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Rural parents' vaccination-related attitudes and intention to vaccinate middle and high school children against influenza following educational influenza vaccination intervention

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Objective: This study examined changes in parental influenza vaccination attitudes and intentions after participating in school-based educational influenza vaccination intervention.

Results: Parents who participated in the intervention conditions reported significantly higher influenza vaccination rates in their adolescents, relative to a control group, as well as increased vaccination rates post-intervention participation relative to their baseline rates. Intervention participants reported greater intention to have their adolescent vaccinated in the coming year compared with control parents. Significant differences were observed post intervention in perceived barriers and benefits of vaccination.

Methods: Participants were drawn from three counties participating in a school-based influenza vaccination intervention in rural Georgia (baseline n = 324; follow-up n = 327). Data were collected pre- and post-intervention from phone surveys with parents' with children attending middle- and high-school. Attitudes, beliefs, vaccination history and intention to vaccinate were assessed.

Conclusions: These findings suggest that a school-delivered educational influenza vaccination intervention targeting parents and teens may influence influenza vaccination in rural communities. Future influenza vaccination efforts geared toward the parents of rural middle- and high-school students may benefit from addressing barriers and benefits of influenza vaccination.

Introduction

Influenza is a significant health burden in the United States. Annually, 5% to 20% of the US population gets the flu, more than 200,000 people are hospitalized from seasonal flu-related complications, and estimates of flu-associated deaths range from a low of approximately 3,000 to a high of approximately 49,000 people.[1,2] Influenza-related illnesses and deaths occur most frequently among elderly persons ≥65 y, people with medical complications and infants <2 y.[3-5] However, rates of influenza transmission are highest among school-age children, who serve as the primary source of infection for high-risk populations.[6-9]

Immunization with influenza vaccine is the most effective method for preventing infection and vaccination of school-age children may indirectly protect vulnerable populations.[9,10] Prior to 2002, the Advisory Committee on Immunization Practices (ACIP) recommended influenza vaccination for a limited set of children: those with underlying medical conditions or household contacts of persons at increased risk for influenza-related complications.[11] In February 2008, the ACIP expanded its recommendation to include all children aged 5–18 y,[12] adding 26 million children and adolescents to groups recommended for routine influenza vaccination.[13]

Of all children included in the ACIP expanded recommendations, vaccinating adolescents may be particularly challenging. Despite the ACIP recommendation, data from eight sentinel sites in 2008–2009 indicate that only 5%–15% of children aged 13–18 received influenza vaccinations.[14] Few adolescents have primary care providers, and those who do infrequently make well-exam visits.[15] Furthermore, African-American adolescents receive less primary care than their White counterparts.[16] Consequently, new and innovative strategies will be needed to reach adolescents.[17] Because nearly all (92.0% to 98.2%) adolescents aged 10–18 y attend school on a daily basis, school-based vaccination programs may provide an effective strategy to immunize large numbers of adolescents against influenza.[18-21]

Successfully administering vaccines to adolescent populations, particularly in schools, requires a paradigm shift on the

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Table 1. Demographic information of study counties

	School-based	Provider-based	Control
Total County Population (2006)	5949	8257	10,468
County, % African American	57%	32%	53%
Total number of students (middle and high, 2007–2008)	418	757	853
Students, % African American++	96%	38%	53%
Percent of students eligible for free or reduced lunch	82%	65%	69%

++Percentage of students who are African American is higher than population percent because a large portion of white students attend private rather than public schools.

part of parents.[22] Historically, vaccination has been treated as an intervention for young children and has typically taken place inside a medical home.[22,23] Providing vaccinations to adolescents outside of the medical home, such as school settings, highlights the importance of parental attitudes toward school-based influenza vaccination. Studies among parents of elementary school children have found that barriers toward participation in school-based influenza vaccination programs include: concerns about adverse effects, lack of physician recommendation, vaccine cost, child has asthma or another illness, and not receiving any vaccinations.[24,25] Of note, in one study, several parents expressed concern about the training of the staff delivering vaccines at school and several expressed a desire to be with their children when they were vaccinated.[25]

Whether similar barriers to school-based influenza vaccination exist among parents of middle- and high-school students is unclear. The purpose of this study was to examine the psychosocial mediators of influenza vaccination among parents of low-income, rural adolescents participating in a school-based influenza vaccination intervention. Specifically, this study sought to: (1) characterize the prevalence of influenza vaccination and theory-based psychosocial correlates of influenza vaccination among parents of middle- and high-school children, (2) examine whether an educational brochure targeted toward parents impacted parents' vaccination and intention to vaccinate adolescents against influenza in two intervention conditions compared with a control condition and (3) examine whether an educational brochure targeted toward parents impacted psychosocial correlates of influenza vaccination in two intervention conditions compared with a control condition.

