

# Overcoming Challenges to Childhood Immunizations Status



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## KEYWORDS

- Childhood immunization • Vaccines • Health disparities • Missed opportunities
- Vaccine hesitancy • Immunization information systems

## KEY POINTS

- Multiple strategies should be considered to address improving immunization rates and decreasing disparities.
- These may be at a physician or patient level, practice or health systems level, community level, as well as at a state and national level.
- Use of immunization information systems is vital in effectively implementing these strategies.

## INTRODUCTION

Vaccines are one of the greatest public health achievements and are one of most cost-effective ways to prevent diseases and advance global welfare.<sup>1</sup> Although immunization coverage rates have been steadily increasing in the United States, overall rates are still less than the 90% target for Healthy People 2020. In 2013, vaccination coverage for children 19 to 35 months old reached the 90% national Healthy People 2020 target for measles, mumps, and rubella vaccine (MMR), hepatitis B vaccine (Hep B), poliovirus vaccine, and varicella vaccine. However, coverage rates were below target levels for diphtheria, tetanus, and pertussis vaccine (DTaP), pneumococcal conjugate vaccine (PCV), *Haemophilus influenzae* type b vaccine (Hib), hepatitis A

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vaccine (Hep A), rotavirus, and the hepatitis B birth dose.<sup>2</sup> For the combined series recommended for children aged 19 to 35 months (4:3:1:3\*:3:1:4)<sup>1</sup> national rates were 70.4%.

Increasing rates have led to dramatic declines in illness and mortality related to vaccine-preventable illness<sup>3</sup> (Table 1). Routine childhood vaccinations also significantly decrease costs to society.<sup>4</sup> However, disparities remain with significantly less vaccination coverage for black children (65%) and children living below the federal poverty level (64.4%).<sup>2</sup> DTaP, PCV, Hib, and rotavirus in particular had lower immunization rates, suggesting that these children had difficulty in maintaining regular and on-time well-child visits.

Adolescent immunization rates have also increased for routinely recommended vaccines to 86.0% for greater than or equal to 1 tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine; 77.8% for greater than or equal to 1 meningococcal conjugate vaccine for serotypes A, C, Y and W (MenACWY) vaccine;

**Table 1**

**Estimated numbers of illnesses, hospitalizations, and deaths prevented by routine childhood immunization for selected vaccine-preventable diseases among children born during the Vaccines for Children era in the United States, 1994 to 2013**

Vaccine-preventable Disease <sup>a</sup>	Cases Prevented (in Thousands)		
	Illnesses	Hospitalizations	Deaths
Diphtheria	5073	5073	507.3
Tetanus	3	3	0.5
Pertussis	54,406	2697	20.3
Hib	361	334	13.7
Polio	1244	530	14.8
Measles	70,748	8877	57.3
Mumps	42,704	1361	0.2
Rubella	36,540	134	0.3
Congenital rubella syndrome	12	17	1.3
Hep B	4007	623	59.7
Varicella	68,445	176	1.2
Pneumococcus-related diseases <sup>b</sup>	26,578	903	55.0
Rotavirus	11,968	327	0.1
Total	322,089	21,055	731.7

<sup>a</sup> Vaccines were considered as preventing disease for birth cohorts born in all years during 1994 to 2013 except for the following, which were only in use for part of the 20-year period: varicella, 1996 to 2013; 7-valent and 13-valent pneumococcal conjugate vaccines, 2001 to 2013; and rotavirus, 2007 to 2013.

<sup>b</sup> Includes invasive pneumococcal disease, otitis media, and pneumonia.

From Whitney CG, Zhou F, Singleton J, et al. Benefits from immunization during the vaccines for children program era - United States, 1994–2013. *MMWR Morb Mortal Wkly Rep* 2014;63(16):354.

<sup>1</sup> Combined vaccine series for 19 to 35 months includes greater than or equal to 4 doses of DTaP, greater than or equal to 3 doses of poliovirus vaccine, greater than or equal to 1 dose of measles-containing vaccine, full series of Hib vaccine ( $\geq 3$  or  $\geq 4$  doses, depending on product type), greater than or equal to 3 doses of Hep B, greater than or equal to 1 dose of varicella vaccine, and greater than or equal to 4 doses of PCV.

57.3% human papillomavirus (HPV) vaccine dose among female patients, and 34.6% for greater than or equal to 1 HPV dose among male patients. Completion rates for 3 doses of HPV vaccine are only 37.6% for girls and 13.9% for boys.<sup>5</sup> Lower vaccination rates for HPV compared with Tdap and MenACWY are concerning. For children living below the poverty level and for black adolescents, Tdap and MenACWY vaccination rates were similar, and rates for an initial dose of HPV were higher for boys and girls, but completion rates for the HPV series were lower. Coverage for Hispanic adolescents was generally higher. However, rates for all groups are still below the goals for Healthy People 2020 of greater than 90%.

