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Local Health Departments Can Deliver HPV and other Age Appropriate Vaccines in Schools but Lack a Sustainable Funding Model

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Human papillomavirus (HPV) causes approximately 35,900 new cases of cancer annually in the U.S., including most cervical cancers, and some cancers of the vagina, vulva, anus, penis, and oropharynx (back of the throat).[1] For over a decade, HPV vaccines have been recommended by the Advisory Committee on Immunization Practices for adolescents and young adults as primary prevention of HPV-related cancers[2]. While the percentage of adolescents initiating the vaccine series has increased by an average of five percentage points annually since 2013, uptake remains below other adolescent vaccines.[2–4]

Multiple barriers to HPV vaccination exist in the United States and Wisconsin, including the initial rollout of the vaccine that focused on mode of transmission (sexual activity) instead of cancer prevention, parental concerns about safety, lack of knowledge that HPV can cause cancer (particularly oropharyngeal), lack of medical provider recommendation, the misconception that boys do not directly benefit from the vaccine, and time needed for multiple appointments.[5] Voluntary school-located vaccination is an attractive strategy for childhood and adolescent HPV vaccine delivery with wide success

internationally as indicated by high (>80%) series completion and decreased rates of vaccine-targeted HPV genotypes.[6–14] School-located vaccination can help to address unreliable access to primary care, missed opportunities for vaccination, vaccination catch-up, and parental awareness of vaccines. Furthermore, the COVID-19 pandemic has highlighted the crucial role of schools for COVID-19 vaccination and vaccination catch-up for students. The approach and extent of school-located vaccination varies by state, however, the challenge of billing insurers remains a major barrier to sustainability in the United States in non-pandemic times.[15–18]

Since 2011, local health departments have operated school-located vaccination clinics with combined support from the Wisconsin Immunization Program, Wisconsin Office of Preparedness and Emergency Health Care, Centers for Disease Control and Prevention (CDC) Section 317 grant funds, and federal emergency preparedness funds. This arrangement allows local health departments to conduct required emergency preparedness exercises by providing vaccines at local K-12 schools without billing or collecting insurance information.

The popularity of these programs outpaced funding in 2017, prompting a reduction in available vaccines, beginning with the elimination of HPV vaccine after two years.[19] Wisconsin local health departments have since faced the dilemma of continuing school-located vaccination with only influenza vaccine or acquiring vaccines through other means. We engaged local health departments to understand if and how they would adapt. We had a particular interest in studying HPV vaccination delivery because it is a key part of the cancer control efforts of the 2020-2030 Wisconsin Cancer Plan. Our study objectives were: 1) to measure provision of vaccines in schools by local health departments before and after limitations were placed on the types of vaccines available; and 2) gauge local health department interest in three alternative options for financially supporting school-located vaccination.

ABSTRACT

Background

Voluntary school-located vaccination is a promising strategy for delivering childhood and adolescent vaccines and can increase rates of human papillomavirus (HPV) vaccine coverage. Wisconsin local health departments operate widely popular school-located vaccination clinics. Objectives were to measure vaccine provision before and after funding constraints limited vaccine availability and to gauge interest in alternatives for financing.

Methods

We conducted descriptive analyses of data from cross-sectional surveys sent to Wisconsin local health department directors 2017 and 2018, before and after vaccine availability decreased.

Abbreviations

HPV: Human papillomavirus
VFC: Vaccines for Children Program, is a federally funded program that provides vaccines at no cost to children who might not otherwise be able to pay.
LHD: Local health department

Results

The number of health departments offering influenza, tetanus-diphtheria-acellular pertussis, meningococcal, and HPV vaccines in middle and high schools decreased over all years studied. The largest percent decrease was among health departments offering HPV vaccine. Only 3 health departments anticipated offering HPV vaccine in 2018- 19. Most respondents (57%) reported interest in continuing or starting school-located vaccination. However, partnering with an outside organization with an existing billing system was the only alternative rated as feasible by the majority.

Conclusion

Local health departments deliver HPV vaccines and other age-appropriate vaccines, but their operations are limited by reliance on vaccines provided at no-cost. The future of health department-led school-located vaccination will be determined by support for billing infrastructure.

