination, prompted the Assistant Secretary for Health (ASH) of the U.S. Department of Health and Human Services (HHS) to ask the National Vaccine Advisory Committee (NVAC) to assess how confidence in vaccines affects childhood vaccination in the United States. In response to this request, the NVAC put together a Vaccine Confidence Working Group (VCWG) in February 2013.

This report is the result of the working group's efforts and examination. The efforts began with developing a definition of vaccine confidence and examining the various factors that can influence vaccination, including the role of parents and health-care providers; the processes involved in vaccine development, testing, licensure, recommendations, and policy; the communication environment; and parents' perceptions of disease susceptibility, vaccine efficacy, and vaccine safety. For the VCWG, vaccine confidence refers to the trust that parents or health-care providers have (*1*) in the immunizations recommended by the Advisory Committee on Immunization Practices (ACIP), (*2*) in the provider(s) who administer(s) vaccines, and (*3*) in the processes that lead to vaccine licensure and the recommended vaccination schedule.

Vaccines are one of the most effective and successful public health tools to prevent disease, illness, and premature death from preventable infectious diseases. As this report illustrates, there is much good news in the United States when it comes to recommended vaccines and vaccinations. Vaccination rates among children are high and, for most parents, following the recommended schedule is the norm. Health-care providers are highly supportive of vaccines and immunization recommendations and are a trusted source of information and guidance for most parents. The working group repeatedly heard that trust in health-care providers, health-care provider communication and endorsement, social norms, and communication plays a central role in instilling, maintaining, and fostering vaccine confidence.

The VCWG also heard about several challenges that threaten successful utilization of recommended vaccines. While vaccination remains the social norm, it is important to continue to pay attention to cultural beliefs and norms among groups from different socioeconomic positions and racial/ethnic minorities, and the impact these differences can have on vaccine confidence. As this report indicates, there are communities and places (e.g., schools) where vaccination levels are below—sometimes far below—the levels needed to protect those who are unvaccinated.[2] Reluctance,

National Vaccine Advisory Committee Vaccine Confidence Working Group Membership

Vaccine Confidence Working Group Chairs
Kasisomayajula Viswanath, PhD, Harvard School of Public Health, Boston, MA, Chair
Charles Mouton, MD, MS, Meharry Medical College, Nashville, TN, Co-Chair

NVAC Chairman
Walter A. Orenstein, MD, Emory University, Atlanta, GA

NVAC Members
Philip Hosbach, Sanofi Pasteur, Swiftwater, PA
Philip LaRussa, MD, Columbia University, Department of Pediatrics, New York, NY
Amy Pisani, MS, Every Child By Two, Mystic, CT
Thomas Stenvig, PhD, MS, RN, South Dakota State University College of Nursing, Brookings, SD
Litjen Tan, PhD, MS, Immunization Action Coalition, Saint Paul, MN

NVAC Liaison Representatives
Charlene Douglas, PhD, MPH, RN, Advisory Committee on Childhood Vaccines, Fairfax, VA
Kathy Edwards, MD, Vanderbilt University School of Medicine, Nashville, TN
Kristen Ehresmann, Association of Immunization Managers, St. Paul, MN
Paul Etkind, DrPH, National Association of County and City Health Officials, Washington, DC
Paul Jarris, MD, MBA, Association of State and Territorial Health Officials, Arlington, VA
David Salisbury, CB, FRCP, FRCPCH, FFPHM, United Kingdom Department of Health, London
John Spika, MD, Public Health Agency of Canada, Ontario, Canada
Kathy Talkington, Association of State and Territorial Health Officials, Baltimore, MD

NVAC Ex Officio Members
Michael Bartholomew, MD, Indian Health Service, U.S. Department of Health and Human Services, Rockville, MD
Michelle Basket, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA
Jessica Bernstein, MPH, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD
Allison Fischer, MPH, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA
Maureen Hess, MPH, RD, U.S. Food and Drug Administration, Silver Spring, MD
Justin Mills, MD, MPH, Health Resources and Services Administration, U.S Department of Health and Human Services, Rockville, MD
Barbara Mulach, PhD, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD
Kristine Sheedy, PhD, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA

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National Vaccine Advisory Committee Vaccine Confidence Working Group Membership (continued)

Angela Shen, ScD, MPH, U.S. Agency for International Development, Washington, DC
CAPT Melinda Wharton, MD, MPH, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA

U.S. Department of Health and Human Services National Vaccine Program Office Staff and Technical Advisors
Sharon Bergquist, PhD, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC
Jaime Earnest, MPH, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC
Bruce G. Gellin, MD, MPH, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC
Judith Mendel, MPH, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC
Glen Nowak, PhD, University of Georgia, Athens, GA
Katy Seib, MPH, Emory University, Atlanta, GA

hesitation, concerns, or a lack of confidence has caused some parents to question or forego recommended vaccines. In some cases, the children are vaccinated but vaccinations are delayed beyond recommended ages, alternative schedules are used, or vaccines are totally declined. In these cases, the child is left susceptible to the disease and, if infected, can transmit it to others.

The VCWG learned that the Centers for Disease Control and Prevention (CDC) is continually assessing the nation's childhood immunization coverage through the National Immunization Survey (NIS). On the other hand, it also learned that significant gaps exist in measuring, monitoring, and tracking vaccine confidence. The NIS, for instance, does not routinely include measures related to vaccine confidence, nor is there a standardized, validated set of questions for measuring vaccine confidence. Additionally, existing efforts do not account for variations at the state, local, and provider levels, meaning it is not possible to gauge or understand community-level vaccine confidence, including the potential vulnerability of communities or schools to a vaccine-preventable disease (VPD).[3] As the VCWG also learned, those who delay or decline recommended vaccinations often live in close proximity to each other or send their children to the same schools. A lack of information on where such clusters exist, and the reasons behind the lack of vaccination, make these areas particularly vulnerable to VPDs.[4] It is thus highly recommended that investments be made in improving the nation's ability to measure and assess vaccine confidence, including at state and community levels.

As noted in this report, the end goal—achieving acceptance by parents and health-care providers of all Advisory Committee on Immunization Practices (ACIP)-recommended vaccinations for children at recommended ages[5]—will require continued and expanded efforts on multiple fronts and by multiple entities. On the science side, the initial efforts toward developing a multinational research network to advance the science to understand vaccine confidence and hesitancy need to be sustained and extended. As the World Health Organization's Strategic Advisory Group of Experts' vaccine hesitancy efforts illustrate, building and fostering vaccine confidence and acceptance is a problem not just in the United States, but also worldwide.[6] More efforts are needed to identify, develop, and evaluate strategies and approaches to find the ones that facilitate or instill confidence. Additionally, resources and systems need to be in place to share lessons learned and effective practices. Along these lines, vaccine confidence and acceptance efforts need to encompass health-care providers. Not only is it imperative that health-care providers have high confidence in recommended vaccines and vaccinations, but they must also have the resources, capacities, and capabilities needed to effectively educate and address parental questions and concerns. In most cases, health-care providers directly affect parental confidence in and acceptance of recommended vaccines and vaccinations.

The near invisibility of VPDs speaks to the value and success of vaccines and highlights the importance of constant—and greater—vigilance when it comes to vaccine confidence. In the absence of disease, for many people, it is confidence—in the vaccine, the recommendation, the provider, and the processes—that fosters their vaccine acceptance and, in turn, the nation's high immunization rates.

With the previous statement in mind, the NVAC recommendations regarding vaccine confidence are grouped into five focus areas:

- Focus area 1: measuring and tracking vaccine confidence
- Focus area 2: communication and community strategies
- Focus area 3: health-care provider strategies
- Focus area 4: policy strategies
- Focus area 5: continued support and monitoring

Within each focus area, the report details specific recommendations to address identified issues.

INTRODUCTION

Vaccines are among the most effective public health interventions available and save 2–3 million lives per year worldwide.[7] Most vaccines in use today provide high levels of individual protection against disease. In addition, most VPDs are spread from infected people to susceptible people. When high levels of immunity in a community are induced by vaccination, a person with a case of a VPD who is transmitting is unlikely to encounter a susceptible host, thus terminating transmission and preventing exposure of others in the community who are not protected by vaccination (no vaccine is 100% effective[8]), cannot be vaccinated (i.e., have a legitimate contraindication to vaccination), or are not eligible for vaccination (e.g., children too young for some recommended vaccines). As such, what makes vaccines unique is that with high levels of vaccination, both the individual and the community are protected, a phenomenon characterized often as "herd immunity." However, high vaccination coverage rates are required for community protection. In the United States, high vaccination rates have been reached for many recommended vaccines, leading to the near elimination of the corresponding VPDs and 99%–100% reductions in VPD mortality, leading to thousands of lives saved each year.[9]

While this reduction in VPDs speaks to the great success of vaccines and the efforts of all the entities involved in vaccination programs in the United States, there is still work to be done. Not all recommended vaccinations have reached high coverage rates, and there are places in the country where coverage is not high enough to achieve population protection, leaving the people, including young children, vulnerable to VPDs, especially in the event of a disease outbreak.