Despite overall increases in immunization rates, there remain significant disparities in childhood immunization rates between racial/ethnic groups and among economically disadvantaged populations.<sup>6</sup> In these areas of underimmunization (pockets of need), which are often poor urban areas with significant barriers to immunization and limited health care resources, disease introduction could have vast impact because of low herd immunity and opportunity for widespread outbreaks.<sup>7,8</sup> Pediatricians can play a vital role in helping to narrow the gap in immunization coverage rates.

Broader immunization coverage results in decreased prevalence of vaccine-preventable disease. With less experience with these infections, there is both less fear of the diseases and a gradual devaluing of the importance of vaccines in the public consciousness. As real or perceived concerns about vaccine side effects are perpetuated by media, or spread in communities through word of mouth, there is the emergence of vaccine hesitation. Although this may be seen more commonly in a different demographic group, in which parents may be more educated and more affluent, similar issues of fear and misinformation can emerge in any setting. Underimmunization rates and vaccine refusals have been noted to occur in geographic clusters.<sup>9</sup> Children living in these clusters are at higher risk for individual disease, and the community at risk for disease outbreaks.

## **BARRIERS TO IMMUNIZATION**

### ***Provider/System Barriers***

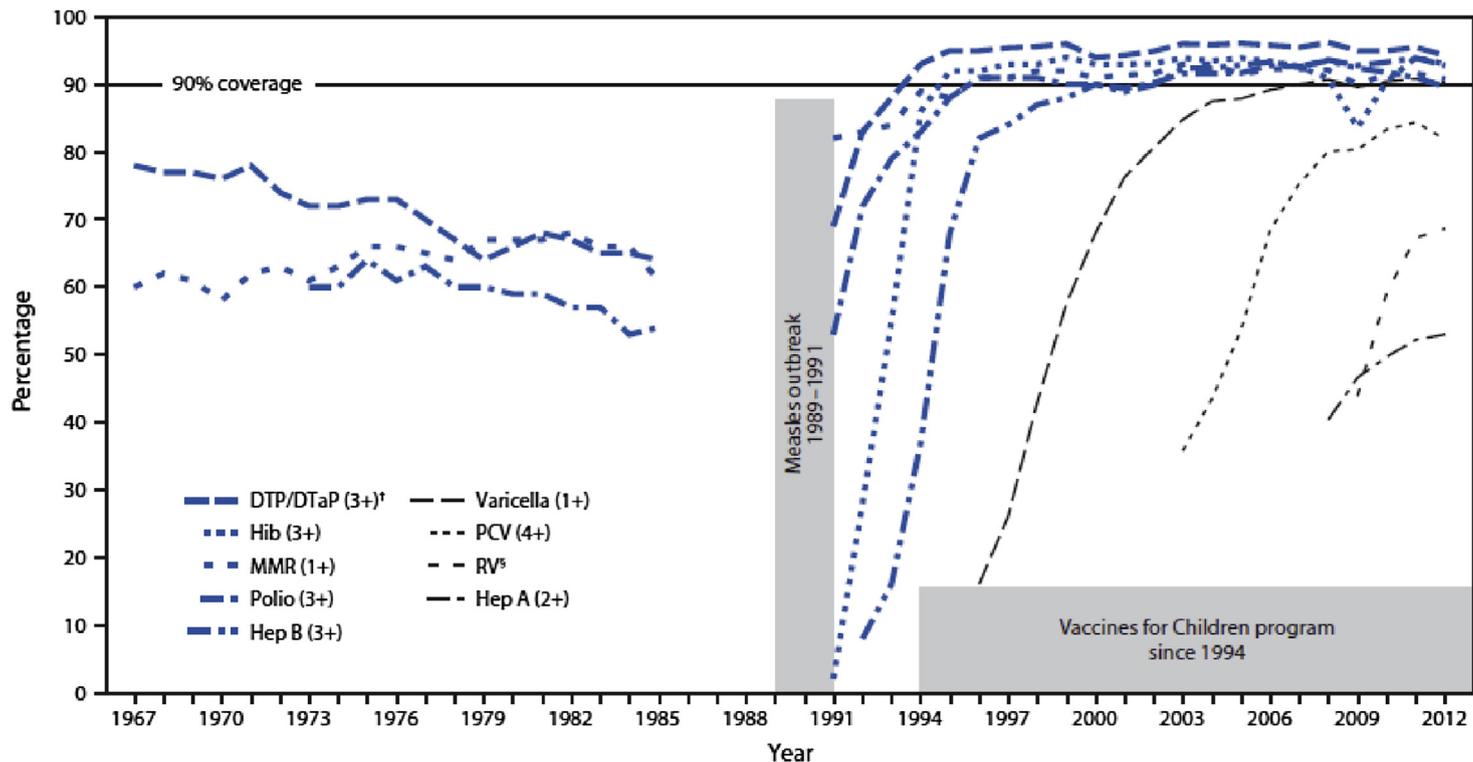
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#### ***Financial barriers***