KEY POINTS

- HPV is a common virus that causes six kinds of cancer in men and women.
- School-located vaccination is a promising strategy for delivering childhood and adolescent vaccines and can increase rates of HPV vaccine coverage.
- Local health departments deliver HPV vaccines and other vaccines but are limited by providing vaccines at no-cost, especially when the HPV vaccine is expensive.
- The future of health department-led school-located vaccination will be determined by support for billing infrastructure.

Methods

Participants

Survey participants were directors of local health departments in Wisconsin. These 85 individuals were contacted to participate in an initial survey (survey 1) in July 2017. One year later, we reconciled survey 1 contacts with updated listings and sent survey 2 to 86 directors (two local health departments were previously managed by a single director). Instructions invited directors to complete the surveys themselves or forward to a colleague (e.g., immunization coordinator) who could best answer questions regarding immunizations at their local health department.

Instrumentation

We used Qualtrics Survey Software (Provo, UT) to develop and host two self-administered web-based surveys. Our intention when designing survey 1 was to measure past and current health department involvement in school-located vaccination. Questions and answer choices were informed by semi-structured interviews with 16 Wisconsin health department immunization coordinators (identified through membership in regional immunization coalitions) held between April and June 2017. Nearly all interviewees reported operating school-located immunization clinics and educated our team about their arrangement with the Wisconsin Immunization Program to obtain vaccines. They suggested that many other health departments not interviewed may be participating and encouraged our study of the breadth of this practice across the State. Survey 1 consisted of multiple-choice, binary, and open-ended questions about which vaccines were provided at middle and high schools, how programs were financially supported, and which students were eligible. Our survey included the following open-ended questions: "Why do you believe that school-located vaccination clinics were never implemented or supported by your health department?", "Is there anything else that you would like to share?", and several opportunities to select "other" and give written responses to multiple choice questions. We did not code responses to any of the open-ended questions because not enough respondents left answers. However, responses to open-ended questions helped inform us that changes were occurring to the vaccines available for preparedness activities.

We developed Survey 2 after learning that health departments expected cutbacks on vaccines available from the state immunization program, the sole entity throughwhich they reported obtaining vaccines on survey 1. Survey 2 asked health departments if they continued or started school-located vaccination during the interim 2017-18 school year, and if so, which vaccines they offered in middle and high schools. Respondents that reported offering fewer types of vaccines listed all contributing factors, including the lack of vaccines available from the state immunization program. Given that the effects of reduced school-located vaccination funding may be seen over more than one year, respondents also gave a projection of the vaccines that they expected to offer in the upcoming 2018-19 school year.

TABLE 1

Descriptions of Alternative Methods for Obtaining Vaccines as Presented to Survey Respondents

Alternative	Description
Screening for VFC[a] eligibility	One method of increasing vaccine offerings at school-located clinics is to screen for VFC eligibility and only provide vaccines to students who qualify for VFC. This approach would allow health departments to offer all of the routine vaccines, but only to students who are VFC eligible (Medicaid, uninsured, underinsured, or Native American or Alaska native).
Billing private insurance	Another method of increasing vaccine offerings at school-located clinics is to bill private health insurance plans for vaccine cost and administration. This approach would allow health departments to offer all routine vaccines, but only to students who are privately insured. Most health departments that bill private insurance also screen for VFC eligibility.
Partnering with outside organizations with billing infrastructure	The final method that we will present is partnering with an outside organization. This approach would allow health departments to offer all routine vaccines by using the billing infrastructure of another entity, such as a clinic, health system, pharmacy, or company specializing in mass vaccination clinics. Please assume that any partnering agreement would include both screening for VFC eligibility and billing private insurance.

(a) The CDC purchases vaccines at a discount and distributes them to grantees such as state health departments who in turn distribute them to registered providers.[29]

Finally, all health departments interested in continuing and starting school-located vaccination in the future were presented with three alternatives to obtaining vaccines: 1) offering vaccines to students eligible for the Vaccines for Children (VFC) program (a federally funded program designed to distribute vaccines at no costs to students who are Medicaid-eligible, uninsured, underinsured, or Native American or Alaska Native), 2) billing insurance companies, and 3) partnering with an outside organization (e.g., health system, pharmacy) with existing billing infrastructure (Table 1). Using a 5-point Likert scale, respondents rated the feasibility of these alternatives and the necessity of various resources (see tables 3 and 4) for implementing the alternatives. The director of the Wisconsin Immunization Program reviewed the survey and suggested language to describe the changes to vaccine availability that would be familiar to respondents.