Results

Demographics of survey participants. The majority of survey participants were mothers (n = 279, 86%). Approximately half of the target children inquired about in the survey were female (n = 171, 53%) and were in middle school (n = 156, 46%); 16% (n = 53) reported a history of childhood asthma. Reflective of county and school-specific demographics (see **Table 1**), a significantly greater percentage of African Americans completed the survey in the school-based intervention county (98%), than in the control (62%) or the provider-based counties (42%) ($p < 0.001$). A greater percentage of survey respondents in the school-based (63%) and control counties (56%) reported receiving Medicaid as their primary insurance coverage, compared with the provider-based county (40%), ($p < 0.001$).

Influenza vaccination history at baseline. At baseline, there was no significant difference in lifetime history of adolescent influenza vaccination by county (Chi-square = 5.93, p = 0.20), with parents reporting 33%, 37% and 42% of students having a prior history of influenza vaccination, in the school-based, the provider-based and the control county, respectively. Also, there were no significant differences in reported intention to have adolescent vaccinated against influenza in the coming year (Chi-square = 12.36, p = 0.14), with 52%, 62% and 55% of parents intending to have their adolescent receive the influenza vaccine next year, from the school-based, provider-based and control groups, respectively. However, there was a significant differences in past year adolescent influenza vaccination rates (Chi-square = 19.77, $p < 0.001$; school-based = 36%, provider-based = 16%, control = 48%).

Attitudes and beliefs about vaccination at baseline. Among the attitudes and beliefs about influenza vaccination assessed, only perceived barriers significantly differed between the counties at baseline. The school-based county had significantly higher scores than provider-based or control counties [$F(2,309) = 8.63$, $p < 0.001$; see **Table 3** for means and standard deviations].

Influenza vaccination history at one year follow-up. At 1 y follow-up, significant differences were observed in reported history of adolescent influenza vaccination by county (Chi-square = 16.29, $p < 0.001$), with the provider-based county reporting a significantly higher vaccination rate (68.9%) compared with both the school-based (49.3%) and control counties (43.2%). Also, there was a marginally significant difference in adolescents receipt of influenza vaccination in the prior year (Chi-square = 4.85, p = 0.088), with school-based (82.9%) and provider-based (87.1%) counties reporting higher rates of vaccination than the control county (72.1%). Also, significant differences were found in intention to have adolescent vaccinated against influenza in the coming year (Chi-square = 26.07, $p < 0.001$), with a higher percent of parents from the school-based (68.4%) and provider-based (79.0%) than the control county (58.7%) intending to have their adolescent receive the influenza vaccine next year.

Attitudes and beliefs about vaccination at 1 y follow-up. Among the attitudes and beliefs about influenza vaccination assessed, at 1 y follow-up significant differences were found for perceived benefits, $F(2, 299) = 19.78$, $p < 0.001$, perceived barriers, $F(2, 271) = 7.86$, $p < 0.001$, and social norms of vaccination,

$F(2, 293) = 4.63$, $p = 0.01$ between the 3 study conditions (see **Table 3** for means, SDs). Post-hoc comparisons indicated that at the 1 y follow-up the provider-based county had significantly higher perceived benefits scores than school-based or control counties. The provider-based county had significantly lower perceived barriers scores than the school-based or control counties at follow-up. Also, the provider-based county had significantly higher perceived positive social norms about influenza vaccination scores than the control county, and the school-based county did not differ significantly from the provider-based or control counties at follow-up.

