Expanding the Recommendations for Annual Influenza Vaccination to School-Age Children in the United States

abstract

BACKGROUND: Despite long-standing recommendations to vaccinate children who have underlying chronic medical conditions or who are contacts of high-risk persons, vaccination coverage among school-age children remains low. Community studies have indicated that school-age children have the highest incidence of influenza and are an important source of amplifying and sustaining community transmission that affects all age groups.

METHODS: A consultation to discuss the advantages and disadvantages of a universal recommendation for annual influenza vaccination of all children age $\geq 6$ months was held in Atlanta, Georgia, in September 2007. Consultants provided summaries of current data on vaccine effectiveness, safety, supply, successful program implementation, and economics studies and discussed challenges associated with continuing a risk- and contact-based vaccination strategy compared with a universal vaccination recommendation.

RESULTS: Consultants noted that school-age children had a substantial illness burden caused by influenza, that vaccine was safe and effective for children aged 6 months through 18 years, and that evidence suggested that vaccinating school-age children would provide benefits to both the vaccinated children and their unvaccinated household and community contacts. However, implementation of an annual recommendation for all school-age children would pose major challenges to parents, medical providers and health care systems. Alternative vaccination venues were needed, and of these school-located vaccination programs might offer the most promise as an alternative vaccination site for school-age children.

CONCLUSIONS: Expansion of recommendations to include all school-age children will require additional development of an infrastructure to support implementation and methods to adequately evaluate impact.

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KEY WORDS

influenza vaccination, mass vaccination, immunization programs, school-age population, school health services

ABBREVIATIONS

ACIP—Advisory Committee on Immunization Practices
QALY—quality adjusted life year

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In the United States, annual epidemics of influenza during the 1990s resulted in an estimated average of 36,000 deaths and 226,000 hospitalizations each year.\textsuperscript{1,2} Community studies have indicated that children have the highest incidence of influenza.\textsuperscript{3} However, the highest incidence of deaths caused by seasonal influenza is among older adults and others with underlying medical conditions.\textsuperscript{2} Estimated hospitalization rates for influenza-related complications among infants and toddlers are similar to rates for other groups considered at high risk for influenza-related complications, including persons aged $\geq 65$ years.\textsuperscript{1} Studies that use population-based surveillance data to measure rates of laboratory-confirmed influenza have shown that annual hospitalization rates among children without chronic underlying medical conditions decrease with increasing age, ranging from 240 to 720 per 100,000 children aged $<6$ months to $\sim 20$ to 70 per 100,000 children aged 2 through 5 years.\textsuperscript{1,4–6} Hospitalization rates decline with older age through childhood, and rates among children aged 5–17 years have been $8–20$ per 100,000.\textsuperscript{5,6} Influenza remains an important cause of vaccine-preventable death among children. Since the 2003–2004 influenza season, when data on the annual number of pediatric deaths due to influenza were first collected at the national level, between 46 and 153 deaths due to laboratory-confirmed seasonal influenza have been reported each season.\textsuperscript{7}

The 2009 influenza A (H1N1) pandemic underscored the need to reduce influenza burden among school-age children. During the 2009 pandemic, school-age children had very high infection rates, high absenteeism during outbreaks caused some schools to temporarily close, and rates of hospitalization exceeded typical hospitalization rates for seasonal influenza.\textsuperscript{8} More than 300 deaths due to laboratory-confirmed 2009 H1N1 influenza were reported among children, and more than 1200 were estimated to have occurred.\textsuperscript{9,10}

Annual influenza vaccination has long been recommended for adults and children with underlying chronic medical conditions or immunosuppression that place them at higher risk for influenza complications.\textsuperscript{11} Despite these long-standing recommendations, vaccination coverage among school-age children with underlying medical illnesses had consistently remained below 30%.\textsuperscript{11} Similarly, annual vaccination had been recommended for many years for children who resided in households with persons at risk for influenza complications. However, vaccination coverage among healthy school-age children remained $<15\%$, even though an estimated 40% of school-age children resided in a household with 1 or more persons at higher risk for influenza complications.\textsuperscript{11} Potential contributors to low coverage were thought to be the complexity of recommendations guiding practitioners to determine who should be vaccinated, confusion caused by changes in recommendations, and the variation in vaccine indications for children from year to year of their lives. For example, children who had an indication based on household contact might be recommended for vaccination at 1 age yet no longer specifically recommended when they were a year older. In view of these findings, expanding routine annual vaccination recommendations to include all children aged 6 months through 18 years (ie, a universal childhood influenza vaccination recommendation) was proposed as a strategy that would encourage protection from influenza for all children and increase coverage among those at higher risk for influenza-related complications by simplifying influenza prevention.\textsuperscript{12}