Procedure

In July 2017, we emailed a link to Survey 1 along with an explanation of the study to 85 local health department directors. Those who did not respond received a reminder email two weeks later. Sixty-seven local health departments returned survey 1 by August 2017, and we retained the 65 surveys that were completed (76% of 85 invitees). We sent survey 2 to 86 local health department directors in July 2018 and again sent reminders after two weeks. Due to low response rates and our increased staff availability, we called local health departments that had yet to complete Survey 2 four weeks after it was originally sent. By September 2018, we received 79 responses for Survey 2, 76 of which were completed (88% of 86 invitees) and used in analyses. This research did not involve human subjects, therefore institutional review board (IRB) review was not required.

Data analysis

We matched surveys 1 and 2 and analyzed the data -using SPSS Statistics Version 25.0 (Armonk, NY; IBM Corp). Our unit of analysis was the local health department. To maintain the largest sample size possible, our analytic sample was those who completed Survey 2 (n=76) irrespective of their activity on Survey 1. We tabulated health department organizational characteristics for the total sample and by school-located vaccination activity (yes or no) during the 2017-18 school year. We condensed categorical groups when possible to avoid low counts and used Fisher's exact test to compare characteristics between those health departments conducting any school-located vaccination during the 2017-2018 school year and those who did not.

To measure vaccine provision over the period of decreasing vaccine availability, we restricted the analyses to health departments that completed Survey 1 in addition to Survey 2 and indicated that they were involved in school-located vaccination on Survey 1. We then tabulated vaccine offerings for this subset of local health departments during the 2016-17, 2017-18, and projected 2018-19 school years. To identify whether local health departments may have initiated school-located vaccination between Survey 1 and Survey 2 and would thus be lost in our analyses, we ran crosstabs for all school-located vaccination involvement between the 2016-17 and 2017-18 school years.

We also used crosstabs to determine how many local health departments were not previously involved in school-located vaccination but planned to initiate school-located vaccination in the upcoming 2018-19 school year.

Similarly, we tabulated feasibility and resource necessity ratings for the three alternative methods of obtaining vaccines, reporting count and percent of local health departments giving each rating.

Results

Sample characteristics

Table 2 shows characteristics of the surveyed local health departments. Nearly all local health departments reported current or prior activity providing immunizations in schools (92%). Local health departments from all public health regions responded in relatively equal numbers. The rural-urban representation, as defined by the National Center for Health Statistics Urban-Rural Classification Scheme, mirrored that of the Wisconsin population with rural, suburban, and urban counties represented equally.[20] Thirty-eight health departments (50%) reported any school-located vaccination activity during the 2017-18 school year, and there was no significant difference between health departments with and without school-located vaccination activity in 2017-18 in terms of the characteristics assessed in Table 2.

TABLE 2

Characteristics of Wisconsin Local Public Health Departments in Aggregate and by School-Located Vaccination Activity in School Year 2017-2018

Characteristic	Total sample (n=76)	LHD school-located vaccination activity in school year 2017-18		
		Yes (n=38)	No (n=38)[a]	p-value[b]
Public health region, n (%)				
Southern	14 (18.4%)	6	8	0.18
Northeastern	17 (22.4%)	10	7	
Southeastern	15 (19.7%)	4	11	
Western	16 (21.1%)	11	5	
Northern	14 (18.4%)	7	7	
Urban-rural classification[c], n (%)				
Metropolitan >250,000 residents	24 (31.6%)	11	13	0.27
Metropolitan <250,000 residents	12 (15.8%)	4	8	
Micropolitan urban cluster 10,000-49,000 residents	12 (15.8%)	5	7	
Noncore	28 (36.8%)	18	10	
Number of employees administering vaccines, n (%)				
0	1 (1.3%)	0	1	1.0
1-3	33 (43.4%)	16	17	
4-9	33 (43.4%)	17	16	
10+	9 (11.8%)	5	4	

(a) "No" designation refers to LHDs that previously conducted school-located vaccination clinics of any kind (n=32) and LHDs that did not provide enough information to determine past activity (n=6).
(b) P values are for Fisher's exact tests comparing LHDs who conducted school-located vaccination in 2017-18 and those that did not.
(c) Classifications were made using the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties with large metropolitan population and medium metropolitan population categories combined due to low counts.