Vaccine costs and copays are potential barriers to vaccination. Vaccine costs have increased dramatically with the development of new vaccines and expansion of the vaccine schedule. In 1987, the entire vaccine series cost \$37 for an individual in the public sector and \$116 in the private sector.<sup>10</sup> According to prices updated in January 2015, the series from birth to adulthood costs approximately \$1452 per individual in the public sector and \$2012 in private sector.<sup>11</sup>

As a means to help provide vaccines for underserved groups, in 1963 Section 317 of the Public Service Act was launched. This program provided discretionary grants to states, select large cities, and territories to conduct routine childhood and adult immunization programs in a partnership model with local health departments. However, following the measles outbreak of 1989 to 1991, it was clear that there were large populations who were still underserved by immunization programs. In 1994, Congress passed the Omnibus Reconciliation Act, which created the Vaccines for Children program. This federal entitlement program was designed to address these issues by providing vaccines free of cost to uninsured and underinsured children 18 years of age and younger (Fig. 1).

More recently, the Affordable Care Act (ACA) requires that vaccines recommended by the Advisory Committee on Immunization Practices (ACIP) before September 2009 be administered without copayments or other cost-sharing requirements when those



**Fig. 1.** Vaccine coverage rates among preschool-aged children in the United States, 1967 to 2012. Since 1996, coverage with 1 dose of a measles-containing vaccine has exceeded Healthy People targets of 90%, up from less than 70% before the 1989 to 1991 outbreak. DTP/DTaP, diphtheria tetanus pertussis/diphtheria tetanus acellular pertussis; Hep A, hepatitis A; Hep B, hepatitis B; Hib, Haemophilus influenzae type b; MMR, measles mumps and rubella; PCV, pneumococcal conjugate vaccine; RV<sup>5</sup>, rotavirus vaccine. (From Whitney CG, Zhou F, Singleton J, et al. Benefits from immunization during the vaccines for children program era - United States, 1994–2013. *MMWR Morb Mortal Wkly Rep* 2014;63(16):353.)

services are delivered by an in-network provider.<sup>12</sup> However, health plans are not required to cover vaccinations delivered by an out-of-network provider, which may place a cost-sharing burden on families. Pharmacists and health departments may be considered out of network, thus preventing families from being able to use these as immunization sites.<sup>13</sup>

### ***Access to immunization***

At present, the US Centers for Disease Control and Prevention (CDC) recommends vaccination against 16 different vaccine-preventable diseases for children. The vaccine schedule was intended to be coordinated with the well-child visit.<sup>14</sup> In the past, vaccines have been administered in a primary care physician's office and usually during scheduled appointments. This approach may affect the parents' ability to bring a child in for vaccinations because of parent work schedules and inability to take time off from work.

### ***Missed opportunities for immunization***

Missed opportunities for immunizations are a well-documented cause for underimmunization.<sup>15,16</sup> They occur when a child who is eligible for a vaccine and has no medical contraindications to vaccination fails to be immunized during a provider visit.<sup>17</sup> These missed opportunities may occur because the physician does not immunize at acute care visits or because of misunderstandings about contraindications, such as during mild illness. It may occur because of providers' reluctance to give multiple shots at 1 visit, or simply from oversight. Vaccine shortages, which occur intermittently, also contribute to underimmunizations or delayed immunizations by missed opportunities. During a shortage of Hib vaccine (December 2007 to September 2009) there was an interim recommendation to defer the booster dose, but to continue the primary series. This recommendation resulted in a decrease in the percentage of fully vaccinated children from 66% to 39.5%. Despite interim recommendations, the primary series coverage was also affected and was reduced by 7 percentage points.<sup>18</sup> Similar national shortages have occurred with PCV (2001 and 2003–2004), varicella vaccine (2002), and influenza vaccine (2004–2005).<sup>19–21</sup> The impact of local or clinic-level vaccine shortages are not well measured but are also likely to be significant.