### Considerations Concerning Universal Childhood Influenza Vaccination

In October 2005, public health and immunization experts, influenza vaccine manufacturers, and representatives from medical professional societies and managed care organizations met at Emory University to discuss issues related to implementing universal influenza vaccination and to define information gaps and potential barriers to implementation of such an expansion.\textsuperscript{12} Most participants favored universal vaccination as a goal. Issues of implementation, supply, and potential unintended consequences such as diverting public health resources for other functions, led the participants to recommend a deliberate yet incremental approach. In February 2006, the Advisory Committee on Immunization Practices (ACIP) considered these and other data, and voted to recommend annual influenza vaccination for children aged 24 through 59 months and their household contacts beginning with the 2006–2007 influenza season.\textsuperscript{13} The underlying rationale for adding this age group to those for whom annual vaccination was already recommended (eg, children aged 6–23 months) was their increased risk of emergency department and acute care visits compared with older children. This approach represented the first step in a paradigm shift from the long-standing objective of reducing complications that result in hospitalizations or death, to reducing less severe illnesses and thus potentially reducing community transmission. At this time, the ACIP indicated that there was interest in expanding recommendations further, with the goal of eventually recommending universal annual influenza vaccination for all children.

Additional expansion of recommendations to groups with a low incidence of influenza-related medical visits, such as school-age children (ie, 5–18 years),
has been viewed as having the potential to reduce illness in the age groups mostly responsible for transmitting influenza viruses and thereby reducing virus transmission to family and community.12,14 Over the next 2 years, new data provided additional evidence of the pediatric influenza disease burden and vaccine effectiveness; vaccine supply increased and experience was gained delivering influenza vaccination to children.6,15 In addition, new studies and experience addressed issues and barriers to the expansion of vaccination recommendations to all school-age children (ie, 5–18 years).16,17

Continued interest in expanding influenza vaccine recommendations to include other child age groups (ie, 5–18 years)18,19 led the Centers for Disease Control and Prevention and the Council of State and Territorial Epidemiologists to sponsor a second consultation September 10–11, 2007. The goal was to discuss evidence gaps and implementation challenges that needed to be addressed as policy makers considered expansion of influenza vaccination recommendations to include all school-age children (5 through 18 years). Meeting participants included child immunization experts; city, county, and state public health officials; immunization program managers; education and student health officials; vaccine manufacturers; and representatives from professional organizations. The consultation was intended to bring together persons from a variety of perspectives to discuss influenza vaccination policy for school-age children but was not designed to rate evidence, develop recommendations, or set policy. The meeting presented updated information regarding influenza vaccination, opinions of national medical and health organizations, updates from manufacturers, group discussions, and a synthesis of information shared.

At the September 2007 consultation, many participants supported the continued expansion of influenza vaccination recommendations to include school-age children. The evidence supporting vaccine effectiveness and safety was considered to be strong, although continued monitoring and long-term studies were needed. In addition, manufacturers’ projections of future vaccine supply suggested that this barrier to expanding vaccination had been ameliorated, although inefficiencies, delays, and perceptions of inequities in distribution continued to need attention. Data clearly demonstrated the direct benefit of vaccinating school-age children as measured by the reduction of influenza morbidity of vaccinated individuals. Although the currently available vaccines were adequate for protecting children, improved vaccines could greatly contribute to the goals of reduced morbidity and transmission to others. Many participants indicated that the evidence for direct benefits and the likelihood of important indirect benefits occurring once substantial numbers of children were vaccinated was enough to move forward with a recommendation to vaccinate all school-age children. Most consultants acknowledged that expanding influenza vaccine recommendations would pose formidable logistical challenges. Traditional health care access points could be overwhelmed, and such providers were not yet prepared to deliver the large number of vaccinations needed in the few months available. Coordinating the proposed vaccination venues (eg, medical homes, schools, public health clinics) to efficiently provide vaccines to enough children to achieve public health goals might best be achieved through community-level planning. School-located vaccination programs have worked well in demonstration projects; however, concerns regarding vaccine distribution and payment for services remained to be addressed. In addition, consultants repeatedly noted that measuring the impact of expanding vaccination recommendations to all school-age children and identifying practical and sustainable immunization delivery plans were critical to the success of a universal childhood vaccination strategy.