Change from baseline to 1 y follow-up in vaccination rates and intention to vaccinate. To assess change in vaccination rates from baseline to 1 y follow-up, each county's baseline rate was separately compared with their 1 y follow-up rate for each of the three vaccination-specific questions (see **Table 4** for baseline and 1 y follow-up, frequencies and percentages). In regards to adolescents ever receiving an influenza vaccination, both intervention counties' rates (school-based and provider-based) significantly increased from baseline to follow-up ($p = 0.04$ and $p < 0.001$, respectively), but no significant increase was observed in the control county ($p = 0.49$). In regards to adolescent influenza vaccination rates in the prior year, all three counties increased significantly from baseline to follow-up (school-based, $p < 0.001$, provider-based, $p < 0.001$, control, $p = 0.005$). Specific to intention to have adolescent vaccinated against influenza in the coming year, both intervention counties showed significant increases overtime (school-based, $p = 0.047$, provider-based, $p = 0.006$), but the control group did not ($p = 0.44$).

Discussion

The findings from this study indicate that parents who participated in a school-delivered intervention to improve influenza vaccination rates among adolescents (either in the school-based or provider-based intervention counties) reported significantly higher influenza vaccination rates in their adolescent children, relative to a control group, as well as increased vaccination rates post-intervention participation relative to their baseline rates. Further, intervention participants (both school-based and provider-based conditions) reported greater intention to have their adolescent vaccinated against influenza in the coming year compared with control parents. Finally, the provider-based intervention parents had significantly higher levels of perceived benefits to vaccination, fewer barriers to vaccination and higher social norms surrounding influenza vaccination than the control group parents at the one year follow-up assessment. Together, these findings suggest that even a minimal intervention (i.e., providing parents with a tailored educational brochure; see Painter et al. 2010 for detailed description of the brochure and its development) [26] may positively impact parent's decision to have their adolescent receive the influenza vaccination in rural, predominately minority communities.

Vaccination of children as a strategy for community control of influenza continues to be a topic of substantial interest, particularly after the 2009 H1N1 influenza pandemic,[27] and recent expansion of ACIP recommendations. Specifically, ACIP now recommends the seasonal influenza vaccine, as well as HPV (requiring multiple doses for complete coverage), Tdap and meningococcal vaccines for adolescents. Finding acceptable alternatives to meet the soon-to-be growing vaccinations needs of this population are needed. Similar to prior research with elementary-school aged children,[24,28-31] the parents in this study who resided in the school-based intervention county were willing to have their adolescent receive the influenza vaccine in a school vaccine clinic as demonstrated by the increased adolescent influenza vaccination rates in this county post intervention. Although similar gains in vaccination were found in the provider-based intervention county as well, these findings are encouraging and demonstrate that school-based vaccine clinics may be a potentially fruitful alternative for vaccinating large numbers of adolescents against influenza, and possibly other adolescent recommended vaccines, outside of the medical home.

The decision to move adolescent vaccination efforts outside of the medical home to school-based vaccination clinics has the potential to efficiently vaccinate large numbers of children at lower total cost than either primary care physicians, pediatricians or public clinics.[29,32,33] Previous studies have shown that school-based vaccine clinics have vaccinated 40–50% of targeted school-aged children for influenza,[25,28-31] reduced influenza illness both directly among the students, and indirectly in the community,[28,31,34,35] and have reduced costs from a societal perspective by decreasing school and work absenteeism.[29,36] Thus, future vaccination efforts that seek to offer vaccination in schools must address possible concerns, not only about the vaccine itself, but also those that may be specifically related to vaccination in non-medical settings (e.g., training of staff).

Although the educational brochure designed to enhance awareness of the health threat of influenza and encourage vaccination did not specifically address possible concerns about receipt of vaccine in school-based clinics, our educational materials were developed with input from the community and tailored to address relevant vaccine-related concerns for this rural, and predominately African-American population. Given that the brochure may have improved influenza vaccination coverage among adolescents whose parents received them, it is also likely that tailored education brochures could address parental concerns about school-based clinics as well.

This study is not without limitations. The study population was rural and small, in terms of both number of adolescents and number of schools. Hence the results may not be generalizable to larger populations residing in other geographic locations (i.e., urban centers). Further, the rate of return for consent forms was low (19.7%); parents who participated in the telephone survey may differ in important ways from the majority of parents who opted not to take part in the survey. Although the return rate appears low, it is comparable to other studies which mailed surveys.[37] Additionally, our primary outcome (influenza vaccination) was based on self-report and not actual chart confirmed vaccination. It is possible that parents may have inaccurately reported their child's influenza vaccination history. Also, given baseline differences between the counties, it is possible that differences in parental/county characteristics could confound intervention effects.

