Objective: Vaccinating all children aged 6 months to 18 years every year has potentially large ramifications for office-based primary care pediatricians. We determined the degree to which pediatricians support routine annual influenza vaccination outside the medical home, especially in school-located mass influenza vaccination clinics.

Methods: Internet-based survey sent in May and June 2009 to all 623 currently practicing primary care general pediatricians who were members of the Maryland Chapter of the American Academy of Pediatrics.

Results: Of those surveyed, 193 (31%) responded. Approximately 67% reported they vaccinated more than half the children in their practice with at least one dose in the 2008–2009 influenza season, and about half anticipated that, in their office, they would not attain ≥75% coverage of all patients older than 5 months of age. Approximately 27% of respondents predicted they would likely have difficulty obtaining sufficient vaccine to cover commercially insured patients, and 32% were likely to have difficulty getting sufficient vaccine to cover Medicaid, underinsured, and uninsured patients because of ordering or distribution problems. Approximately 78% of respondents cited borderline or poor reimbursement for influenza vaccinations, and 53% had unused vaccine at the end of the 2008–2009 influenza season. Ninety-six percent of respondents supported school-located influenza vaccination programs in their community for their patients.

Conclusions: These results indicate awareness by primary care pediatricians in Maryland of the potential difficulties involved in implementing universal influenza vaccinations in their practice and their support of school-located vaccination programs managed by the local health department in their community. Pediatrics 2012;129:S96–S100

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Key words: immunization programs, influenza vaccination, mass vaccination, school-aged population, school health services

Abbreviations: LAIV—live attenuated influenza vaccine
TIV—trivalent influenza vaccine
MDAAP—Maryland Chapter of the American Academy of Pediatrics
VFC—Vaccines for Children

The 3 authors made substantive intellectual contributions to this published study and met the following criteria: (1) made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; (2) drafted the article or revising it critically for important intellectual content; and (3) approved its final version to be published.

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Prevention of influenza infections in children has been an increasing public health focus in this country over the past decade. This is largely due to the vulnerability of children, including their high rate of hospitalization, high rate of medical utilization, and increased school absenteeism.\(^1\)\(^-\)\(^4\)

In addition to their vulnerability, preschool- and school-aged children are important primary vectors in the spread of influenza to their families and communities. Compared with adults, children experience higher rates of influenza infection, are the first to become infected, and tend to shed greater quantities of influenza virus and for longer periods of a time once infected.\(^5\)\(^-\)\(^10\) Limiting influenza infections in children can limit its spread to families and the community.\(^11\)\(^-\)\(^14\)

Accordingly, in 2008, the Advisory Committee on Immunization Practices recommended universal influenza vaccination for all children aged 6 months to 18 years with implementation beginning in 2008–2009 influenza season if feasible, and no later than during the 2009–2010 influenza season.\(^15\) With these new recommendations, \(\sim\)83\% of the US population was recommended to receive an annual influenza vaccination.\(^16\)

For over half a century, the medical office-based setting has been the primary site of vaccine administration to most children for all antigens. In Maryland, at the onset of the 2008–2009 winter season, several primary-care pediatrician members of Maryland Chapter of the American Academy of Pediatrics (MDAAP) voiced concern about their ability to vaccinate every child aged 6 months or older against influenza because of office space, time, and staffing issues (V.A.K., personal communication, 2009). For the 2009–2010 influenza season, pediatric primary care clinicians faced the additional challenge of administering influenza vaccine against influenza A (H1N1) 2009 as well as against seasonal strains. Well-planned community-based pediatric influenza campaigns have served as a means to potentially achieve higher influenza vaccination rates among children. A natural setting for such a campaign is the child’s school. Schools offer a central location in which a large number of children are gathered and therefore could be vaccinated efficiently and conveniently. Studies have demonstrated that mass school-located influenza vaccinations are feasible and efficient.\(^17\)

Little is known about the attitudes of pediatric clinicians toward influenza vaccinations if they were to be administered by staff not affiliated with the practice at a site other than their office practice and outside their sphere of influence. Primary care pediatric clinicians could potentially feel threatened by such programs if they were seen as a threat to their practice income, the concept of a medical home, or the business of delivering routine vaccines. Additionally, off-site administration of vaccine does not permit the office-based pediatrician the assurance of the quality of the vaccination process or personal care delivered to the children of their practice, for whom they have a strong sense of medical responsibility.