ACIP members heard presentations of data and expert opinions, including the conclusions of the September 2007 consultation, at the October 2007 and February 2008 ACIP public meetings. In February 2008, ACIP voted to recommend routine influenza immunization for all children aged ≥6 months.20

The following is a summary of key data and issues related to influenza, influenza vaccines, and the process of vaccinating children annually. The summary does not include data, insights, or considerations from the 2009 influenza A (H1N1) pandemic.

**BURDEN OF INFLUENZA AMONG CHILDREN**

Studies of the burden of influenza illness among school-age children indicate substantial variation in rates of illness by year, and differences in study design have resulted in a range of disease burden estimates. However, 2 large, well-designed, retrospective cohort studies using medical records estimated that school-age children were hospitalized 0.8 to 4.0 times per 10 000 children per year; and that there were ~5 visits to a health care provider per 100 healthy children per season.5,6 Deaths or hospitalizations caused by seasonal influenza virus infection are not common in this age group, but uncomplicated illness among children is still an important cause of outpatient medical visits, increased school absenteism (10%–30%) during influenza season, and work time lost for parents; in addition, it contributes to overuse of antibiotics.21 Additional studies are needed to examine economically important but less severe outcomes such as absence from school and antibiotic use.
VACCINE EFFECTIVENESS AND SAFETY

Vaccine effectiveness for healthy school-age children ranges from 50% to 100% for the prevention of laboratory-confirmed influenza based on multiple studies using a variety of study designs from different influenza seasons. Live attenuated influenza vaccine has been shown in some studies to be more effective than trivalent influenza vaccine among younger children. Indirect protection among contacts of vaccinated children has been demonstrated in some studies; however, such studies have had methodological limitations, the age groups shown to enjoy indirect protection have been inconsistent, and precise quantification of protection has been difficult. Many investigations were not designed to examine issues of indirect benefit specifically and used a variety of different study designs. Some of the difficulties in interpretation result from the use of non-specific clinical outcome measures, lack of randomization or randomization by cluster (e.g., school or community), pronounced season-to-season variability in influenza illness activity, variation in vaccine match to the circulating virus, variability in vaccination rates among the “contacts,” and use of historical controls. Data on influenza incidence in a geographic area has not always been included in study designs and should permit cost-effectiveness studies to include indirect effects in economic models. Intervention trials with laboratory-confirmed outcomes among vaccinated children, household contacts, and the community at large—conducted in areas with low underlying vaccine coverage and over more than 1 influenza season—provide useful data. Studies that assess how vaccinating children affects rates of laboratory-confirmed influenza among unvaccinated individuals in the same community would ideally be conducted using an appropriate study design (e.g., an observer-blinded, randomized, active-control study) with sufficient statistical power to detect 25% reductions in influenza among unvaccinated members of the vaccinated community. Such studies require substantial resources and present a variety of logistic and analytic challenges.

Available evidence indicated that annual influenza vaccination is safe, well-tolerated, and effective over multiple years. Data available from repeated annual vaccination studies were limited and primarily consist of immunologic studies comparing correlates of protection that could be measured after vaccination. The percentage that developed putative protective titers was similar among first-time and previously vaccinated children. Geometric mean titers were also similar. In addition, no increase in the frequency or type of adverse events had been noted among children or adults vaccinated annually over several years. Extended and ongoing analyses of databases that capture information on repeatedly immunized subjects are needed.

Data from vaccine safety monitoring systems currently in place are reassuring and indicate that trivalent influenza vaccine and live attenuated influenza vaccine have an excellent safety record among school-age children. The development of “rapid cycle analysis” capabilities in the Vaccine Adverse Events Reporting System should allow early detection of prespecified adverse events. However, the multiple influenza vaccine formulations available, the changing and increasingly crowded vaccination schedule, and the use of a variety of nonmedical settings for administering influenza vaccines will all pose challenges for safety monitoring systems.