Methods

Study population. The study population consisted of parents of students enrolled in schools participating in a non-randomized controlled trial of a school-based influenza vaccination intervention in rural Georgia. The purpose of the trial was to assess influenza vaccination uptake among a multi-ethnic sample of adolescents attending middle- and high-school in three study arms: (1) a multi-component school-based influenza vaccination intervention condition (County 1), (2) a multi-component provider-based influenza vaccination condition (County 2) and (3) a standard of care control condition (County 3). In Counties 1 and 2, the "multi-component" interventions consisted of a structural component (either school-based or provider-based provision of influenza vaccination) and an educational component (a tailored brochure for parents and a live in-school skit/presentation for students). Both County 1 (school-based vaccination offered as the structural component) and County 2 (provider-based vaccination offered as the structural component) received the same school-delivered educational component (i.e., the tailored brochure sent home for parents and a live in-school skit/presentation for students), the only difference in regards to the two was where vaccination was offered (i.e., school clinics vs. provider's office).

School-delivered educational intervention. The school-delivered educational intervention was implemented in both intervention counties at the beginning of the school year, prior to implementation of the structural interventions (i.e., vaccine provision either in school or provider's office). Both intervention counties received the same educational intervention,[26] consisting of (1) a brochure mailed home through the school (targeted toward adolescents and their parents) and (2) a school presentation (targeted toward adolescents). The educational intervention in both multi-component intervention counties was based on the Health Belief Model (HBM), and social norms from the Theory of Reasoned Action (TRA). The school presentation included a skit presented by a volunteer group of students, question and answer session facilitated by study staff. The skit addressed HBM and TRA constructs, including self-efficacy, social norms, perceived benefits, perceived barriers, perceived susceptibility, perceived severity and students' sense of invincibility. The skit itself served as a cue to action. Both the brochures and school skits were developed collaboratively by trained study staff and participants from the community.

Participating counties were selected because they were relatively small (one school system with a single middle- and a single high-school per county), rural, and had substantial minority populations (**Table 1**).

Data collection. Data for the present study were derived from telephone surveys administered to parents of students in each of the three participating counties at two time points: (1) baseline, prior to intervention implementation (April–September 2008) and (2) follow-up, six—ten months post-intervention (April–September 2009). The influenza vaccination intervention was implemented during October 2008–December 2008.

In March of 2008, packets were mailed or sent home from the schools to all parents (or primary caregivers) of children enrolled in either middle- or high-school in the three study counties. The packets included an invitation letter briefly describing the phone survey, along with a consent form and contact information sheet. Interested parents were instructed to sign the consent form and complete the contact information sheet (which asked for phone number and best times to call) and send both back to school (in a provided envelope) with their child. Ten-dollar Wal-mart gift cards were provided as incentives to students for returning the packets to school (at baseline), and parents were mailed $10 Wal-mart gift cards upon completion of each telephone survey (at baseline and follow-up). Telephone surveys were conducted by trained research assistants and were approximately 15 min in duration. Study protocols were reviewed and approved by the Emory Institutional Review Board (IRB) as well as the IRBs of collaborating institutions.

Across all 3 study counties, 2,028 baseline survey invitation packets were mailed to parents/guardians of enrolled middle- and high-school students. Four hundred signed consent forms were returned (return rate = 19.7%) and 324 baseline surveys were conducted (response rate = 81%); 65 surveys were conducted in the school-based intervention county, 119 in the provider-based intervention county and 140 in the control county. At 1 y follow-up, 327 surveys were conducted: 79 surveys were conducted in the school-based intervention county, 105 in the provider-based intervention county and 143 in the control county.

Survey instrument. The telephone survey was designed to investigate demographic, behavioral and psychosocial factors associated with parental acceptance of influenza vaccination for their adolescent children. The Health Belief Model (HBM),[38] was used to guide survey development, allowed assessment of the effects of the educational intervention (also guided by the HBM) on psychosocial mediators of vaccine acceptance among parents. HBM-guided questions were adapted from surveys with demonstrated reliability and validity among parents.[38]

The survey was designed to assess four major HBM components: (1) perceived susceptibility to influenza; (2) perceived severity of influenza; (3) perceived benefits of influenza vaccination; and (4) perceived barriers to influenza vaccination. Also, although it is not an HBM construct, social norms from the Theory of Reasoned Action (TRA) [39] was used to guide the intervention and parent survey development. **Table 2** displays how key constructs from the Health Belief Model (including social norms from TRA) map onto questions on the parent baseline and follow-up telephone surveys.