A high level of public and parental confidence is an important factor for achieving and maintaining the high vaccination rates needed to sustain community-level protection against VPDs. Vaccine confidence, or the level of trust that people have in recommended vaccines and those who administer vaccinations, is often a significant determinant of vaccine acceptance. When confidence is high, people will likely support immunization recommendations and follow recommended schedules. When confidence is low or lacking, people are more likely to hesitate and may decide to delay or forego recommended vaccinations. The recognition of the need to support public confidence in vaccinations is growing and has become a focus for public health organizations in the United States and internationally. For example, in 2012, the World Health Organization's Strategic Advisory Group of Experts on Immunization formed a Working Group on Vaccine Hesitancy that, in its October 2014 report to the Strategic Advisory Group of Experts, called for concerted action to address hesitancy concerns throughout the world.[5]

Despite these concerns, it should be noted that vaccination in accordance with CDC's ACIP-recommended immunization schedule continues to be the social norm for children in the United States, and high vaccination coverage has been achieved for most vaccines on the recommended childhood immunization schedule. For infant and early childhood immunizations, rates have been high and stable for the past several decades—at or above the 80%–90% range for nearly all ACIP-recommended childhood vaccinations.[10,11]

Similarly, recent reports suggest that a majority of parents have favorable beliefs or perceptions regarding recommended childhood vaccines. A 2009 HealthStyles survey of parents of children aged ≤6 years, for example, found that 79% were "confident" or "very confident" in the safety of routine childhood vaccines. A 2010 HealthStyles survey found that 72% of parents were confident in the safety of vaccines, with slightly more parents expressing confidence in the effectiveness of vaccines (78%) and the benefits of vaccines (77%).[12] Further analyses of these data showed that two factors —confidence in vaccine safety and confidence in vaccine effectiveness—were a major influence on parents' self-reported vaccination behavior.[13] Overall, however, these studies also suggested that about one in five parents were not fully confident in the safety or importance of recommended vaccinations.[12,13] The Cultural Cognition Project at the Yale Law School has collected data involving or related to confidence and found that about 27% of adults strongly to slightly disagreed with the statement, "I am confident in the judgment of public health officials who are responsible for identifying generally recommended childhood vaccinations." About 62% had moderately or extremely high confidence in "the judgment of the American Academy of Pediatrics that vaccines are a safe and effective way to prevent serious disease," but about 20% had relatively low confidence.[14]

National estimates also can mask geographic variation in coverage rates. In other words, some communities or schools have relatively low vaccination rates that are overshadowed by strong national rates.[15] While most parents choose to vaccinate their children according to the ACIP recommendations, as with any medical decision parents make for their children, they may have questions or concerns about immunization. More critically, several reports have suggested that some parents are choosing to delay and/or refuse one or more recommended vaccines. There is also evidence that some parents are following alternative

or non-recommended schedules, indicating they may have concerns about the ACIP-recommended schedule.[16–19] Finally, exemptions from school immunization requirements obtained for personal reasons have been increasing in some school districts and states.[20,21] Delays and refusals of recommended vaccinations provide evidence that some parents lack confidence in recommended vaccines and the vaccine schedule. Such non-recommended schedules and vaccination refusals also are concerning because they leave children and communities vulnerable to disease outbreaks. In the United States, recent measles outbreaks highlight this vulnerability. In the past several years, measles outbreaks have occurred in communities and schools with pockets of un-immunized people or children.[22]

In response to concerns that vaccination acceptance is not as high as needed to achieve optimal use of all ACIP-recommended vaccinations, and in an effort to better understand how best to foster confidence to achieve and sustain high vaccination rates, the ASH asked the NVAC to form the VCWG in February 2013.

Charge to the working group

Recognizing that immunizations are given across the lifespan and that there are likely to be important differences in vaccine acceptance at different stages of life, the ASH initially charged the NVAC to report on how confidence in vaccines impacts the optimal use of recommended childhood vaccines in the United States, including reaching Healthy People 2020 immunization coverage targets, which focus on the prevention and control of infectious disease through immunization.[23] The focus of such a report may include understanding the determinants of vaccination acceptance among parents, what HHS should be doing to improve parental confidence in vaccine recommendations, and how best to measure confidence in vaccines and vaccination to inform and evaluate future interventions.

In response to the ASH's charge, the VCWG set out to first define vaccine confidence and its constituent factors and to understand the state of vaccine confidence in the United States. From this framework, the VCWG formulated recommendations, which were adopted by the NVAC, related to identifying, measuring, and tracking vaccine confidence moving forward. Finally, the working group recommended strategies and approaches for sustaining and increasing parental confidence in vaccines, including research to identify ways to strengthen confidence.

VCWG membership

VCWG membership was limited to members and liaison members of the NVAC. In the process of developing the recommendations, the VCWG solicited extensive input from experts in the vaccine confidence field as well as from stakeholders such as health-care providers, public health practitioners, policy makers, and parents of young children (Table). This report summarizes the information and perspectives considered by the VCWG, as well as VCWG's findings, conclusions, and recommendations. Each section that follows focuses on a major component of the working group's effort.

KEY TERMS AND DEFINITIONS

Introduction and overview

One of the VCWG's first objectives was to agree on consistent, clear, and measurable definitions for the key terms and concepts encompassing vaccination decision making. Currently in the literature, the terms "hesitancy," "confidence," "trust," and "acceptance" have been used, sometimes interchangeably, to describe the factors that influence an individual's decision to accept recommended vaccinations as well as society's overall level of support of vaccination.[24–27] This conflation of different terms could make it difficult to document, track, and intervene on confidence.

It is important to note that numerous factors influence whether or not a recommended vaccine is accepted, including knowledge of the recommendation, availability of vaccination services, vaccine affordability, and vaccine accessibility. However, the focus of the VCWG's efforts was to understand the drivers of individuals' or parents' decisions to accept immunizations when safe and effective vaccines are recommended and high-quality vaccination services are available. That is, all things being equal, what are the major individual and social determinants influencing the confidence in recommended vaccines?

Vaccine acceptance and confidence

There is consensus that attitudes and intentions with regard to vaccination fall along a continuum ranging from complete refusal to complete acceptance of all recommended vaccines administered at the recommended times.[28–30] The aforementioned terms, particularly "hesitancy" and "confidence," have been used in the literature to describe those individuals who fall in the middle of this continuum. The individuals and parents in the middle are a heterogeneous group whose attitudes and intentions with respect to vaccines vary. Some parents and individuals delay or refuse some recommended vaccines as a result of their concerns, while others get recommended vaccinations for themselves or their children despite their concerns.

While the VCWG recognizes that much remains to be learned regarding the scale, scope, and details of vaccine confidence in the United States, it concluded

Table. National Vaccine Advisory Committee Vaccine Confidence Working Group agenda: presentations to the working group, 2013–2014

Topic	*Material presented*	*Presenters*	*Date*
Epidemiology, measurement, and tracking	Coverage data and attitudes and beliefs surveys	Kristine Sheedy, Allison Fisher, and Glen Nowak, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, Georgia	August 26, 2013
	Predictive vaccine confidence surveys and other methods to track vaccine confidence	Douglas Opel, University of Washington School of Medicine, Seattle, Washington; Nicolas Sevdalis, Imperial College, London, United Kingdom; and Saad Omer, Emory University Schools of Public Health and Medicine, Atlanta, Georgia	September 9, 2013
Perspectives	Health-care providers	Kathryn Edwards, American Academy of Pediatrics, Elk Grove Village, Illinois	March 19, 2014
	State and city health workers	Katelyn Wells, Association of Immunization Managers; Paul Etkind, National Association of County and City Health Officials; and Kimberly Martin, Association of State and Territorial Health Officials, Arlington, Virginia	April 9, 2014
	World Health Organization Strategic Advisory Group of Experts Working Group on Vaccine Hesitancy	Bruce Gellin, U.S. Department of Health and Human Services, Washington, DC; and Heidi Larson, London School of Hygiene & Tropical Medicine, London	April 16, 2014
	Nurses	Melody Ann Butler, Nurses Who Vaccinate, West Islip, New York	June 25, 2014
	Parents	Three parent focus groups conducted online	
Strategies to support vaccine confidence	Communication strategies	Dan Kahan, Yale University, New Haven, Connecticut	December 6, 2013
	Health communication and social/news media	Ivan Oransky, MedPage Today, New York, New York; Joseph Cappella, University of Pennsylvania, Philadelphia, Pennsylvania; and Rumi Chunara, Harvard Medical School, Boston, Massachusetts	February 10, 2014
	National strategies for surveillance and engagement	Julie Leask, University of Sydney, New South Wales, Australia	February 19, 2014
	Provider reimbursement and opportunities to support provider-patient conversations	LJ Tan, Immunization Action Coalition, Saint Paul, Minnesota	May 7, 2014
	Lessons from anti-tobacco campaigns	Ann Aikin, National Vaccine Program Office, U.S. Department of Health and Human Services, Washington, DC	May 28, 2014
	Community mobilization	Robb Butler, World Health Organization, Regional Office for Europe, Copenhagen, Denmark; and Mackenzie Melton and Todd Faubion, Vax Northwest, Seattle, Washington	June 9, 2014
	Decision making and risk analysis	Cornelia Betsch, University of Erfurt, Erfurt, Germany	July 9, 2014

that fostering acceptance of all ACIP-recommended vaccines administered at the recommended ages should be the end goal. With childhood vaccinations in mind, the VCWG chose to focus on vaccine confidence of parents. In addition, the VCWG concluded that the focus should be on building parental confidence in the middle of the continuum to promote vaccine acceptance.