Vaccine offerings, 2016—2019

Thirty health departments reported any school-located vaccination activity at middle or high schools in 2016-17, with influenza vaccine being the most frequently offered (Figure 1). Between the 2016-17 and 2017-18 school years, the number of these 30 health departments offering each of four age-appropriate vaccines decreased. The largest percent decrease was among those offering HPV vaccine (61% decrease in middle schools, 50% decrease in high schools). The smallest percent decrease was among those offering influenza vaccine (23% decrease in middle schools, 15% decrease in high schools). When comparing the 2017-18 offerings to predicted 2018-19 offerings, the number of local health departments providing each of the four vaccines again declined in both middle and high schools. Over the entire three-year period, there was more than a 65% decline in the number of local health departments offering tetanus-diphtheria-acellular pertussis (Tdap), meningococcal conjugate, and HPV vaccines. In 2018-2019, only three (10%) local health departments anticipated offering HPV vaccine in middle schools and two (7%) anticipated doing so in high schools.

Twenty-seven health departments (89% of the 30 health departments in these analyses) that decreased the number of vaccines offered between 2016 and 2019 cited the new limitations on vaccines available from the state immunization program as a reason for decreasing their offerings. Other contributing factors cited by one local health department were lack of interest from schools and parental hesitation towards all or some vaccines.

Discussion

Widespread school-located vaccination in Wisconsin is a product of local, state, and federal partnership. Our findings indicate that most Wisconsin local health departments (92% of respondents) have experience delivering vaccines in schools. However, the sustainability of health department-operated school-located vaccination is uncertain. The number of health departments offering each type of vaccine declined across all years studied. The largest percent decrease was seen in the number of local health departments offering HPV vaccines, unsurprising given that HPV vaccines were the first to be eliminated due to its relatively high cost. Similarly, Tdap and meningococcal vaccine offerings decreased when health departments no longer had access to a supply at no cost. Importantly, health departments that decreased vaccine offerings or ended school-located vaccination completely did so because of limitations on vaccines available from the state immunization program with few additional reasons cited.

The challenge to maintain school-located vaccination offerings is not unique to Wisconsin. Compared to the widespread implementation and success reported internationally,[6–14] school-located vaccination in the U.S. has occurred on a small scale, primarily through partnerships between local health departments and schools, at school-based health centers, or through short-term grants.[21,22] These programs have focused heavily on influenza and hepatitis B catch-up vaccines,[15,23–26] although several programs have offered HPV vaccine with modest initiation rates and high series completion rates.[16–18,27] Long-term sustainability has been a challenge, with billing insurers as a commonly cited barrier.[15–18] The hurdle of billing and reimbursement was likewise a main component of our results, as evidenced by the small number of health departments that found a way to continue offering vaccines that were no longer available at no cost.

Despite decreases in vaccine offerings, local health departments remain committed to school-located vaccination. This is apparent from the high percentage of health departments that continued to operate by offering influenza vaccine as well as the small group that initiated or planned to initiate school-located vaccination despite decreasing vaccine availability. As for a financing method that these health departments might turn to in the future, our results suggest that partnering with an outside organization with an existing billing system is the most feasible alternative for continuing school-located vaccination. Operating an in-house billing system is seen as the least feasible alternative while screening for VFC eligibility falls in the middle.