The purpose of this study was to query primary care pediatricians in Maryland to determine barriers to universal influenza vaccination in their office and their level of support for school-located influenza immunization programs in their community.

**METHODS**

We developed and pilot-tested a short Internet survey concerning influenza immunization practices and opinions of Maryland pediatricians. By using their e-mail addresses, in May to June 2009 we sent each registered member of MDAAP up to 6 invitations to participate in this survey. The questionnaire was then made available to them by using Survey Monkey (Portland, OR). The survey was set up to be anonymous and to limit repeat responses, so that only 1 response was allowed from any 1 computer. Of the surveys returned, we excluded any completed by pediatric specialists and retirees. The final study sample thus included only MDAAP-registered general pediatricians. This study was reviewed and approved by the University of Maryland, Baltimore Institutional Review Board.

Survey questions concerned the characteristics of the pediatricians and their practice, the estimated proportion of children in their practice who received influenza vaccine during the 2008–2009 season, and the predicted proportion likely to be vaccinated in the 2009–2010 season. Additional questions also concerned logistical aspects of the 2008–2009 vaccination season, including difficulty obtaining adequate doses of vaccine, compensation for administering influenza vaccine, and having unused residual vaccine at the end of the influenza season. We then asked questions about physician attitudes toward mass influenza vaccinations of their patients in daycare or school settings if managed by their local health department. Additional details included their preferred choice of influenza vaccine formulation (ie, intranasal versus intramuscular injection) and vaccinating only healthy versus healthy and chronically ill or immunosuppressed patients in a school setting. These questions included caveats that the vaccine would be administered in accordance with FDA regulations, parental consent would be obtained, and the primary care physician would receive notification that the vaccine was given.

**RESULTS**

Of the 623 primary care general pediatricians registered as MDAAP members, 193 responded, yielding a 31% response rate. The respondents practiced in 17
(71%) of the 24 Maryland counties. Of these physicians, ~19% were aged ≤40 years, 60% were aged 41 to 61 years, and 22% were aged >60 years. Seventy-eight percent were white, 10% were black, and 10% were Asian, and 2% were other. Fifty-eight percent were female. Their practice sites were urban for 28%, suburban for 64%, and rural for 8%, roughly reflecting the demographics of the state. The number of practitioners in each of the practices varied from 1 (solo) for 7%, 2 to 5 for 47%, 6 to 10 for 31%, and >10 for 15% of the respondents.

Table 1 indicates each practitioner’s estimated proportion of patients who received at least 1 dose of influenza vaccine in their practice during the 2008–2009 influenza season and the proportion of patients they projected to receive influenza vaccine during the upcoming 2009–2010 season. Although only 25% (95% CI: 20%–30%) of the practitioners estimated they vaccinated 75% or more of their patients aged ≥6 months during the 2008–2009 season, 49% (95% CI: 43%–55%) anticipated vaccinating this many during the 2009–2010 season.

Concerning vaccine availability and provider compensation, 27% (95% CI: 22%–32%) of providers reported difficulty obtaining adequate supplies of vaccine in the 2008–2009 season for their privately insured patients, and 32% (95% CI: 26%–38%) reported such difficulty for their Medicaid and underinsured patients, including those in the Vaccines for Children (VFC) program. Only 22% (95% CI: 17%–27%) of the primary care providers reported profitable reimbursement for vaccination; 54% (95% CI: 48%–60%) reported recovery of their costs, and 24% (95% CI: 19%–29%) were compensated at levels below their cost. Finally, 53% (95% CI: 47%–59%) reported having some unused influenza vaccine after the 2008–2009 season, either from their privately purchased or VFC stock, with 17% (95% CI: 13%–21%) reporting that >5% of their vaccine remained unused. Respondents generally supported the concept of vaccine administration in sites other than their office, if such programs in such sites were associated with their local public health department. Ninety-six percent indicated they supported their local health department. This can have a positive impact on seasonal influenza vaccination rates among children. Universal influenza vaccination before or during the influenza season presents a significant challenge to office-based pediatricians. How do they provide 1 or 2 such vaccinations in their office during the busy fall-winter season each year for nearly all their patients, while continuing to offer quality care for their regular flow of patients? This self-reported survey reveals some practices and barriers in attempting to do so.