Confidence vs. hesitancy

The working group chose to focus attention on "vaccine confidence" rather than "vaccine hesitancy" for three reasons. First, in reviewing relevant literature, conversations with other stakeholders, and presentations to the VCWG, it became evident that the best and most appropriate goal for immunization programs was to instill, build, and maintain high confidence in vaccines and recommended vaccinations. The positive

frame of "confidence" rather than "lack of hesitancy" best characterizes how parents, health-care providers, and others should come to perceive vaccines and recommended vaccinations. Second, confidence was seen to encompass hesitancy. For example, if parents have high confidence in recommended vaccines and vaccinations, there should be little or no hesitation about having their children receive immunizations at the recommended ages. Conversely, if confidence is low or lacking, parents will likely hesitate when it comes to a recommended vaccination. Finally, the VCWG recognized that many parents have questions or potential concerns about medical decisions, including vaccinations.[8]

The VCWG wanted to stress that questions as well as the involvement of parents in medical decisions should be respected and supported. Therefore, efforts to address parents and others who have doubts and concerns should focus less on labels (e.g., "vaccine hesitant") and more on how best to build and maintain confidence. The VCWG concluded it was the responsibility of the public health and health-care provider communities to understand what was required to increase parental and public confidence in recommended vaccines and vaccinations.

Key definitions

In line with the aforementioned, the VCWG defined vaccine acceptance and confidence in the following way:

- Vaccine acceptance is defined as the timely receipt of all childhood vaccines as recommended by ACIP when vaccines and vaccine services are available.
- Vaccine confidence refers to the trust that parents or health-care providers have (*1*) in the recommended immunizations, (*2*) in the provider(s) who administers vaccines, and (*3*) in the process that leads to vaccine licensure and the recommended vaccination schedule.

These dimensions assume that parents are aware of the recommended vaccinations and have knowledge of how vaccination recommendations are made. These concepts are interrelated and linked, with vaccine acceptance being the desired end outcome and vaccine confidence being an important antecedent to that outcome.

VACCINE CONFIDENCE-RELATED RESEARCH

Determinants of confidence

Vaccine confidence is a relatively new concept in understanding vaccine acceptance. However, through several review articles, presentations from experts, and conversations with parents, the VCWG was able to identify and describe key determinants associated with parental confidence in, and acceptance of, childhood vaccines.[31–37] While it is clear that the most influential factors often differ across locations, time, and individual vaccines, four factors are notable: (*1*) trust, (*2*) attitudes and beliefs, (*3*) health-care provider confidence both in vaccines and in their ability to communicate effectively to parents about vaccines, and (*4*) the information environment regarding vaccines.

In summarizing these key determinants of vaccination confidence, the VCWG hopes to:

- Identify potentially important factors for those studying and intervening to increase public confidence in vaccinations,
- Recommend methods to track confidence over time, and
- Suggest ways to support efforts to increase and maintain the confidence individuals and communities have in vaccinations.

Trust

Trust is one of the most important factors associated with vaccine confidence. Trust is the willingness to rely on someone else's expertise and advice (e.g., their vaccine recommendation). For vaccinations, trust comes into play in a number of ways and with respect to a number of stakeholders. For example, parents need to have trust in the pharmaceutical companies that produce vaccines, in the health-care system that delivers them, in the health-care providers who recommend and administer vaccines, and in the organizations and policy makers that decide which vaccines are needed and when. Trust also extends to the safety and effectiveness of vaccines, including a belief that the system has adequately evaluated the safety and effectiveness of recommended vaccines. The levels of trust parents have in government, the health-care system, and their health-care providers are often associated with their ultimate decision to either accept or refuse vaccinations for their children.

Many studies have found that parents' trust in health-care providers remains high. In a 2009 HealthStyles survey, for example, 82% of parents said their child's doctor or nurse was the most important source for helping them make decisions about vaccinating their youngest child.[38] Furthermore, provider

recommendations for vaccinations are the most commonly cited reason for vaccine confidence and, ultimately, acceptance, underscoring the importance of maintaining the currently high levels of parental and patient trust in individual health-care providers.

Attitudes and beliefs

Vaccination confidence is also associated with the attitudes and beliefs that parents have regarding VPDs, vaccine safety, vaccine effectiveness, and vaccination benefits. It has been found that parents' perception of their child's susceptibility to a VPD, of the disease's severity, and of the benefits, safety, and efficacy of vaccines matters when it comes to accepting an immunization recommendation. In general, parents have more confidence in their decision to follow the recommended vaccination schedule when they perceive that their child is likely to encounter a disease (susceptibility), that the disease has serious consequences for their child (severity), and that the recommended vaccine is safe and effective (efficacy).[39,40]

In addition, parental attitudes about and confidence in vaccination are strongly influenced by perceived social norms. Social norms refer to the perceptions that people hold with respect to the views and actions of others who are significant in their reference group or are their role models. In the case of vaccination, parents may try to gauge what the majority of parents are doing or what other parents they know are doing (e.g., are most following the recommended schedule?). With respect to vaccine confidence, parents are more likely to be confident in immunization recommendations if they perceive that others in their social group have high levels of vaccine acceptance. Conversely, the perceptions that other parents in their circle are delaying or declining recommended vaccinations may lower parental confidence in vaccines. News media stories, and how they frame the value, safety, and effectiveness of vaccinations, can also contribute to parental perceptions of social norms.

Social norms also can influence the cognitive heuristics that people use when making medical and health-related decisions, including decisions involving immunization. Cognitive heuristics are decision-making shortcuts used to either quicken the decision-making process or to make a decision. If people in a social network have experienced or are discussing the seriousness of a VPD, the disease is more immediately recallable and parents may be more confident in their decision to vaccinate because of that awareness. Conversely, if social networks are discussing vaccine reactions or possible reactions, the reverse can be more likely. Similarly, if parents perceive that most parents in their social network have confidence in vaccination, this perception will in turn support their own confidence and choice to accept vaccinations.

It is also important to note that school entry requirements can be associated with vaccination attitudes and beliefs. Several studies have found, for example, that parents of children with an exemption to school immunization requirements and parents of non-exempt children often have different vaccine knowledge, attitudes, and beliefs. Salmon et al. found that parents of fully vaccinated children were more likely to believe that children benefited moderately or greatly from vaccination. Salmon et al. also found that parents of fully vaccinated children generally held more favorable perceptions of vaccine efficacy and safety,[41] while Kennedy et al. found that a parent's belief in compulsory vaccination for school entry was associated with a belief in the safety and utility of vaccines.[42] In addition, the Salmon et al. study found that the majority of parents trusted their child's health-care provider and relied on the provider as the most frequently used source for vaccine information, which Salmon et al. showed can both facilitate and inhibit vaccination.[41]

Health-care provider confidence

It is clear from published studies and presentations to the VCWG that health-care providers—the frontline people who interact with parents and who administer vaccines—are critically important when it comes to instilling vaccine confidence. Studies consistently find that the vast majority of parents (≥80%) look to their child's health-care provider for information and advice on VPDs, vaccines, and the recommended immunization schedule.[43] When providers are able to effectively communicate with parents about vaccine benefits and risks, the value and need for vaccinations, and vaccine safety, parents are more confident in their decision to adhere to the recommended schedule. In a study involving both parents and health-care providers, Mergler et al. found a strong association between parental and provider vaccine-related attitudes and beliefs. For example, parents had 45 times higher odds of agreeing that the community benefits from having children fully vaccinated if their provider agreed, as compared with parents whose provider did not agree. They also noted that some parents likely chose providers with similar vaccine beliefs as their own; as such, providers with doubts about recommended vaccinations can foster or support hesitancy.[44] Finally, it has also been found that reliance on vaccine information sources other than providers is associated with exemptions from school entry requirements. For example, Jones et al. found that parents who sought vaccine information on the

Internet were more likely to have lower perceptions of vaccine safety, vaccine effectiveness, and disease susceptibility and were more likely to have a child with a nonmedical exemption compared with parents who had not sought vaccine information on the Internet.

From the perspective of vaccine confidence, it is thus important to recognize that health-care providers are key players when it comes to establishing, maintaining, and building parental confidence in vaccines. For this reason, it is critical to assess and support health-care providers' vaccine-related confidence and equip them with the information and resources they need to confidently engage with parents in vaccine conversations. The VCWG recognizes that these efforts to support providers are critical to building and fostering confidence in the patients they serve.