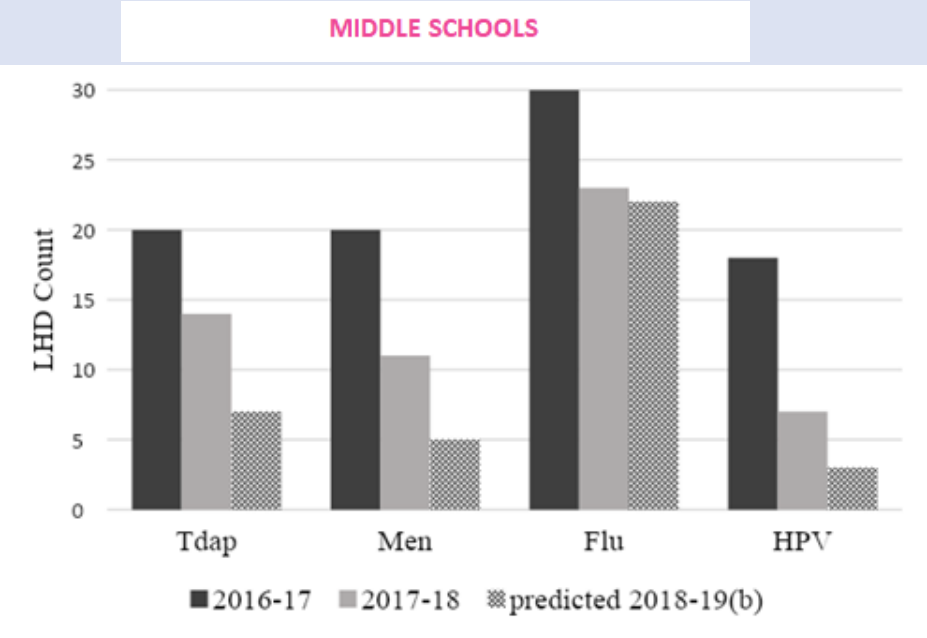
It may be worth studying the experience of the small number of health departments in this survey who continued to offer vaccines by screening for VFC eligibility. However, broader acceptance and funding mechanisms beyond the VFC program are needed for school-located vaccination to be successful in the United States. To this end, we should explore opportunities for health department—pharmacy or health department—health system partnerships and reduce the cost of vaccines by means such as bulk purchasing by health departments. Furthermore, the COVID-19 pandemic has highlighted the role of local health department mass vaccination, the success of which could be used as evidence to support reoccurring school-located clinics for all age-appropriate vaccines. Finally, reframing vaccines as tools that not only prevent disease and suffering, but also save significant amounts of money may favorably influence stakeholders funding school-located vaccination. For example, the significant costs of HPV-related cancers combined with high vaccine effectiveness should ideally bolster the case for vaccinations even if the initial cost of the vaccine seems high.

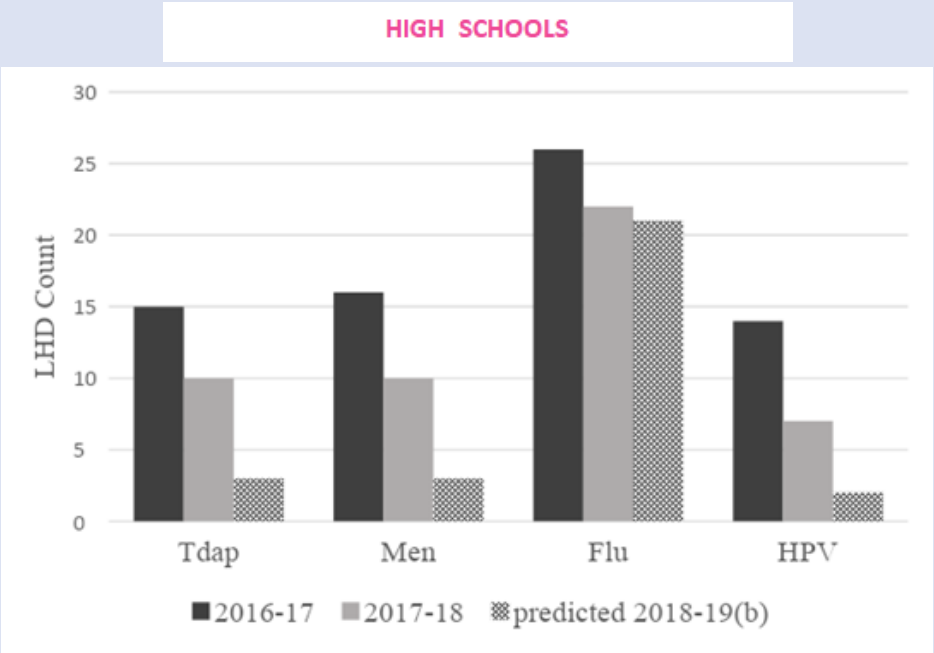
Strengths of this study include a high response rate on both surveys. Moreover, to our knowledge, this is the first study in the U.S. to report widespread school-located vaccination in rural school districts. However, several shortcomings should be considered when interpreting our results. Because of using self-reported survey data, our results are subject to many types of response bias, and the answers given by health departments were not able to be confirmed with official records of vaccine provision.[28]