### ***Family/Social Barriers***

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#### ***Socioeconomic barriers***

Children living below the poverty level and black children are documented to consistently have lower vaccination coverage rates.<sup>2</sup> Factors associated with underimmunization include having public or no insurance, belonging to a family with 2 or more children living in the household, and having parents who are unmarried.<sup>22</sup> Children who were enrolled in Women, Infants, and Children (WIC) during the first year of life, and children who were not eligible for WIC, tended to have higher vaccination coverage than those who were WIC eligible but not enrolled. Younger maternal age, history of fewer maternal prenatal care visits, higher birth order, and receiving care at public health clinics were also associated with late initiation of immunizations.<sup>23</sup>

#### ***Vaccine hesitancy***

In contrast with the families described earlier, a growing group of parents are refusing vaccines. These families refuse or defer vaccines for a growing variety of reasons.<sup>24–27</sup> Many parents are worried about unsubstantiated vaccine side effects such as autism. Concerns also include a fear of overwhelming the child's immune system with too

many antigens, leading to parents' requests for an alternate or delayed vaccination schedule (eg, the Dr Sears<sup>28</sup> schedule). Parents may have objections to a specific vaccine because of personal beliefs or certain components of the vaccine (eg, adjuvants). Other reasons include distrust toward vaccine manufacturers, the government, and health care providers, and a preference for natural immunity.<sup>29,30</sup>

Vaccine exemptions are a growing problem. Allowable reasons for exemption vary from state to state, with all states allowing medical exemptions. Religious exemptions to vaccination are granted in 48 states and Washington, DC. In addition, 20 states allow philosophic, or personal-belief, exemptions. Only Mississippi and West Virginia do not allow either type of nonmedical exemption.<sup>31</sup> The ease of obtaining exemptions can also vary (Fig. 2). Personal-belief exemptions in particular, when easily obtained, are predictive of increased disease risk among exempt children and in their communities.<sup>32–35</sup> Parents of children with exemptions are more likely to perceive low susceptibility to vaccine-preventable disease, low vaccine efficacy and safety, and less trust in the government compared with parents who have vaccinated their children.<sup>36</sup> Although parents who vaccinate their children may have similar concerns, these tend to be less frequent or manageable. Parents of children with exemptions are less likely to consider medical and public health authorities to be trusted sources for vaccine information and were more likely to trust and use practitioners of complimentary or alternative medicine.

There have been recent resurgences noted across the United States in vaccine-preventable diseases, including measles, pertussis, and mumps, which have been attributed to importation by unvaccinated individuals and transmission among under-vaccinated communities.

#### Box 1

##### Recommendations

###### *Provider/system barriers*

###### Addressing financial barriers

- Decrease out-of-pocket costs
- Vaccines for Children Program
- State health insurance programs

###### Improving access to immunizations

- In the medical home
- Expanding the immunization neighborhood
  - School-based health centers
  - WIC program offices
  - Child care centers
  - Pharmacies

###### Decrease missed opportunities to vaccinate

- AFIX
- Standing orders

###### Reminder recall strategies

- Population-based recall
- Clinic-based recall

Expanded use of immunization information systems

Legal requirements for immunizations for school or daycare

*Family/social barriers*

Community-based strategies

- Target high-risk communities
- Integration with existing community programs

Promoting WIC

Addressing vaccine hesitancy

- Gain parents' trust
- Parent education
- Effective communication

*Abbreviation:* AFIX, assessment, feedback, incentives, exchange.

## RECOMMENDATIONS

### *Provider/System Barriers*

#### *Addressing financial barriers*

The Institute of Medicine has made the following suggestions to address financial barriers that impede universal uptake of vaccines recommended by the ACIP.<sup>10</sup> These suggestions include an insurance mandate that applies to all private and public health plans, and a federal subsidy to cover vaccine costs and administration fees, combined with a government subsidy and voucher plan. They have also suggested that a process be developed to determine societal benefits of the vaccines as a means to calculate subsidy levels for different vaccines based on estimated benefits.

Out-of-pocket costs such as copays or office visit fees have been shown to be correlated with lower immunization levels.<sup>37</sup> Eleven studies reviewed by the Community Guide show a 22% (16- 33%) median increase in immunization rates by reducing out-of-pocket costs for vaccinations.<sup>38,39</sup> They recommend broader promotion of the Vaccines for Children Program and Medicaid/state children's health insurance programs to decrease immunization costs, especially among children of low-income families.

It is important that all financial barriers to vaccines be removed, to enable equal access and improved immunization rates.<sup>40,41</sup> The impact of the ACA on decreasing financial barriers for patients remains to be seen. The benefits of the ACA requiring no copays or cost sharing for vaccinations should apply at all sites, including those considered out of network, such as pharmacies. In addition, there are many exceptions that need to be addressed, such as exempting some employer plans from these requirements (**Box 1**).