Information environment

In addition to health-care providers and members of parents' social network, news and entertainment media can play a significant role in influencing knowledge, beliefs, and behaviors associated with vaccines. News media coverage of celebrities declining vaccines or questioning the safety of vaccines can perpetuate the perception that vaccines are unsafe or that such beliefs are widely shared. The news media's attempt to be fair and balanced often results in quoting individuals on both sides of a vaccine issue. In other words, expert opinions of scientists or medical professionals are often juxtaposed against a parent who is certain that vaccines caused harm, when, in fact, the weight of the evidence counters such claims. That is, personal stories and anecdotes are often juxtaposed against factual opinions based on a large body of sustained scientific work. Inaccurate stories and misstatement of facts on vaccines, even when contradicted, remain in people's minds.[45]

The media's influence in setting the agenda and framing the issue is further reinforced by platforms associated with new information and communication technologies, such as social media. Social media platforms can become virtual echo chambers for fostering questions about vaccine safety and can reinforce false information and myths. The VCWG recognizes the important role that news, entertainment, and social media play as situational determinants driving vaccine confidence. In summary, the VCWG recognizes the importance of communication science and the basic and applied scientific work necessary to understand its role in vaccine confidence.

VACCINE ACCEPTANCE AND CONFIDENCE IN THE UNITED STATES

Introduction and overview

This section summarizes the current data on childhood vaccination coverage in the United States, along with (*1*) available information related to deviations from the recommended immunization schedule (e.g., immunization delay or declination), (*2*) information on exemptions from school immunization requirements, and (*3*) some key findings from surveys of parental attitudes, beliefs, and confidence with regard to childhood immunization. At present, this type of information represents the best available data on vaccine acceptance and confidence in the United States. In addition, this section describes some of the perspectives of providers, parents, and public health workers that have been collected through VCWG deliberations. Combined, the available data and information provide an instructive overview of the overall state of vaccine acceptance and confidence in the United States, as well as insights into the ways a lack of confidence can affect parental acceptance of immunization recommendations.

National coverage data

National vaccination coverage data collected and reported by CDC suggest that parental acceptance of vaccines and vaccination recommendations is quite high. During the past decade, data from CDC's NIS show consistently high and stable vaccination rates among children 18–35 months of age. The percentage of children who received no vaccinations has also remained consistently lower than 1.0% (0.7% on average) during the past decade.[10,11]

Healthy People 2020, the nation's 10-year strategic plan for improving the health of all Americans, sets a target of 90% coverage for one dose of measles, mumps, and rubella vaccine (MMR); three doses of poliovirus vaccine; three doses of hepatitis B vaccine (HepB); one dose of varicella vaccine; four doses of diphtheria, tetanus, and acellular pertussis vaccine (DTaP); four doses of pneumococcal conjugate vaccine (PCV); and the full *Haemophilus influenzae* type b vaccine (Hib) series. In 2013, coverage was at or above the Healthy People 2020 target for MMR, polio, HepB, and varicella vaccines. Coverage was below the HP 2020 target for ≥4 doses of DTaP (83.1%; target 90.0%); ≥4 doses of PCV (82.0%; target 90.0%); the full series of Hib (82.0%; target 90.0%); ≥2 doses of hepatitis A vaccine (HepA) (54.7%; target 85.0%); rotavirus vaccine (72.6%; target 80.0%); and the HepB birth dose (74.2%; target 85.0%). HepA and rotavirus vaccines were the most recent additions to the childhood immunization schedule, and coverage

rates have been increasing since their incorporation, although they remain below the rates of other vaccinations. Children living below the federal poverty level had lower vaccination coverage compared with children living at or above the federal poverty level for many vaccines, with the largest disparities for ≥4 doses of DTaP (by 8.2 percentage points), full series of Hib (by 9.5 percentage points), ≥4 doses of PCV (by 11.6 percentage points), and rotavirus (by 12.6 percentage points).[11]

State coverage data

State vaccination coverage rates reveal a more nuanced and variable picture that is masked by the national coverage averages. In general, state coverage rates have also remained stable for the past decade. However, the most recent CDC coverage data continue to demonstrate wide geographic variation in vaccination coverage in the United States in 2013. Specifically, the 2013 data showed the combined childhood vaccine series (MMR, polio, HepB, varicella, DTaP, PCV, and Hib) coverage estimates for children aged 19–35 months ranged from 60.6% in Nevada to 82.1% in Rhode Island. Looking at individual vaccines, using MMR as an example, Colorado and Ohio had the lowest coverage (86.0%) and New Hampshire had the highest coverage (96.3%). Overall, MMR coverage was <90% in 17 states.[11]

In summary, two themes emerge from the national and state coverage data. First, at both the national and state level, vaccine acceptance has remained high and stable during the past decade, although uptake has been relatively slow for newly recommended (e.g., rotavirus vaccine) or expanded (e.g., influenza vaccine) immunization recommendations. Second, national data especially, but also state data, mask variation in coverage at local levels, where exemption data and other reports indicate lower coverage rates in some places. Thus, when it comes to vaccine acceptance, the available national and state-level data indicate that immunization rates vary by both geography (e.g., state, community, and school district) and vaccine. This variation in vaccine acceptance, both by location and by vaccine, demonstrates the importance of assessing and accounting for variation at the local level to understand which vaccine coverage targets are not being met and why (including issues of confidence and access).[46]

Day care and school exemptions

School and day care exemption-related data have been used to help assess vaccination acceptance at a more granular level. In the United States, day care and school immunization requirements are the responsibility of states, and nearly all states require children to receive most of the ACIP-recommended childhood immunizations before entering day care and/or kindergarten. All states allow exemptions from vaccination requirements for medical contraindications, and in 48 states parents can also obtain religious or philosophical exemptions, including personal belief exemptions. Although state and local school district exemption data are not completely standardized, they can and have been used to identify schools or communities where relatively high numbers of children have vaccination exemptions. As such, exemption rates can be used to help identify places where vaccination acceptance is lagging, decreasing, or changing, and to indicate levels of or changes in vaccine confidence.

Rates for religious and philosophical exemptions increased from 1.0% in 1991 to 1.5% in 2004. Looking only at states with philosophical exemptions, the increase was more pronounced; from 1.0% to 2.5%. The exemption rates are higher in states that make it easier for parents to obtain exemptions.[4,21,26] Furthermore, the overall or average exemption rate in a state is often quite different from the rate for local communities or school districts; that is, there can be geographic clustering of vaccine exemptors. For example, in Washington State, the overall exemption rate in 2006 was 6.0%, but county-level exemption rates ranged from 1.2% to 26.9%.[46] Counties with high exemption rates are at much higher risk of VPD outbreaks. For example, school exemption data show a clear association between clusters of exemptions and increased incidence of pertussis.[4]

However, some cautions about using school exemptions have been raised. Salmon and colleagues found, for example, that 22.0% of the children who had been identified as exemptors by their schools were in fact fully vaccinated. They also found that a high proportion of children with exemptions (75.5%) had received some vaccines, highlighting that exemption data often do not provide information on which specific vaccines or how many were exempted.[41] Overall, it appears that school exemption data have value for identifying schools or communities where vaccine confidence and acceptance may be lagging, but it is also important to assess the completeness and quality of the data before drawing conclusions.

Delays and alternative schedules

While the NIS is designed to provide timely and accurate national and state vaccination coverage data, it is not currently designed to provide information about intentional vaccination delays or refusals on a regular basis. Obtaining information on intentional delays

or refusals requires adding questions to the standard survey. Data from two instances in which survey questions were added suggest that slightly more parents may be delaying recommended vaccinations and that the percentage has also slightly increased. NIS data showed that the percentage of parents who delayed at least one vaccine increased from 21.8% in 2003[47] to 25.8% in 2009.[17]

The VCWG also identified a number of relatively recent studies that found 10%–25% of parents have delayed or may be delaying recommended vaccines or deviating from the ACIP-recommended schedule. A national survey conducted in 2013 that addressed vaccine refusals reported that most pediatricians (87%) received requests from parents for an alternative vaccine schedule, with the pediatricians surveyed estimating that 16% of parents asked for an alternative vaccination schedule for at least one vaccine during the past year.[48] A national survey in 2010 found that 13% of parents reported using an alternative vaccination schedule.[49] In a national survey of physicians conducted in 2012, 93% reported that, in a typical month, some parents with children younger than 2 years of age requested spreading out vaccines. Despite concerns about spreading out recommended vaccinations for their young patients, 82% of the physicians in the survey believed that honoring these requests would build trust with the families.[50] In Colorado, a study of Kaiser Permanente members found that approximately 49% of children in the study population were under-vaccinated for at least one day during 2004–2008. This percentage increased from 42% in 2004 to 54% in 2008. This study further estimated that 13% of children were under-vaccinated due to parental choice during 2004–2008, which is consistent with national estimates.[51] In addition, a study from Portland, Oregon, showed that the percentage of parents who chose to limit the number of vaccinations received per visit increased from 19% in 2005 to 30% in 2009.[52]

As the Portland data help illustrate, national or state-level findings do not provide information or insights into the vaccine-related decision-making process of parents in a given community, where changes to the recommended immunization schedule may be happening more frequently. Rather, these data indicate that despite relatively high and steady national coverage rates, there are places in the country with a higher percentage of parents choosing to delay or decline recommended vaccines. It should be noted that alternative schedules are not supported by scientific evidence nor recommended by ACIP or other agencies.