ECONOMIC STUDIES

Economic studies indicate that programs focused on vaccinating children at risk for complications from influenza are more economical than those that have adopted a universal age-based recommendation and that vaccinating those children not at high risk, particularly children aged 5 through 18 years, is unlikely to produce cost savings based on direct effects. Difficulties with evaluating indirect effects in economic models include the implicit assumption that maximum indirect benefits would occur if some community members were not vaccinated (such as older adults), and as vaccination coverage increases, the potential impact of herd immunity decreases. The degree of herd immunity also will vary greatly from season to season depending on population age structure, vaccine effectiveness, and other factors difficult to quantify. In a 2006 vaccination strategy of targeting children at high risk aged 5 to 18 years, the cost per quality adjusted life year (QALY) rose from $72 000 to $79 000 per QALY for vaccinating low-risk children aged 5 to 11 years (i.e., healthy children without chronic medical conditions) to $108 000 to $119 000 per QALY for vaccinating low-risk children aged 12 to 17 years. In contrast, vaccination of high-risk children (i.e., children with chronic medical conditions) aged <2 years old is cost saving, and vaccination of high-risk older children aged 5 to 17 years costs $7000 to $10 000 per QALY. Cost-effectiveness decreases with increasing age, and the costs were considerably less per outcome measure with the 2006 vaccination strategy of targeting children at high risk aged 5 to 18 years for vaccination. The cost-effectiveness ratios were similar for inactivated and live attenuated influenza vaccines, with live-attenuated vaccine being more costly but also more effective, and potentially more cost-effective. The overall cost-effectiveness ratios for influenza vaccination of school-age children are at the high end of the range for other currently recommended vaccines. However, the consistently low vaccine coverage among children at higher
risk for influenza-related complications has been viewed as an argument for moving away from risk-based vaccination strategies in favor of simpler age-based strategies.19,38

IMMUNIZATION PROGRAM ISSUES
The practical issues related to providing annual influenza immunization to all children are not fully characterized and likely vary among practices and programs. However, consultants at the 2007 meeting noted that demands on vaccine delivery infrastructure are a significant consideration and might be the most important limiting factor in achieving high vaccination coverage among school-age children. Meeting consultants agreed that some immunization providers are likely not prepared for the challenges of administering influenza vaccine to the many patients in their care who require it. Some providers do not provide vaccination throughout the recommended period and need help to create linkages with partners who can assist them. Some private practitioners might feel that the rapid increase in the number of pediatric vaccines and the complexity of ACIP recommendations has been a substantial burden and at times has been a source of frustration. Influenza vaccine supply remains unpredictable at the local level, and this makes it difficult to develop plans to vaccinate large numbers of children. Established strategies to overcome these barriers include increasing demand among patients by using patient reminders and education, enhancing access by using walk-in clinics and reducing cost of vaccination, guiding health care professionals to better practices using techniques such as practice audits with feedback on improvement strategies, and providing model standing orders and policies.11

Expanding influenza vaccination recommendations requires assurance that vaccine supply will also increase. Influenza vaccine manufacturers have increased the amount of influenza vaccine produced and distributed over time, but decisions to continue increasing capacity will be based on projected demand. Inconsistencies in supply, distribution, and pricing will hinder vaccination efforts in both public and private venues.

Operational research concerning the logistics of providing influenza vaccinations to school-age children has identified a number of challenges important to consider. School-age children are not a homogenous population with regard to their influenza vaccination requirements and potential health care access points where vaccination could be provided. Children aged <9 years, for example, need 2 vaccine doses in the first season of vaccination.11 Older children have different types of medical homes, such as gynecologists or adolescent medicine specialists, who might not be accustomed to providing influenza vaccination services. The percentage of children who have a medical home declines with age, so that by 18 years, only 75% have a medical home. Providing vaccination in a child’s medical home will require extra visits. One analysis estimated that 60% to 80% of children aged 5 to 8 years would need 2 otherwise unscheduled visits in the first year; and 20% would need 1 extra visit, even if every medical visit was used to provide a vaccination. Among children aged 9 to 18 years, at least 75% would need 1 extra visit.39 To be maximally effective and avoid missed opportunities to prevent early season infections, vaccination should occur as early as possible, beginning as early as September. Strategies to reduce the burden of extra visits include providing vaccination at all medical visits during the influenza season, and extending the vaccination season through February to increase coverage during the usual peak month of transmission, or who need second doses. Even so, providing all influenza vaccinations to school-age children in medical homes would still require an estimated 42 million extra visits by children aged 5 to 18 years annually nationwide and would increase the total number of primary care visits by 36%.59

Expanding routine influenza vaccination for all school-age children has to be accompanied by efforts to avoid negative consequences. These include (1) lost focus on prioritizing vaccination (including both doses where applicable) for children at higher risk for influenza complications, (2) challenging cost and supply issues for some practices, and (3) disillusionment of clinicians and the public when high coverage rates prove difficult to achieve quickly. Other vaccination venues will be needed to achieve reasonable coverage rates, and expectations for rapid and thorough uptake of an expanded recommendation should be tempered by acknowledging the challenges that immunization programs and providers would face. The suitability of vaccination settings outside of the traditional medical home, including schools, public health clinics, and pharmacies, needs to be better understood.