#### *Improving access to immunization*

The Standards for Child and Adolescent Immunization Practices recommend that immunizations should be provided in a medical home whenever possible.<sup>42</sup> Although this recommendation is ideal for providing continuity, stable medical responsibility, maintaining a child's medical records, and providing other relevant information, this is not always feasible. More recent recommendations suggest identifying other venues for vaccinations if children in a community do not have convenient access to a medical home.<sup>44</sup> Suggested venues include public health department clinics; WIC program

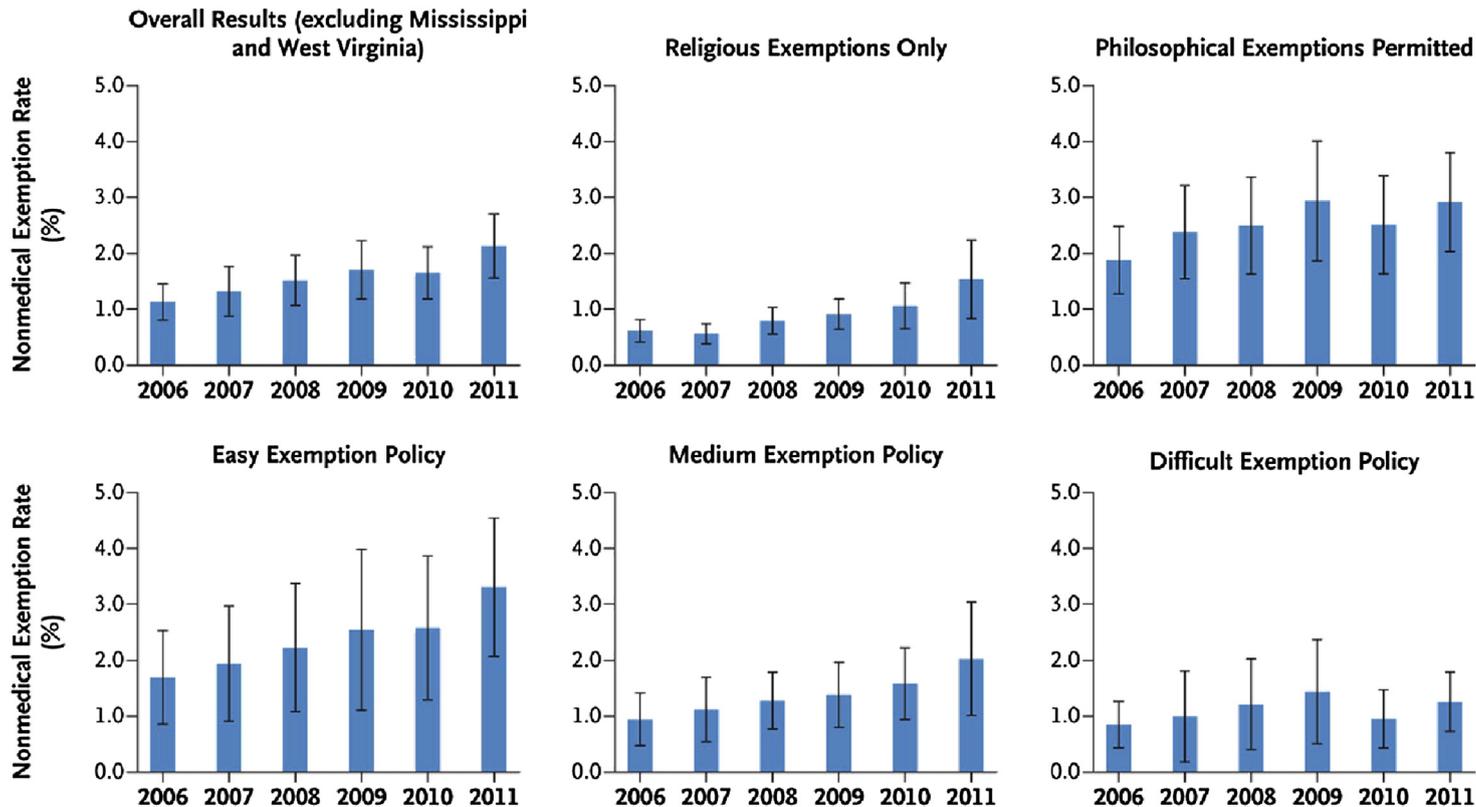


Fig. 2. Rates of nonmedical exemptions from school immunization, according to type of exemption and ease of obtaining one, 2006 to 2011. Overall mean rates of nonmedical exemptions per year for 48 states and the District of Columbia (excluding Mississippi and West Virginia, which do not allow nonmedical exemptions), as well as the rates for the types of exemptions allowed (religious reasons only and philosophic reasons permitted), are shown for the years 2006 to 2011 (top row of graphs). Mean rates of nonmedical exemptions per year according to the level of difficulty (easy, medium, or difficult, as modified from the criteria described by Rota et al.<sup>43</sup>) of the exemption policies are also shown (bottom row of graphs). I bars represent 95% confidence intervals. (From Omer SB, Richards JL, Ward M, et al. Vaccination policies and rates of exemption from immunization, 2005–2011. *N Engl J Med* 2012;367(12):1170; with permission.)

offices; child care centers; school-based health clinics (SBHCs); and, in those states that allow it, pharmacies.