Surveys of confidence, attitudes, and beliefs

As previously noted, there is likely a relationship among attitudes, beliefs, and vaccine confidence. Parental confidence in vaccines and vaccination recommendations is often linked or influenced by the parents' beliefs as well as whether they have favorable or unfavorable perceptions of vaccine safety, effectiveness, and value. A variety of attitudes and beliefs likely influence parental confidence in vaccines and, in turn, their willingness to adhere to the ACIP-recommended schedule. For example, in one systematic review of 15 studies that used various qualitative methods, the authors found that many parents believed vaccines caused adverse health events and expressed concerns about short- and long-term adverse events. The authors also found that some parents expressed distrust of the medical community and identified several challenges with vaccine access, including poor communication with health-care staff, unpleasant staff, and being unaware of the current, approved vaccination schedule.[36]

Pediatrician and provider perspectives

A health-care provider's interaction with a parent often greatly influences parents' decisions to accept vaccinations and follow the ACIP-recommended immunization schedule. In most cases, parents rely on their child's health-care provider for information and advice, and the health-care providers' knowledge, approach, and communication skills are the most influential determinants of parents' vaccination-related behaviors.[53] In surveys of parents, health-care providers are consistently listed as the most trusted source of information.[54] In addition, parents who change their minds about vaccination (e.g., deciding to vaccinate on time rather than delay) often cite a provider recommendation as the reason for the change. When it comes to vaccines, the provider-parent interaction may be even more predictive of vaccination status than parents' demographic characteristics.[53]

While the majority of health-care providers (84%) feel comfortable addressing parents' questions and concerns regarding vaccines, most providers also believe parents' confidence in vaccines is declining and more parents are requesting alternative vaccination schedules. A national survey of providers in 2009 found that 43% of providers thought parents' level of concern had greatly increased and 28% thought it had moderately increased compared with five years ago. This same survey reported that in a typical month, 79% of providers had at least one parent refuse a vaccine, 89% had at least one request to spread out vaccines, and 20% reported that more than 10% of parents requested to alter the vaccine schedule.[55] Similarly,

the American Academy of Pediatrics reports that up to 85% of physicians encounter families or parents who are planning to refuse one or more recommended vaccines.[56] Health-care providers also report challenges in communicating about vaccines with parents. Time constraints on increasingly extended providers, lack of information regarding new vaccines and vaccination recommendations and safety, and parents having misperceptions or misinformation regarding vaccine safety or adverse events have all been cited as challenges by providers.[55,57]

Although adherence to recommendations is the norm, from the provider perspective, more parents have concerns and more are requesting alterations to the recommended immunization schedule than in the past. In light of the importance of provider-parent relationships in fostering vaccination confidence and acceptance, the VCWG noted the need for efforts to support physicians, nurses, and other clinicians in their roles as vaccine educators. To do so, it will be important to more frequently survey providers to understand the barriers they face and to develop and promote tools that will assist them in providing vaccine-related education and counseling.

Public health perspectives

State immunization program managers have a general sense that parental confidence in vaccines is declining in some communities, and the number of parents using alternative vaccination schedules is increasing. According to a January 2014 survey of state immunization managers, most respondents listed vaccine hesitancy as a moderate to high priority for their programs. According to state immunization managers, areas with low vaccination confidence are normally identified through increases in school exemptions and/or from conversations with local health-care providers. Few immunization program managers relied on immunization registry data or coverage rates; in fact, most listed the lack of local information and coverage data as barriers to precisely gauging the state of vaccine acceptance and/or identifying communities of hesitant parents and their specific concerns. A lack of resources to collect local coverage data and assess parents' concerns was also cited as a barrier.[58]

Conversations with mothers about vaccine confidence

As the studies previously referenced illustrate, parents fall along a spectrum of vaccination attitudes and beliefs. In addition to reviewing recently published research, the VCWG elicited input from 11 mothers and one expectant mother via three online focus groups. The women who participated were recruited by an external research firm that specializes in recruiting participants for focus groups and panels. Selection was purposive and done to ensure no conflicts of interest. The focus groups included mothers who were following the ACIP-recommended immunization schedule and those who had delayed or declined, or planned to delay or decline, some recommended vaccinations. The focus group discussions were designed to obtain participants' thoughts about recommended vaccinations, perceptions of vaccinations, and suggestions for increasing parental confidence in recommended vaccinations.

The themes that emerged from these discussions reinforced the findings from the literature. First, all the focus group participants sought to make the best decisions for their child(ren)'s health when it came to vaccinations, including the mothers who had delayed or foregone, or were planning to delay or forego recommended vaccinations. Most of the mothers indicated that they had done some research (e.g., Internet searches) related to vaccines and vaccination and spoken with their child's health-care provider. Second, confidence in recommended vaccines and vaccinations varied, with mothers who were following the ACIP-recommended schedule having the most confidence. Mothers who expressed less confidence noted they had questions or concerns regarding the number of vaccinations given at one visit, the timing of vaccinations, and/or specific vaccines (e.g., influenza and HPV). Third, most of the mothers indicated that it was important for parents to be educated about vaccines and to be active participants in vaccination decisions. Respondents noted that parents should do their own research and ask health-care providers questions about vaccines. This point goes hand in hand with another theme from the focus group discussions; namely, that parents want to be viewed and treated as individuals by health-care providers. As one mother noted, "First and foremost, knowing my physician is listening to my concerns (is important) whether or not [my physician] already knows [he or she is] right—to see me and my child as unique human beings with unique concerns." Finally, with respect to steps that could be taken to foster vaccine confidence, suggestions included providing more information on how vaccines work in a child's body; encouraging strong partnerships between parents and health-care providers; sharing more research related to vaccine safety, as well as providing greater visibility of what has been learned regarding vaccine safety; and explaining efforts to address and/or accommodate parental preferences regarding the vaccination schedule.

Conclusions

From the data and perspectives gathered, the VCWG concluded that vaccine acceptance remains high and stable for the majority of infant and childhood vaccines in the United States. However, vaccine confidence may not be as high as needed for all recommended vaccinations or as high as needed in some communities and schools. Data on school exemptions, vaccination delays and declinations, and perspectives of parents, health-care providers, and public health workers indicate that there is room for improvement in building confidence to maintain the currently high vaccination coverage rates.

MEASURING AND TRACKING VACCINATION CONFIDENCE

Introduction and overview

As detailed in the previous section, a more systematic approach to measuring and tracking U.S. vaccination acceptance and confidence at the national, state, and community levels is needed. While our current system does show that vaccination coverage rates remain high nationally and that the majority of parents and the population support vaccinations, there are gaps in immunization programs' ability to identify places or communities where confidence or acceptance is low and/or may be declining. The VCWG acknowledges that there is already ongoing work on developing robust methods of measuring vaccine confidence, and these efforts should be supported, strengthened, and accelerated.[59] For example, measures that are sensitive enough to detect whether significant numbers of parents are delaying or making other changes with respect to following the ACIP immunization schedule are needed. Moreover, we need measures that are sensitive enough to detect variation in vaccine confidence at local or regional levels that contribute to lower immunization rates. Currently, a variety of indicators are being used as proxies for vaccine confidence. For example, state and local immunization programs often utilize school exemption information as well as communication with local providers to develop a broader understanding of the local factors that may contribute to increased exemptions in communities. Although this information is important and helpful, reliance on such information also highlights the general lack of consistent and accurate indicators of parental acceptance and confidence.

In addition to having more and robust measures of vaccination acceptance, the development of validated measures and consistent measurement systems for assessing vaccination confidence are needed. While some work has been done to develop and evaluate accurate measures of parental vaccination confidence, these efforts are in the early stages. Efforts to date are focused on identifying and incorporating items that encompass the major determinants or mediators of vaccination confidence, yet agreement or consensus on what the measures should include to link confidence to acceptance and vaccination is lacking. Thus, there are currently no widely validated measures of parental or immunization provider vaccine confidence, and large-scale efforts to assess the utility of potential measures in broad parent or health-care provider populations have not been undertaken.[59,60] For vaccine confidence measures to be of value, they must both be linked to vaccination acceptance and be able to discern the elements associated with increased or decreased confidence. The availability of validated measures will also make it possible to test the effectiveness of intervention strategies designed to increase vaccine confidence and to compare intervention strategies to determine best practices.

Vaccination confidence: current measurement approaches

A number of efforts in the United States, Australia, and Europe have been launched to develop validated measures of vaccine confidence and to assess the level of vaccine confidence in a population or subpopulation. Measures and approaches that were presented to the VCWG included the following:

- University of Sydney, Australia: Julie Leask presented to the VCWG her team's efforts to develop and evaluate a three-tiered measurement system called the Vaccine Attitudes Beliefs and Concerns (V-ABC). V-ABC is designed to (*1*) measure and track population-level vaccine acceptance; (*2*) identify—for either individuals or a population—the attitudes, beliefs, and concerns that affect vaccine acceptance; and (*3*) help identify and/or diagnose the factors that influence (e.g., increase or decrease) vaccination confidence to target and evaluate public health campaigns and other interventions. V-ABC is a 25-item measure drawing on data from national surveillance efforts to identify key classes of attitudes, beliefs, and concerns, and to diagnose and target interventions.[61]
- In the United States, similar efforts to design a tiered system of surveys to move from national surveillance to more detailed analysis and diagnosis of specific concerns are underway. In Washington State, Douglas Opel and colleagues have developed a survey of Parent Attitudes about Childhood Vaccines (PACV) to identify parents who are hesitant about childhood vaccines and

may under-immunize their children as a result.[28,59] The PACV survey has been validated and shown to be predictive of under-immunization in the Seattle Group Health population and is currently being tested in other populations. In addition, in collaboration with Dan Kahan of Yale University, an effort is underway to condense the PACV survey into a five-item survey that would be equally predictive of vaccination behavior. This shortened survey instrument could be used for national surveillance, but requires further testing for validation.