As expected, the reported anticipated pediatric practice vaccination rates increased from 2008–2009 to 2009–2010, but are not yet near the eventual goal of universal vaccination. Logistic issues for practitioners include problems obtaining vaccine, inadequate reimbursement, and concern about having nonreturnable, nonrefundable, unused influenza vaccine remaining at the end of the season.

This study points out the pediatrician’s paradox of having too little vaccine in the fall, but too much unused vaccine the following spring, after which it expires. In 1 common scenario, the pediatrician receives only several hundred influenza vaccine doses in the early fall that are designated for patients covered under the VFC program. These doses are quickly used, and more vaccine is reordered by November. However, the second aliquot of vaccine does not arrive until early the next year, when

### TABLE 1  Maryland Primary Care Pediatricians’ Perceptions (N = 193) on Influenza Vaccine Use in Their Practice

<table>
<thead>
<tr>
<th>Estimated proportion of Pediatricians’ patients aged ≥ 6 mo of age who were or will be vaccinated against influenza</th>
<th>&lt;25%</th>
<th>25%–49%</th>
<th>50%–74%</th>
<th>75%–95%</th>
<th>&gt;95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of clinicians estimating they DID vaccinate the proportion of patients &gt; 6 mo noted above for 2008–2009 influenza season</td>
<td>5% [2%–8%]</td>
<td>29% [24%–34%]</td>
<td>41% [35% 47%]</td>
<td>23% [18%–28%]</td>
<td>3% [1%–5%]</td>
</tr>
<tr>
<td>Percent of clinicians estimating they WILL vaccinate the proportion of patients &gt; 6 mo noted above for the 2009–2010 influenza season</td>
<td>0%</td>
<td>10% [6%–14%]</td>
<td>42% [36%–48%]</td>
<td>38% [32%–44%]</td>
<td>10% [4%–16%]</td>
</tr>
</tbody>
</table>

Brackets indicate 95% confidence limits.

**DISCUSSION**

Nearly all the pediatricians surveyed here accepted the value of having a child in their practice vaccinated at a school-located facility managed by the local health department. This can have a positive impact on seasonal influenza vaccination rates among children. Universal influenza vaccination before or during the influenza season presents a significant challenge to office-based pediatricians. How do they provide 1 or 2 such vaccinations in their office during the busy fall-winter season each year for nearly all their patients, while continuing to offer quality care for their regular flow of patients? This self-reported survey reveals some practices and barriers in attempting to do so.

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This study points out the pediatrician’s paradox of having too little vaccine in the fall, but too much unused vaccine the following spring, after which it expires. In 1 common scenario, the pediatrician receives only several hundred influenza vaccine doses in the early fall that are designated for patients covered under the VFC program. These doses are quickly used, and more vaccine is reordered by November. However, the second aliquot of vaccine does not arrive until early the next year, when
TABLE 2. Maryland Primary Care Pediatricians’ Perceptions (N = 183) on Their Support for Mass Influenza Vaccination Efforts Outside the Practice