In addition, while employing serial surveys allowed for measurement of vaccination over time, several local health departments did not respond to both surveys. We chose to follow the 30 health departments that reported school-located vaccination activity in survey 1 and completed survey 2 to ensure a consistent group for analyses. Based on when survey 2 respondents reported stopping school-located vaccination, if all health departments that responded to survey 2 had responded to survey 1, an estimated 10-12 health departments could have been included in analyses. Finally, we did not measure the number of HPV vaccines administered in schools, and therefore, we cannot comment on the degree to which the reduction in vaccine availability impacted vaccine coverage rates across communities.

FIGURE 1

Number of Wisconsin Local Public Health Departments[a] Offering Vaccines in Middle and High Schools, 2016-2019





Abbreviations: LHD, local health department; Tdap, tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine; Men, meningococcal conjugate vaccine; Flu, season influenza vaccine; HPV, bivalent, quadrivalent, and nonavalent human papillomavirus vaccines

(a) Analysis was limited to LHDs that conducted at least one school-located vaccination clinic in 2016-17 as indicated on survey 1 and completed survey 2
(b) LHDs were asked in Summer 2018 to predict which vaccines they would be offering in the upcoming 2018-19 school year.

Of note, only three health departments (10%) continued to offer vaccines that were no longer available from the state immunization program, and they all did so by screening for VFC eligibility and administering VFC vaccines to those who qualify.

Two local health departments that did not participate in school-located vaccination in 2016-17 started in 2017-18, and an additional six local health departments that did not participate in 2017-18 planned to start in 2018-19.

Feasibility and resource necessity ratings for future school-located vaccination

The majority of Survey 2 respondents (n=44, 57%) were interested in continuing or starting school-located vaccination in the future and a smaller number were unsure (n=18, 24%). However, when presented with the three alternatives for obtaining vaccines, very few local health department directors gave "very feasible" or "extremely feasible" ratings (Table 3). After combining the categories of "somewhat feasible," "very feasible," and "extremely feasible," partnering with an outside organization had the highest feasibility ratings (60% of respondents who answered this set of questions gave a response of "somewhat feasible" or higher). Screening for VFC eligibility and billing private insurance were felt to be less feasible with 51% and 28% of health departments giving a rating for "somewhat feasible" or higher, respectively.

Health departments reported high need for nearly all resources should they implement any of the three alternatives to obtain vaccines (Table 4). Additional staff time, funding, and extra support from schools were rated as "very necessary" or "extremely necessary" by 70% or more of health departments regardless of the alternative . Billing private insurance stood out as the alternative requiring the most resources; over 80% of health departments gave a rating of "very necessary" or "extremely necessary" for all resources if they were to engage in billing. Partnering with outside organizations was associated with a similarly high need for all resources. Screening for VFC eligibility was the only alternative where a minority of local health departments rated any of the listed resources as "very necessary" or "extremely necessary."

TABLE 3

Feasibility Ratings for Three Alternatives to Obtaining Vaccines for School-Located Vaccination Clinics, 2017-2018

	Alternatives					
	Screening for VFC eligibility *n (%) of LHDs giving each rating*					
Feasibility ratings	1 Not feasible at all	2	3	4	5 Extremely feasible	Total (n)
	2 (3%)	28 (46%)	20 (33%)	9 (15%)	2 (3%)	61
	Billing private insurance *n (%) of LHDs giving each rating*					
Feasibility ratings	1 Not feasible at all	2	3	4	5 Extremely feasible	Total (n)
	14 (23%)	30 (49%)	13 (21%)	3 (5%)	1 (2%)	61
	Partnering with outside organizations with billing *n (%) of LHDs giving each rating*					
Feasibility ratings	1 Not feasible at all	2	3	4	5 Extremely feasible	Total (n)
	2 (3%)	23 (38%)	28 (46%)	4 (7%)	4 (7%)	61