- Robb Butler of the World Health Organization presented the Guide to Tailoring Immunization Programmes (TIP) developed by the World Health Organization—Europe in 2013 at the request of the European Technical Advisory Group of Experts on Immunization. TIP is an evidence- and theory-based behavioral insight framework and diagnostic guide designed to help (*1*) identify and prioritize vaccine-hesitant populations and subgroups, (*2*) diagnose the demand- and supply-side barriers to vaccination in these populations, and (*3*) design evidence-informed responses to vaccine hesitancy that are appropriate to the setting, context, and hesitant population. Many factors can influence a parent's decision to accept immunizations for their children. These factors vary from one location to another, differ by subgroups within a population, and can also vary with respect to time and vaccine. To address vaccine hesitancy effectively, interventions must target subgroups and be tailored to address the factors that are leading to the vaccine hesitancy at that time and in that context. TIP provides immunization program guidelines to help in this process of population segmentation, diagnosis of concerns, and intervention design. TIP has been successfully used in Bulgaria, Sweden, and the United Kingdom; however, it does require trained facilitators, which has limited its use beyond these countries. Currently, there are plans to make a more practical TIP that would require fewer resources and training.[62]
- Heidi Larson from the London School of Hygiene & Tropical Medicine and her colleagues continue to work to better understand vaccine confidence globally. In a report from a multi-country (i.e., Georgia, India, Nigeria, Pakistan, and the United Kingdom) survey of confidence in vaccines and immunization programs, the authors reported on their Vaccine Confidence Index, analogous to the Consumer Confidence Index. The index is expected to track public sentiment related to vaccines and vaccination.[63]

Toward more sensitive measures of vaccination acceptance: vaccine registries and electronic health records

Immunization information systems (IISs) and electronic health records (EHRs) in the United States may be another way to gather information and gain insights regarding vaccine confidence. Both involve the collection of health-related information, including vaccinations; as such, they may provide opportunities to create centralized repositories of community-level coverage data[64] that researchers or public health officials could access to identify groups or places with low vaccination rates. In addition, some states have added coding fields to IISs and EHRs, making it possible to determine any vaccination delays or refusals. Such information can help quantify how many parents are delaying or refusing recommended vaccinations or following an alternative immunization schedule.

IISs and EHRs could enhance current national coverage measures and be used at the state and local levels to identify pockets of under- or un-vaccinated children that are often hidden by our current national and state surveillance methods. However, there are still major barriers to implementation of IISs and EHRs, including broader use related to vaccination confidence. Namely, IISs and EHRs are not nationally standardized and vary dramatically from state to state (as well as provider to provider) with regard to widespread adoption and functionality. Despite these challenges, improvement, standardization, and expansion of IISs and EHRs are currently areas of work and attention by several organizations and programs, and have been illustrated by CDC's IIS Strategic Plan[65] and initiatives such as the Office of the National Coordinator for Health Information Technology IIS Data Exchange project.[66]

VCWG ASSESSMENT AND RECOMMENDATIONS

After reviewing the available research, the VCWG concluded that there are many research and monitoring needs related to vaccination confidence and acceptance. First, work is needed on developing and evaluating vaccine and vaccination confidence measures toward the goal of having a set of validated measures. The availability of tested measures will make it possible to evaluate vaccination confidence-related intervention strategies and determine best practices. Second, there is a need for a national surveillance system that encompasses both vaccination coverage and vaccination confidence. As is currently possible and done with vaccination coverage, such a system would

have the ability to track trends over time; be sensitive enough to detect variations across populations, time, and geography; and provide actionable information regarding vaccination confidence and acceptance.

The VCWG recognized that the state of the science of vaccine confidence and acceptance measurement is a multi-method, multinational work in progress. With this idea in mind, the NVAC makes the following recommendations:

FOCUS AREA 1: MEASURING AND TRACKING VACCINE CONFIDENCE

1.1. Development of an index, composed of a number of individual and social dimensions, to measure vaccine confidence. This index should be capable of (*1*) rapid, reliable, and valid surveillance of national vaccine confidence; (*2*) detection and identification of variations in vaccine confidence at the community level; and (*3*) diagnosis of the key dimensions that affect vaccine confidence.

1.2. Continue the use of existing measures for vaccine confidence, including systems that measure vaccine coverage as well as vaccine-related confidence, attitudes, and beliefs, while the science of understanding and tracking vaccine confidence is being advanced.

1.3. Development of measures and methods to analyze the mass-media environment and social-media conversations to identify topics of concern to parents, health-care providers, and members of the public.

1.4. That existing approaches and systems for monitoring vaccination coverage rates and vaccine-related cognitions, attitudes, and behaviors be strengthened and enhanced. These include: (*1*) IISs and EHRs to collect and capture delays and refusals; (*2*) reliable and valid measures (or surveys) of factors such as adult and parental confidence, attitudes, and beliefs regarding vaccines and recommended vaccinations; (*3*) surveys of provider attitudes and beliefs toward vaccination; and (*4*) integration of data from all existing systems to track trends in vaccination confidence over time and to detect variations across time and geography.

Strategies to increase vaccination confidence

The VCWG determined that there is a need to both better identify communities where vaccine confidence is low and/or waning (as outlined in the previous section) and address those communities with targeted and effective intervention strategies to increase vaccine confidence. The term "communities" refers to both geographical areas (e.g., cities and neighborhoods) as well as population groups that share certain common characteristics or experiences (e.g., race/ethnicity and socioeconomic status, among others). The VCWG further concluded that supporting confidence in vaccinations at individual, community, and national levels is a complex challenge and no single strategy will be sufficient. Vaccine confidence and the determinants of confidence vary by location, population, time, and vaccine. Therefore, addressing issues of vaccine confidence requires careful assessment of the setting, root causes of lack of confidence, and, most likely, the employment of several strategies to increase confidence.

While intervention strategies are needed, few studies currently have evaluated the impact of interventions on increasing vaccine confidence.[67] Researchers and organizations working in this area are identifying promising evidence-informed and, in some cases, validated strategies. In addition, the VCWG heard from a variety of presenters working in related and relevant fields (e.g., behavior change, health communication, risk communication, and public health promotion) and determined that many strategies could be adapted for use to increase vaccine confidence. However, as outlined in this report, the study of vaccine confidence is a relatively new field with definitions and clear measures still being determined. Therefore, intervention strategies aimed at increasing confidence in vaccinations are also developing. Highlighted throughout the VCWG recommendations are the need for (*1*) continued research toward the development of validated interventions and (*2*) accessible repositories where strategies, resources, and effective practices can be shared to facilitate communication and forward progress among those working in this field.

The VCWG drew upon the published research, invited presentations, and online focus group discussions to develop their recommendations. These recommendations are presented as three general categories of strategies to support and increase vaccine confidence:

- Communication and community,
- Health-care providers, and
- Policy

FOCUS AREA 2: COMMUNICATION AND COMMUNITY STRATEGIES TO INCREASE VACCINE CONFIDENCE

2.1. The NVAC recommends that health-care providers, immunization programs, and those involved in promoting recommended vaccinations actively reinforce that vaccination of children according to the ACIP-recommended schedule is the social norm and not the exception. Misperceptions that vaccination in line with the ACIP-recommended schedule is not the norm should be appropriately addressed.

The vast majority of parents in the United States choose to vaccinate their children in accordance with the ACIP-recommended schedule. Numerous presenters stressed the importance of promoting public awareness that on-time vaccination is the social norm. While the data continue to show that coverage rates are high, stories and rhetoric in the media and elsewhere can lead people to believe that vaccination rates are much lower than they are. Communicating that 80%–90% or more of parents choose to vaccinate their children in line with the recommended schedule not only ensures that parents and the public have access to accurate information, but can also serve to strengthen this social norm by reinforcing to parents and the broader community that their decision to vaccinate is in agreement with the values and decisions of most parents.

2.2. The NVAC recommends consistent communications assessment and feedback pertaining to vaccine confidence. These include:

2.2.1. Creation of a communication assessment infrastructure to assess vaccine sentiment and provide timely, accurate, and actionable information related to vaccination confidence and acceptance to relevant stakeholders. This system should have the capability to regularly assess the vaccine-related messaging environment (e.g., to identify new or emerging concerns and questions) to assess the understanding and effectiveness of education and information materials and resources.

2.2.2. Identification, evaluation, and validation of communication resources and approaches in terms of their effects on enhancing vaccine and vaccination confidence so that effective (i.e., evidence-based/evidence-informed) interventions and best practices can be shared and more widely used.