VACCINATION PROGRAMS OUTSIDE THE MEDICAL HOME
School-located vaccination programs might offer the most promise as an alternative vaccination site for school-aged children. School settings have been demonstrated to be effective environments for vaccination of a large number of school-age children.40–43 One countywide program allowed staff to immunize an entire school in as little as 3 hours.38 A statewide program in Hawaii has shown that a large school-located vaccination program can be widely accepted and result in vaccination coverage of at least 50%.16 Meeting consultants noted that education and public health share the common goal
of improving the lives of children. Many parents are well connected with their school district, might appreciate the opportunity to avoid a medical visit for vaccination and likely view their child’s school as a trustworthy institution.

A substantial increase in overall vaccine coverage was reported in Ontario, Canada, after a province-wide, all-ages universal influenza vaccination recommendation was implemented in 2000. Vaccination rates for children aged 12 to 19 years increased across the country over time but were significantly higher by 2005 in Ontario (37%) compared with all other provinces (14%). Improved vaccine coverage was greatest for children with chronic medical conditions, among whom 42% were vaccinated in Ontario and only 23% in the rest of Canada in 2005. A variety of vaccination settings (physician offices, community clinics, school-located clinics, pharmacies, hospitals, workplaces, and long-term care facilities) were used. Universal vaccination of older children was found to be feasible and sustainable in this environment, and the experience of universal immunization was thought to improve pandemic preparedness in this province.

In the United States, school-located vaccination demonstration projects have met with some success and in some instances have demonstrated both direct and indirect effects on illness. One large multicenter study provided school vaccination programs free of charge in target schools and measured a variety of outcomes during the week of peak influenza activity. Compared with schools where no vaccination program was offered, target school families reported statistically significant relative reductions in influenza-like illness in children (35%), child physician visits (36%), prescription medications (42%), over-the-counter medications (58%), herbal/natural medicines (36%), and humidifier/vaporizer purchases (36%). Target school families also had significant reductions in adult influenza-like illness (36%), adult work days lost (36%), and high school days lost (40%). In response to this trial, 1 Maryland county asked that all school children be offered the influenza vaccine. In the 2005–2006 season, 5319 (44%) public school children received live attenuated influenza vaccine. Teams consisting of 2 to 3 medical and 1 to 3 lay or volunteer personnel went to schools and vaccine administration (including 2 doses when indicated) was completed in 8 days. Compared with previous seasons, significant reductions in school absenteeism were seen in elementary and high school students during the local influenza outbreak period. Measuring outcomes from both trials, investigators concluded that immunizing even a moderate proportion of school-age children benefitted the students, their families, and the community.

A multiyear school influenza vaccination campaign in Knox County, Tennessee, illustrated the promise and challenges associated with school-located vaccination. Extensive planning culminated in a mass clinic in each of the 81 public and 13 private schools in Knox County in 2006. Using live attenuated influenza vaccine, they obtained an overall immunization rate of 46% in 2005 and 48% in 2006. In the 2006 campaign, the vaccination rates ranged from a high of 70% in primary schools to a low of 26% in high schools. One observation common to all of the studies of school-located vaccination programs has been the relatively modest coverage rates (typically 40%–55%) achieved. Similar findings from other school- or community-based studies using inactivated and live attenuated vaccines have also been reported.

A robust school health infrastructure is not available in most school districts, and school administrators might find it difficult to plan and schedule vaccination clinics within the confines of busy curricular requirements. Another study in Knox County, Tennessee (containing ~65,000 school-aged children), assessed time and personnel requirements for a school-located vaccination program and found them to be considerable. It estimated that the local health department spent 840 total hours in preparation and supervision and 4200 hours for implementation, whereas the school system spent 2700 hours for implementation, and school nurses spent 85 person-hours per school, not including school hours spent handling consent forms. Because school systems are locally controlled, approval for a vaccination program might have to occur district-by-district and school-by-school. However, school administrators might be intrigued by the idea of reducing school absenteeism through vaccination, especially if the potential benefits of school vaccination are framed in a way that is familiar, such as helping students to be “ready to learn” (ie, not ill or behind in class due to previous influenza illness).