TABLE 4

Resource Need Ratings for Three Alternatives to Obtaining Vaccines for School-Located Vaccination (2017-2018)

Resources	Screening for VFC eligibility *n (%) of LHDs giving each rating*					
	1 Not necessary	2	3	4	5 Extremely necessary	Total (n)
Additional staff time	1 (2%)	3 (5%)	9 (15%)	26 (44%)	20 (34%)	59
Instructions detailing the steps for SLV	1 (2%)	10 (17%)	16 (27%)	20 (34%)	12 (20%)	59
Access to experts who can help troubleshoot problems	1 (2%)	12 (20%)	24 (41%)	17 (29%)	5 (8%)	59
Extra funding	1 (2%)	5 (8%)	10 (17%)	26 (43%)	18 (30%)	60
Mentorship from LHDs with prior experience	7 (12%)	19 (33%)	20 (35%)	9 (16%)	2 (4%)	57
Extra cooperation and support from schools	0	0	15 (26%)	24 (41%)	19 (33%)	58

Resources	Billing private insurance *number (%) of LHDs giving each rating*					
	1 Not necessary	2	3	4	5 Extremely necessary	Total (n)
Additional staff time	0	0	2 (3%)	19 (33%)	37 (64%)	58
Instructions detailing the steps for SLV	1 (2%)	2 (3%)	4 (7%)	17 (29%)	34 (59%)	58
Access to experts who can help troubleshoot problems	1 (2%)	2 (3%)	4 (7%)	24 (41%)	28 (47%)	59
Extra funding	0	1 (2%)	5 (9%)	16 (28%)	36 (62%)	58
Mentorship from LHDs with prior experience	2 (3%)	4 (7%)	12 (21%)	20 (34%)	20 (34%)	58
Extra cooperation and support from schools	0	3 (5%)	9 (15%)	20 (34%)	27 (46%)	59

Resources	Partnering with organizations with billing *number (%) of LHDs giving each rating*					
	1 Not necessary	2	3	4	5 Extremely necessary	Total (n)
Additional staff time	0	2 (3%)	7 (12%)	21 (36%)	29 (49%)	59
Instructions detailing the steps for SLV	0	3 (5%)	5 (9%)	24 (42%)	25 (44%)	57
Access to experts who can help troubleshoot problems	0	4 (7%)	8 (14%)	22 (39%)	23 (40%)	57
Extra funding	0	3 (5%)	9 (16%)	19 (33%)	27 (47%)	58
Mentorship from LHDs with prior experience	1 (2%)	5 (9%)	9 (16%)	26 (45%)	17 (29%)	58
Extra cooperation and support from schools	0	2 (3%)	10 (17%)	26 (45%)	20 (34%)	58

Implications for School Health

This study offers evidence of a successful model for school-located vaccination that is popular but limited by its reliance on vaccines provided at no-cost while bypassing traditional health insurance billing. We conclude that local health departments are enthusiastic partners in school-located vaccination with considerable experience delivering HPV vaccines and other age-appropriate vaccines, but the future existence of health department-operated school-located vaccination will depend on ability to finance vaccines.

This study identifies opportunities for school-located vaccination that are preferable and more feasible for local health departments. Future efforts should focus on implementing and evaluating pilot projects that allow local health departments to trial school-located vaccination. Our results suggest that partnering with organizations with existing billing infrastructure, such as health systems or pharmacies, may be the most feasible model for such trials. However, some flexibility should exist as local health departments may have obvious reasons to prefer a certain approach (e.g., areas with a sizable proportion of VFC-eligible students may want to operate by screening for VFC eligibility). Another opportunity for local health departments may be maintaining school-located vaccination clinics currently operating to provide COVID-19 vaccines and catch-up vaccines from the child and adolescent platform. The COVID-19 pandemic has demonstrated the importance of mass vaccination opportunities for individual and community health, which may influence the funding landscape. Regardless of the model used to secure a vaccine supply, sustainability should be at the forefront of all decisions related to financially supporting school-located vaccination.

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