2.2.3. Creation of a repository of evidenced-based best practices for informing, educating, and communicating with parents and others in ways that foster or increase vaccine or vaccination confidence. This repository would be maintained and expanded as future evidence is compiled regarding messages, materials, and interventions that positively affect vaccine or vaccination confidence.

The most effective communication strategies are typically those tailored or customized to the questions and concerns of a particular target audience. Employing effective communication strategies requires ongoing assessment of current and arising vaccination sentiments. Toward this aim, the NVAC recommends the creation of a dashboard that can reflect the vaccine-related messaging environment and track the attitudes, questions, and beliefs regarding vaccinations. This tool will help to both tailor messages and also assess whether or not those messages are having an impact on addressing questions and concerns and increasing vaccine confidence.

Effective communication also requires understanding which messages are most effective for different audiences, which is not always straightforward. It has been shown that the effectiveness of messages often varies depending on how confident parents are in vaccines and that some pro-vaccine messages can have unintended consequences, especially with people who are the most hesitant about vaccination.[68] As a result, the VCWG also recommends continued evaluation of communication resources and approaches with a variety of audiences. Specifically for vaccinations, message testing following segmentation of parents according to vaccination confidence is of critical importance to increasing our understanding of how best to communicate with all parents regarding vaccines.

Finally, to facilitate the translation of research into practice, the VCWG identified a need to create a repository of evidenced-based best practices. This repository would provide researchers and public health workers with a database of the most current data, materials, and resources related to vaccine and vaccination confidence. It would also facilitate coordination and collaboration on strategies and approaches to foster, build, or maintain vaccination confidence, including

ones focused on testing and evaluating communication strategies across diverse settings and populations.

2.3. The NVAC recommends the development of systems to support parent and community efforts that seek to promote vaccine confidence and vaccination.

Parents themselves can often be the strongest and most persuasive advocates for vaccination in their communities. As trusted members of their communities and with a direct understanding of the concerns of their peers, parents who support vaccinations can serve as powerful partners for public health by identifying and helping to address the most relevant issues. While the vast majority of parents choose to vaccinate their children, this majority is often not the most vocal or visible. Seeing an opportunity to help give a voice to this majority, several organizations and immunization programs have partnered with and provided resources and support for parents looking to communicate about the importance of vaccination in protecting their children and their community. The NVAC recommends continued support for parent and community-based efforts.

2.4. The NVAC recommends support for a community of practice or network of stakeholders who are actively taking steps to foster or grow vaccine confidence and vaccination; such a network can foster partnerships and encourage sharing of resources and best practices.

Many stakeholders, health-care providers, and public health advocates are working to promote childhood vaccinations at the local, state, or national level. The NVAC believes that efforts to foster collaboration and share information would bring many benefits, including helping stakeholders find useful resources, building a portfolio of effective practices, and fostering better understanding of the determinants and factors associated with vaccine confidence.

FOCUS AREA 3: HEALTH-CARE PROVIDER STRATEGIES TO INCREASE VACCINE CONFIDENCE

Providers are consistently cited as a key factor in parents' vaccine decision making.[19,43,69] Therefore, providers, including pharmacists, nursing professionals, physicians, and other health staff involved in vaccination, need to be equipped with the resources and materials necessary to address parents' questions and concerns, and be confident in their ability to do so. Confident, well-informed health-care providers who can effectively communicate to the public and patients about the benefits of immunization are central to achieving optimal health outcomes. Provider confidence means that clinical staff should feel they have sufficient time to spend with parents or patients to answer questions about vaccinations, accurate and up-to-date information about the recommended immunizations, and the skills and resources needed to effectively communicate with concerned parents. For these reasons, the NVAC believes it is important to put a high priority on ensuring adequate support, resources, and training for health-care providers.

3.1. The NVAC recommends the development and deployment of evidence-based materials and toolkits for providers to address parents' questions and concerns. These materials and toolkits should continue to be revised to incorporate the latest communication science and research.

3.1.1. A repository of evidence-based effective practices for providers should be an output of this effort.

There is a need to provide evidence-based communication strategies, resources, and other interventions that can be used to address, build, or foster vaccine and vaccination confidence in patients and providers. Immunization intervention and communication strategies that health-care providers can tailor to the characteristics or needs of their patient or parent population are in particular demand. While toolkits and other vaccine-related educational resources are currently available, the VCWG has heard from health-care providers that most of these toolkits have not been evaluated or validated. In addition, there is ongoing discussion and research to establish the most effective communication strategies for providers in both initiating and engaging in conversations about vaccinations. Several promising strategies are currently being tested to address these issues, but they require further study and validation across different populations and with parents segmented by their confidence in vaccines.[70,71]

NVAC also recommends the establishment of a repository (e.g., an online or Web-based repository) for this information that is easily accessible to a range of providers. Once effective intervention and communication strategies and resources are developed and

reviewed, this information should be disseminated and made readily available to a wide range of immunizers.

3.2. The NVAC recommends the development of curriculum and communication training that focuses on vaccine confidence (e.g., strategies and approaches for establishing or building confidence) that can be made available to health-care providers, including doctors, nurses, alternative providers, and ancillary care providers. Such tools and training will allow providers to address any vaccine-related concerns of patients or parents expeditiously through a variety of platforms.

3.2.1. This training should encompass "providers in training," such as students, residents, and interns, as well as currently practicing physicians, nurses, and other health-care providers through continuing medical education (CME) credits.

3.2.2. Clear and accessible information on vaccinations, the schedule, and any changes to the immunization schedule should be developed specifically for providers and made available to them through resources they utilize most.

Training health-care providers to communicate effectively about vaccines is a critical task in the effort to increase vaccine confidence. Focusing efforts on the education of health-care students is one strategy to ensure that providers are knowledgeable and confident in vaccines and vaccination recommendations, and confident in negotiating potentially complex conversations with their patients. Educating students to this end will require the development of curricula that meet the needs of the provider once in practice. In addition, vaccine education and communication-related curricula should be developed for student nurses, physicians, interns, and health-care providers, and should be applicable to the populations and environments in which they work. As continuing education for all health-care providers is a necessity throughout the career span, educational information should also be available to practicing providers in formats that are easy to access and available from sources they trust and use. CME is one method for reaching current providers, along with workshops at annual meetings and conferences.

3.3. The NVAC recommends: (*1*) that a meeting of appropriate vaccination stakeholders be held to discuss the current coding infrastructure and the possible need to develop and value a new code for vaccine counseling when vaccination is ultimately not given; and (*2*) the development of pay-for-performance initiatives and incentives as measured by (*a*) the establishment of an immunizing standard within a practice and (*b*) continued improvement in immunization coverage rates within a provider's practice.

Physicians and other health-care professionals want to take the time to engage and answer all questions that patients, parents, and caregivers may have with respect to vaccination. The Current Procedural Terminology Category I immunization administration codes[72] are able to capture this service, as they are valued to include the physician work of vaccine counseling. However, the current codes cannot be reported to capture the time physicians take to address the questions and concerns of patients, parents, and caregivers who ultimately choose not to vaccinate. To help address the concerns that these providers have regarding the amount of time they may need to spend with some patients, parents, and caregivers educating them about the benefits of vaccines and addressing concerns, the development of a code for immunization counseling performed in the absence of vaccination should be explored. While patients, parents, and caregivers may refuse vaccinations at one visit, the time and conversation they have with the health-care provider may encourage them to vaccinate at a later date. Establishment of such a code would highlight the value of these conversations and recognize the need to adequately compensate physicians and other appropriate health-care professionals for their time and services.

To achieve high immunization practice standards in clinical settings, formal recognition of the time investment made by these providers in addressing parent, caregiver, or patient questions and concerns is critical. A new immunization counseling code could provide the additional benefit of allowing performance incentives for providers to be established, and allowing providers to gauge how they are performing when taking time to explain the risks and benefits of vaccination to parents, caregivers, or patients. The NVAC recognizes that important details are involved in the final development and implementation of such an immunization counseling code and urges that appropriate vaccination stakeholders be convened to discuss, develop, and implement such a counseling code. This recommendation is aimed at addressing concerns and issues related to immunization counseling when vaccines are

not administered at the same visit. The NVAC believes that the impact of this recommendation should be evaluated as more data on the effectiveness of billing for counseling without immunization administration become available.

FOCUS AREA 4: POLICY STRATEGIES TO INCREASE VACCINE CONFIDENCE

4.1. The NVAC recommends states and territories with existing personal belief exemption policies assess their policies to assure that exemptions are only available after appropriate parent education and acknowledgement of the associated risks of not vaccinating to their child and community. Policies that do not do this should be strengthened.

4.1.1. Increased efforts should be made to educate the public and state legislatures on the safety and value of vaccines, the importance of recommended vaccinations and the ACIP schedule, and the risks posed by low or under-vaccination in communities and schools. The impact of these efforts on immunization rates should be closely monitored.