SBHCs are particularly advantageous for adolescent immunizations. Compared with community health centers within a single system, children and adolescents seen in SBHCs were significantly more likely to be up to date and have higher completion rates for vaccines that required multiple doses.<sup>45</sup> Advantages of SBHCs are that patients can be seen over time for multiple visits, which is a benefit especially for older children and adolescents, because follow-up visits are often challenging, disrupting school or parent work schedules, and are often complicated by transportation issues. It is generally simpler to conduct reminder recall for vaccinations in this setting because regular communication to parents is part of the system. In general, SBHCs see patients regardless of their insurance status or ability to pay, potentially removing cost as a barrier. However, many SBHCs lack adequate funding, and many private and public patients do not pay for services received at SBHCs. However, some insurers are now partnering with such groups and providing financial support to ease the strain on busy offices, especially for periodic immunizations such as influenza.

We support policies to help support SBHCs, allowing them to deliver immunizations and other care to underserved children and adolescents. Insurers and other providers should consider supporting such programs as a means to ease congestion in their own offices and promote routine immunizations.

Pharmacists and other ancillary health care providers may also play an important role in improving immunization access. Pharmacists as immunizers have been shown to improve immunization rates in adult populations.<sup>46,47</sup> In the state of Wisconsin, pharmacists can immunize children aged 6 years and older. They serve as additional vaccination sites and provide support for parents whose work hours make it difficult to seek care for their children during clinic hours. A survey of family physicians showed that 95% of physicians were willing to collaborate with nonphysicians to provide out-of-office immunizations. Concerns included being informed about immunizations received outside of their offices, training of nonphysicians to administer immunizations and to respond to potential complications of immunization, and potential loss of preventive health opportunities.<sup>48</sup>

We recommend using alternate sites and expanding the immunization neighborhood.<sup>49</sup> An important component of the success of this method is access to immunization records and the ability to update these in real time. Alternate sites should have access to up-to-date immunization information and also be required to update the child's immunization information at the time of delivery of the vaccine. Use of immunization information systems (immunization registries) is a highly recommended.

### ***Decreasing missed opportunities for immunization***

AFIX (assessment, feedback, incentives, exchange) is a CDC quality-improvement program shown by systematic review to increase vaccination rates by a median of 9.4%.<sup>50,51</sup> This dynamic strategy has 4 parts: (1) assessment of the health care provider's vaccination coverage levels and immunization practices, to identify opportunities for improvement of vaccination coverage levels and decrease missed vaccination opportunities; (2) feedback of results to the provider (and ideally other staff, including nurses, clerical staff, and office managers) along with recommended quality-improvement strategies to improve processes, immunization practices, and coverage levels; (3) incentives to recognize and reward improved performance; (4) exchange of information with providers to follow up on their progress toward quality improvement in immunization services and improvement in immunization coverage levels. AFIX visits are expected to address the Healthy People 2020's objectives by

increasing the proportion of providers who have had vaccination coverage levels among children in their practice population measured within the past year to 50%, for both public health and private providers.

Provider vaccine education to improve knowledge or change attitudes may include written materials, computerized modules and videos, lectures, and other continuing medical education programs. Used along with feedback (AFIX) they are effective, but significant improvement in rates has not been shown when used alone.<sup>52</sup>

Standing orders are an extremely effective and simple way to increase vaccination rates. They authorize nurses, pharmacists, and other health care personnel (as allowed by state law) to assess a client's immunization status and administer vaccinations according to a protocol approved by an institution or provider without the need for examination or direct order from the provider at the time of the visit. Systematic review of 24 studies showed a 24% (14%–37 %) increase in vaccination rates when providers use standing orders.<sup>53</sup>