<table>
<thead>
<tr>
<th>Scenario: Mass vaccination of their patients in daycare — Aged 24–59 mo</th>
<th>Percentage supporting such a practice for each age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged 2–3 mo</td>
<td>55% (44–78%)</td>
</tr>
<tr>
<td>Aged 4–5 mo</td>
<td>73% (68–78%)</td>
</tr>
<tr>
<td>Aged 6–11 mo</td>
<td>96% (94–98%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario: Local health department run, mass school-based influenza immunization program — Aged 24–59 mo</th>
<th>Percentage supporting such a practice for each patient health status category</th>
</tr>
</thead>
<tbody>
<tr>
<td>No not for any patient</td>
<td>4% (2–5%)</td>
</tr>
<tr>
<td>Yes, using either LAIV and TIV for healthy patients and TIV for high-risk patients</td>
<td>53% (47–59%)</td>
</tr>
<tr>
<td>Yes, using either LAIV or IV for only healthy patients</td>
<td>31% (26–36%)</td>
</tr>
<tr>
<td>Yes, using only TIV for healthy and high-risk patients</td>
<td>9% (6–12%)</td>
</tr>
</tbody>
</table>

A large proportion of respondents supported influenza vaccination for school-aged children delivered through a school-located program provided that the local health department managed it. This support appeared to be stronger for school-aged children than for younger children, but even 55% of respondents supported off-site vaccinations for children younger than age 2.

Parents assume it is too late to have their child vaccinated, and excess vaccine remains at the end of the influenza season. Further compounding this problem, the next year’s allotment of VFC doses is reduced, rather than increased, because the allotment is based on the previous year’s doses used.

Other studies have identified similar barriers to universal influenza vaccination in the medical home. One study stressed that medical practice-based influenza vaccination visits using routine office procedures were time-consuming and inefficient. Another study considered that even having “vaccination-only” visits to an office practice during regular hours could be a substantial burden. Implementation of special influenza vaccination clinics in the office practice has been recommended, but the pool of available and willing regular office staff available for overtime or evening hours during several months in a given practice may be insufficient to manage such additional clinics for several months. Also, influenza vaccine supply and distribution issues have been of particular concern for pediatricians in the recent past. The recent increase in the number and output of influenza vaccine manufacturers may help pediatricians obtain the doses they need. Two other studies support the concept that poor reimbursement for vaccination efforts may be associated with fewer vaccines given in the medical home.

A school-located program provided that the local health department managed it. This support appeared to be stronger for school-aged children than for younger children, but even 55% of respondents supported off-site vaccinations for children younger than age 2.

Only 4% of respondents objected to any of their school-aged patients being vaccinated in the child’s school. For healthy children, there did not seem to be an overwhelming preference for either LAIV or TIV used in this type of program. More than half the respondents indicated they would support the vaccination of both their healthy and high-risk patients in a school-located program.

Several study limitations exist. Most notably, the respondents comprised only 31% of the primary care members of the MDAAP, and not all pediatricians in Maryland or a known proportion of them are members of this organization. Even though the survey response rate by physicians was low, the demographics of the respondents represented a broad range of demographics that were similar to the state as a whole. We addressed the low-response-rate issue by conducting this simple sensitivity test. Because nearly all respondents approved of such an off-site influenza vaccine program, we postulate that, if even half of the nonrespondents objected to their school-aged patients being vaccinated in the child’s school (rather than the 4% figure we measured), this would still result in the majority (64%) of MDAAP pediatricians finding the use of school-located vaccine programs acceptable. In addition, we recognize that physicians may incorrectly estimate the proportion of patients who have or will receive influenza vaccine during any 1 season.

We did not survey attitudes and practices of family medicine physicians, who vaccinate a great number of children, especially in rural counties. Responses from pediatric specialists were excluded because of small numbers, and no adolescent medicine specialists responded. Both these groups were likely to have some members who vaccinate children against influenza. Additionally, multiple respondents could have come from the same office, which we did not
This study indicates that several key logistical problems exist in achieving universal influenza vaccination of children in the office setting. This survey revealed substantial support by primary care pediatricians for school-located influenza immunization of their pediatric patients. These findings support the use of school-located programs to help achieve the goal of annual universal vaccination of children aged ≥6 months against influenza. When planning such an influenza vaccination campaign, it is essential that local health departments communicate early and frequently with primary care pediatricians to help them titrate the level of vaccine purchases and possible extra “vaccine clinics” planned for their office practices. Support by pediatricians in office practices for school-located programs managed by the local public health system could greatly facilitate the common goal of achieving higher influenza vaccination rates among children.

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REFERENCES

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