As outlined earlier in this report, all U.S. states require children to receive a number of vaccines prior to entering school. School and early childhood care center vaccination requirements have been shown to effectively increase vaccine coverage and provide an important public health benefit by reducing rates of VPDs.[46] All 50 states and the District of Columbia permit medical exemptions, which protect children where vaccination is medically contraindicated. Almost all states allow nonmedical exemptions for religious beliefs, and many states allow exemptions for personal beliefs. As of July 2012, 48 states allowed religious exemptions and 18 states allowed exemptions based on philosophical or personal beliefs.[73] The NVAC recognizes that there are differences between these two types of exemptions and that personal belief exemptions can accentuate the problem.

Steps required for obtaining exemptions vary by state. Some state policies make exemptions relatively easy to obtain, while others make it more difficult and require parents to receive education on the risks and benefits of vaccination from a licensed health-care provider. Research has demonstrated a relationship between the ease of exemption and the exemption rate. States with less rigorous procedures for obtaining exemptions have higher exemption rates.[20,74]

Exempt children are at increased risk for acquiring VPDs and pose a risk for transmitting infection to other susceptible people in their communities. The risk is also amplified because children with personal belief exemptions are often geographically clustered. Data show that these geographic areas with high rates of vaccination exemptions have higher rates of VPDs.[4]

For the aforementioned reasons, the NVAC concluded that exemptions should not be allowed to easily occur because of misinformation or convenience. Exemptions, like immunizations, carry responsibilities that need to be recognized by state legislatures and the public. Therefore, the NVAC recommends that states with personal belief exemption policies ensure that parents seeking exemptions first obtain vaccine- and immunization-related education from a state-approved appropriate source as well as explicitly acknowledge the risks associated with not receiving recommended vaccinations. The NVAC recommends appropriate sources to be state health departments or health-care providers for children whom the state considers appropriate for immunization education. The NVAC further recommends that state legislatures should be informed of the individual and public health benefits that vaccines provide along with the risks associated with not vaccinating (e.g., more children susceptible to VPDs).

4.2. The NVAC recommends information on vaccination rates, vaccination exemptions, and other preventive health measures (e.g., the presence or absence of a school nurse) for an educational institution be made available to parents.

4.2.1. Encourage educational institutions and childcare facilities to report vaccination rates publicly (e.g., via a school health grade or report).

When choosing a school for their child, parents often seek out and have access to a range of information—from school performance indicators and student test scores to after-school programs and policies to ensure the safety and health of their child. As stated previously, communities with higher rates of exemptions have higher rates of VPDs. The NVAC concluded, given this fact, that many parents would be interested to know the vaccination rate at their child's or children's school. Although this information is likely collected by state health departments, it is often not easily accessible to parents. The NVAC therefore recommends that schools make this information readily available to parents so that they can be informed about decisions regarding the safety of their children.

4.3. The NVAC recommends that on-time vaccination should be included as a quality measure for all health plans, public and private, as a first-line indicator of vaccine confidence. The NVAC acknowledges that other issues, such as access, can also affect on-time vaccination.

FOCUS AREA 5: CONTINUED SUPPORT AND MONITORING OF THE STATE OF VACCINE CONFIDENCE

The NVAC believes that both public and private entities play a role in helping to foster and improve vaccine confidence. As such, it is important that resources from both public and private sectors be available to implement efforts geared toward improving or sustaining vaccine confidence.

5.1. Stakeholders from the public and private sectors have essential roles in helping to build vaccine confidence. It is critical that both public and private resources be made available to help support and accomplish the recommendations set forth in this document.

The NVAC also believes that it is important to continue monitoring and evaluating the state of vaccine and vaccination confidence in the United States. Tracking the state of vaccine confidence on a regular basis will keep the NVAC and other stakeholders informed about what is being done to implement these recommendations.

5.2. The NVAC recommends that the National Vaccine Program Office (NVPO) should work with federal and nonfederal partners to develop an implementation plan to address vaccine confidence, including metrics, and report back to the NVAC on the progress annually.

CONCLUSION

Sustaining and, in some cases, improving the timely acceptance of recommended vaccines and vaccinations for children depends on the active involvement of practitioners and parents, among others. At the heart of these efforts are relationships, with the strongest and most effective relationships being those built on trust. Vaccine confidence encompasses these important concepts: it recognizes that parents and health-care providers need to have trust in the recommended vaccines, trust in the providers who recommend and administer vaccinations, and trust in the processes that lead to vaccine licensure and the recommended schedule.

In reviewing the current state of affairs in the United States, the NVAC found much that is positive or encouraging. First, childhood immunization rates are at or near historically high levels. The vast majority of parents are following the ACIP-recommended immunization schedule, and the vast majority of children are receiving recommended vaccines—and getting them on time. While vaccine coverage rates are an incomplete measure of vaccine confidence, the fact that acceptance is high does indicate that most parents have confidence in recommended vaccines. Importantly, and in line with the recommendations of experts, efforts are made by CDC and others to highlight and promote this social norm for children so that other parents, especially first-time parents, can be confident in their decision to follow the ACIP schedule. The NVAC recognizes the importance of these efforts and recommends that those involved in promoting recommended vaccinations continue to actively highlight that following the childhood immunization schedule is the social norm rather than the exception. It is also recommended that parents and the community at large know the vaccination rates and vaccination exemptions in the community, but especially in educational institutions (e.g., day care centers, elementary schools, and middle and high schools).

It was also encouraging that most parents seek and trust information and guidance from health-care providers on vaccines and vaccinations. Most health-care providers recognize the important roles they play in fostering confidence and acceptance of recommended vaccines. While many health-care providers encounter families or parents who are considering delaying or foregoing recommended vaccinations, the vast majority of health-care providers are willing to engage in lengthy vaccine-related conversations and take steps that foster confidence and, ultimately, acceptance. However, they are seeking advice on how to conduct these conversations most effectively and efficiently.

The VCWG's examination of the state of vaccine confidence did, however, find a number of areas where improvement or additional efforts are needed. The first area involves measurement and assessment. Although CDC's NIS is a powerful and important tool for monitoring national and state immunization coverage, there is no system or survey that routinely monitors vaccine confidence or the factors related to confidence. There is a need for regular as well as better metrics to track parents' vaccine-related confidence and to provide timely, accurate, tested, and actionable information to

relevant stakeholders. It is also important that tracking and intervention efforts go beyond the national and state levels. Given that VPD outbreaks begin in communities, including in schools, efforts are needed to find ways to assess vaccine confidence at the community and perhaps health-care provider levels. Furthermore, and as noted in this report, the state of science of vaccine confidence and acceptance measurement will involve using multiple methods and approaches, including looking at efforts in other countries.

Related to the aforementioned, there is also a need for research and evaluations that can identify evidence-based interventions related to fostering vaccine confidence. Relatively little is currently known regarding the best and most effective approaches to respond to parents who lack confidence in recommended vaccines, how to interact with communities that lack confidence, or what actions to take to address low or declining vaccine confidence. Based on experience to date, it is likely these efforts will be multidisciplinary.

While the VCWG discovered that excellent work is being done on the communication front, needs and opportunities for improvement exist. The needs include having consistent and regular assessments of the vaccine communication environment. It is important for policy makers, immunization programs, and health-care providers to have information on parents' vaccine-related knowledge, beliefs, intentions, questions, concerns, and confidence. It will also be helpful to know whether or not vaccine education efforts and materials are addressing the right questions and concerns and building vaccine confidence, suggesting continuous tracking and evaluation. In addition, developing a repository of evidence-based or evaluated approaches and materials would greatly assist immunization programs and health-care providers. Evidence-based approaches and materials can increase both the effectiveness and efficiency of communication and educational efforts.

Implementation of these recommendations and improvement in vaccine confidence requires close coordination and concerted action among federal agencies as well as private and nonprofit sector stakeholders to draw on their synergies and advance childhood vaccination. It is also critical to assess the impact of these efforts at local, state, and national levels and ensure that efforts are made to develop concerted action and avoid duplication.

Finally, going forward, it is important to support frontline health-care providers in their daily efforts to educate, inform, and guide parents on vaccines and vaccination recommendations. Health-care providers are consistently cited as a key factor in parental vaccine decision-making, and parents usually follow the recommendations of their trusted health-care providers. Today, and likely in the future, the demands on health-care providers' time will increase and their expertise will be sought on many topics. As such, a high priority needs to be placed on (*1*) training and assisting health-care providers on vaccines and vaccine communication so they can effectively address parents' questions and concerns (e.g., through curriculum, coaching, regular updates on vaccine recommendations and vaccine safety, and a repository of evidence-based educational materials) and (*2*) systems and incentives that recognize the value of health-care provider-parent vaccine education and offer encouragement for undertaking such efforts (e.g., being able to take the time to address parents' concerns and be able to bill for vaccine-related counseling).

Vaccines have made an enormous contribution to the health and well-being of all, but some people still question or doubt their value and importance. It is thus essential to recognize that confidence now plays a central role in vaccine acceptance, and investments and efforts are needed to ensure that high levels of trust exist in recommended vaccines, the health-care workers who provide them, and the entities and processes involved in vaccination policies and recommendations.

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Address correspondence to: Judith Mendel, MPH, U.S. Department of Health and Human Services, Office of the Assistant Secretary for Health, National Vaccine Program Office, 200 Independence Ave. SW, Room 733G, Washington, DC 20201-0004; tel. 202-205-5317; e-mail <judith.mendel@hhs.gov>.

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