### ***Reminder recall interventions***

Reminder interventions involve communicating to members of a target population that vaccinations are due. Recall actions involve notifying the target population that they are late or overdue for vaccinations. These reminders have typically been delivered by telephone, letters, or postcard, but other newer technologies, such as social media or short message service (SMS) text messages show considerable promise.<sup>54</sup> These communications may be accompanied by educational messages regarding the importance of vaccination, which may also activate other members of these social networks. Multiple studies have shown these interventions to be effective.<sup>55–57</sup> A systematic review by the Task Force on Community Preventive Services showed 6.1% median increase in vaccination coverage with the use of reminder recall interventions.<sup>58</sup>

Although reminder recall interventions have been shown in multiple studies to be highly effective, implementation is challenging for busy pediatric practices, and these tools are underused by clinicians.<sup>59,60</sup> Population-based recalls for immunizations using centralized immunization information systems have been shown to be more effective and cost-effective than practice-based interventions.<sup>61,62</sup> As access to immunization registries has increased, and combined with the broad use of electronic health records (EHRs) required by the ACA, these recall activities may also be conducted by larger health care systems. Although this method seems more cost-effective than the practice-based recall, population-based reminder/recall would still require additional resources. In the future, as technological advancements continue, centralized computer-based reminder systems could be integrated with registries in order to decrease costs.

Provider reminders that individual clients are due for specific vaccinations are also very effective; studies show a median increase in vaccination rates of 10%.<sup>63</sup> Although labor intensive, techniques by which providers can be reminded vary widely, but can include notes posted in client charts, alerts in electronic medical records, and letters sent by post or email.

### ***Expanded use of immunization information systems***

Immunization Information Systems (IISs) are an important tool in improving immunization rates and can be effective through multiple capabilities. They are population-based computerized databases that record or collect immunization data from vaccine providers and can interoperate with EHR systems.<sup>64</sup> They are highly effective in increasing vaccination rates and were recommended after systematic review by the Task Force on Community Preventive Services.<sup>65</sup> They can generate

vaccination coverage reports and support patient reminder recall systems, as well as provider assessment and feedback (AFIX) and provider reminders. In addition, they offer the capability for providers to determine the vaccination status of children at any location with access to the system (eg, clinics, health departments, schools, pharmacists, and emergency rooms). Other capabilities include identifying missed vaccination opportunities and disparities in vaccination coverage. A Healthy People 2020 target is to increase the proportion of children aged less than 6 years whose immunization records are in fully operational, population-based IIS to 95%.

### ***Legal requirements for immunizations: school requirements, vaccine mandates, and vaccine exemptions***

School entry requirements have been used for many years as an effective intervention for improving immunization rates, and offer broad protection for potentially vulnerable populations. Although vaccine mandates (allowing only medical exemptions) have been upheld by courts and have been recommended by professional societies such as the American Medical Association, the American Academy of Pediatrics, the Pediatric Infectious Diseases Society, and the Infectious Diseases Society of America, states in general are wary of mandating a medical intervention without accommodating personal or religious beliefs.

State requirements for school or daycare entry vary. Studies have shown them to be associated with higher immunization rates among preschool-aged children independently of other individual and household factors.<sup>66,67</sup> Thirty-four states currently have middle school requirements for immunization with Tdap.<sup>68</sup> Twelve states have similar requirements for at least 1 dose of meningococcal vaccine and not surprisingly, none have yet to enact a requirement for Human Papilloma Virus (HPV) vaccine. These mandates can potentially generate public discord when the community has not been adequately informed or engaged in the planning of new mandates. Poor community engagement and communication potentially lead to higher rates of nonmedical exemptions, even when there is minimal public disapproval or concern about a vaccine.

Blank and colleagues<sup>31</sup> recommend tightening the process for obtaining nonmedical exemptions and adding a vaccine education component in order to decrease exemption rates. In view of the high costs generated to society by disease outbreaks, related to people who were intentionally unvaccinated, some experts have recommended stronger measures.<sup>69</sup> Constable and colleagues<sup>70</sup> discussed possible solutions for discouraging vaccine exemptions, including penalties (taxes on underimmunized individuals) or incentives (tax cuts for vaccinators, vouchers). These measures have been used in various forms for tobacco use and could be applied at a state level or by insurance companies.

### ***Family/Social Barriers***

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#### ***Socioeconomic barriers***

Various strategies have been proposed to address socioeconomic barriers. Case management can be effective but is not necessarily cost-effective.<sup>71</sup> It may be considered for very-high-risk cases but is difficult to implement on a large scale. Community-based strategies, which may be more effective, target certain high-risk communities with low immunization rates and involve integration of immunization promotion into existing community service programs. These strategies identify eligible parents, providing education and reminders about their child's needed immunizations.<sup>72,73</sup>

The ACIP has long recommended that Special Supplemental Nutrition Program for WIC settings should promote vaccination strategies for eligible children at risk for undervaccination.<sup>74</sup> Effective strategies include assessment of a child's immunization

status and referral to a provider if underimmunized. Other effective supplemental strategies include monthly vouchers, other parental incentives, outreach, and compliance tracking.<sup>75,76</sup>

Eligible children enrolled in WIC tend to have higher immunization coverage, comparable with more affluent children. However, not all eligible children are benefiting from WIC. A study comparing WIC and non-WIC (but eligible) children estimated that 8% of eligible children never made use of the program and, among disenrolled children, most still met income eligibility requirements. The benefits of WIC participation have been clearly shown to be effective in improving immunization disparities.<sup>77</sup> Strong efforts must be made to identify, enroll, and retain eligible children in WIC in order to benefit from vaccination promotion strategies.