The issues of costs and distribution will remain challenges if schools are used as venues for administering influenza vaccines because most successful school-located demonstration projects have used donated vaccine or substantial state or private infrastructure support that might be difficult to sustain beyond the demonstration project duration. Systems capable of paying for or billing for vaccines for children not eligible for the Vaccines for Children Program will need to be developed. A coordinated effort at the national level between Vaccines for Children and private insurers will be needed to increase access to vaccine and reduce cost barriers for individuals. Public health agencies have often provided the staffing to make the clinics operate effectively but are typically underfunded and understaffed. Unless public health
departments receive assistance, as they did in the published field trials and during the 2009 H1N1 pandemic, their contribution will be limited in many areas. Because this effort would be required annually, a community-wide long-term system of conducting school-based vaccination clinics would need to be established.

Another option if public health/school partnerships are unable to shoulder the burden is to contract with private entities that provide vaccination services within schools, sometimes outside of regular school hours. Necessary steps such as educating parents, ensuring documentation of informed consent, payment issues, linkage of vaccination status to immunization information systems and the child’s medical home, and planning around vaccine supply and distribution interruptions pose considerable challenges for school-located vaccination programs run by private entities.

COMMUNICATION ISSUES

Health communication efforts will play a significant role in expanding vaccination recommendations, especially because influenza vaccines are given annually and necessitate most persons to seek out vaccination. Most persons will not have the opportunity to be vaccinated while seeing a health care provider for another reason, because the time window for vaccinations is limited, typically from September through December. Family-focused, personalized messages, possibly emphasizing the potential impact of children missing instructional time while ill (and parents missing work), might increase acceptance. Examples of adverse outcomes associated with influenza complications (eg, children occasionally die of influenza, and influenza increases a child’s risk of other infections—Streptococcus pneumoniae, methicillin-resistant Staphylococcus aureus, group A Streptococcus) can be powerful if used in a nonthreatening way. As with other public health education/messaging efforts, engaging a local community leader to lead the vaccination education effort might improve compliance. Messages should make clear the distinction between what causes influenza and what vaccination does not protect against so that parents don’t expect protection against common colds or other noninfluenza illnesses. Health care providers will also need to be provided with a rationale to offer and encourage vaccination of all children, especially those who, despite a long-standing recommendation for annual vaccination of all health care workers, choose not to be vaccinated themselves. Providers are often parents themselves, so using messages similar to parents’ messages might be convincing. Every community provider has experience with seasonal influenza outbreaks that have overwhelmed their practices and the hospitals within their community. Highlighting the direct and indirect benefits might trigger action to avoid the annual challenges faced by medical practices during peak influenza season. Providing business models for different types of providers and practice setups (nurses, pediatricians, family physicians, multispecialty, etc.) could assist providers in keeping vaccination at least revenue-neutral and reduce clinic staff concerns.

CONCLUSIONS

Several overall themes were consistent during the consultation. First, many consultants agreed that annual influenza vaccination of all children could reduce the burden of influenza illness among vaccinated children, would likely reduce transmission of influenza to unvaccinated household and school contacts, and might reduce community transmission and thereby reduce severe illness among adults at high risk and older adults. A second theme was that implementation of recommendations to vaccinate all school-age children would require time for community planning, including education of parents, providers, and the local community, and that vaccination programs would need to be implemented in a variety of settings beyond the medical home. Some consultants expressed concern that relatively few communities had experience with vaccinating school-age children outside of medical settings. Expansion of recommendations would have to supply the major impetus to developing the infrastructure to support implementation, including the large number of challenges associated with vaccine distribution and reimbursement for vaccination services. A third theme was that the acceptability of universal pediatric vaccination recommendations by health care providers and the public was unknown. Additional educational and communication strategies would be required. Wording of recommendations that were subject to several interpretations, such as “strongly consider,” rather than “recommending,” vaccinating were potentially confusing to providers and the public. Mandated requirements for influenza vaccination such as school-entry laws might be initially effective but might also raise public concerns about coercion. Specific recommendations based on the best available science would be needed for providers, parents, and the community to undertake vaccination of school-age children. Finally, methods of adequately evaluating the processes and outcomes of expanding influenza vaccination recommendations needs to be refined and adapted to a variety of settings.

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