## Box 2

### Resources

#### *Physician resources*

Assessing evidence to improve immunizations:

<http://www.thecommunityguide.org/vaccines/index.html>

Talking to parents about immunizations:

[http://www.immunize.org/concerns/comm\\_talk.asp](http://www.immunize.org/concerns/comm_talk.asp)

<http://shotbyshot.org/>

<http://www.voicesforvaccines.org/>

<http://www2.aap.org/immunization/pediatricians/refusaltovaccinate.html>

Parents' resources for questions about immunization

<http://www.pbs.org/wgbh/nova/body/vaccines-calling-shots.html>

<http://www2.aap.org/immunization/multimedia/soundadvice.html>

<http://www.vaccinateyourbaby.org/faq/index.cfm>

### ***Vaccine hesitancy***

Trust in physicians and in medical professionals is central in parent decisions on vaccination. A qualitative study of maternal decision making on vaccines found that factors promoting vaccination included trusting the pediatrician, feeling satisfied by the pediatrician's discussion about vaccine, and not wanting to diverge from the cultural norms. Factors inhibiting a decision to vaccinate were feeling unable to trust the pediatrician, having a trusting relationship with an alternate health care provider or other person who did not believe in vaccinating, anxiety about side effects, beliefs that vaccine-preventable diseases are not serious, and thinking that high vaccination rates decrease children's risk of disease.<sup>30</sup>

Parent education, effective communication, and gaining parental trust are all critical in convincing hesitant parents to immunize. In order to effectively communicate with vaccine-hesitant parents, providers must understand parents' immunization concerns and the influences leading to misinformation (**Box 2**). They should have an open discussion at an early stage and provide clear, easily comprehensible answers about known vaccine side effects, as well as accurate information about vaccine-preventable disease. It is thought that personal stories and images of those affected by vaccine-preventable diseases might be helpful reminders of the importance of

immunization. It is thought that these discussions and provider recommendations may reassure some vaccine-hesitant parents about the safety and benefits of vaccines and, more importantly, the risks of vaccine-preventable diseases.<sup>78</sup>

The providers' manner of recommending vaccines may influence parent acceptance as well. An observational study involving videotaped provider-parent vaccine discussions during health supervision visits showed that most providers used a presumptive manner when recommending vaccines (eg, saying, "Well, we have to do some shots") rather than participatory manner (eg, "What do you want to do about shots?"). Parents were more likely to resist vaccine recommendations if the provider used a participatory format.<sup>79</sup>

More research is needed to understand how to individualize these findings effectively. A systematic review in 2012 by Sadaf and colleagues<sup>80</sup> concluded that there is a need for randomized controlled trials to evaluate interventions to address parental vaccine refusal and hesitancy, assessing their impact on vaccination rates among refusing parents. Parents of children considering exemptions should be targeted with extra effort to provide them with accurate information from sources that they trust.<sup>36</sup>

## SUMMARY/DISCUSSION

No single strategy is sufficient to improve immunization rates and decrease disparities; multiple strategies are needed. Vaccines need to be accessible, and available at multiple sites, including the medical home as well as alternate providers such as pharmacies, WIC settings, and schools. They should be provided with no financial burden to families. Vaccine status should be assessed and vaccines given in a timely fashion at all possible opportunities. All efforts should be made for reminder and recall of children due for vaccines, not only at a clinic level but also by the use of IIS at a state level.

It should be recognized that pockets of underimmunization can still occur, not just in poor urban areas but in geographic clusters of vaccine hesitancy and refusal. Further research is needed to effectively address the concerns of vaccine-hesitant parents and communicate effectively with these families. In addition, state legal immunization requirements for daycares and schools should be encouraged and strengthened, and nonmedical exemptions discouraged. The role of IIS in these efforts is vital because broad use of IIS makes it possible to access immunization information at multiple sites, conduct reminder recall, and assess vaccination rates at various levels to identify areas of need. At present IIS are state based; a national system would enable sharing of immunization data across state borders.

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