Measures. *Main outcome measures.* The main outcomes of interest are parent-reported influenza vaccination of their adolescent (ever and past year) and intention to have their adolescent vaccinated against influenza in the coming year in the two intervention counties, relative to the control condition county, and to each other. Adolescent receipt of an influenza vaccination was measured by two items: "Has your child ever received the flu vaccination?" and "Did your child receive a flu vaccination last

Table 2. Application of health belief model (HBM) constructs and social norms to inform the parent telephone survey

Theoretical Constructs	Items per construct (True/False)
Perceived Susceptibility (HBM)	-Your child is not very likely to get the flu -A healthy 40 y old is more likely to get the flu than your child -Compared with other children your child's age, your child is more likely to get the flu
Perceived Severity (HBM)	-The flu is a serious illness
Perceived Benefits (HBM)	-Giving the flu vaccine to children decreases their time out of school -The flu vaccine is very effective at preventing the flu -Giving the flu vaccine to children will decrease their parents' time lost from work -Children should be vaccinated against diseases in general
Perceived Barriers (HBM)	-Children receive more immunizations than necessary -Your child's immune system could be weakened by too many immunizations -Your child could get sick from the flu vaccine itself -My child is scared of needles -Children should only be immunized against serious diseases
Social Norms (TRA)	-Most parents you know take their children for flu vaccine -Most people important to you think you should give your child a flu vaccine

Table 3. Differences between counties in baseline and one year follow-up attitudes and barriers scores

	School-based Mean (SD)	Provider-based Mean (SD)	Control Mean (SD)	p value
Baseline				
Benefits	2.72 (1.13)	3.07 (1.05)	2.93 (1.10)	ns
Barriers	2.24 (1.30)	1.46 (1.09)	1.73 (1.19)	0.001
Susceptibility	1.52 (0.89)	1.25 (0.90)	1.55 (1.03)	ns
Severity	0.97 (0.17)	0.94 (0.24)	0.92 (0.27)	ns
Social norms	1.71 (1.15)	1.69 (1.03)	1.73 (1.00)	ns
1 y follow-up				
Benefits	2.78 (1.14)	3.56 (0.83)	2.70 (1.18)	0.001
Barriers	1.94 (1.35)	1.19 (1.06)	1.77 (1.37)	0.001
Susceptibility	1.75 (0.91)	1.46 (0.82)	1.47 (0.81)	ns
Severity	0.94 (0.25)	0.94 (0.23)	0.93 (0.26)	ns
Social norms	1.96 (0.92)	2.16 (0.92)	1.77 (0.98)	0.01

ns = non-significant difference between counties.

fall or winter?" Intention to receive an influenza vaccination was measured by asking: "Do you plan to have your child receive the flu vaccine next fall or winter?" All were dichotomous variables (Yes/No).

Demographic information. Participants reported their gender (dichotomous) and race (categorical), whether target child was in middle or high-school (dichotomous), gender of child (dichotomous) and insurance coverage (categorical).

Attitudes and beliefs toward influenza and influenza vaccination:

Questions specific to: (1) perceived severity of influenza infection for adolescents (1 items), (2) perceived susceptibility of adolescent to influenza infection (3 items), (3) perceived barriers to influenza vaccination for adolescent (5 items), (4) perceived benefits of influenza vaccination for adolescents (4 items) and (5) perceived social norms about getting adolescent vaccinated against influenza (3 items) were asked of parents (see **Table 2** for survey items). Responses were either true (1) or false (0). A true/false option was opted for rather than a Likert-rating because the survey was conducted over the phone, in attempt to reduce possible confusion from offering a more complex response range. Items were summed per construct, resulting in 5 separate attitude and belief scores.

Data analysis. Descriptive statistics assessed the distribution of demographic variables among parents. Bivariate analyses (chi-square tests for dichotomous variables and one-way ANOVA for continuous variables) examined differences in self-reported adolescent vaccination rates, intention to vaccinate one's adolescent and psychosocial constructs across the 3 study conditions at baseline and at 1 y follow-up. Additionally, separate comparisons were made for each study condition to assess change from baseline to follow-up in each study condition. All analyses were

Table 4. Differences between the counties in baseline and 1 y follow-up vaccination behaviors

	School-based number (%)	Provider-based number (%)	Control number (%)	p value
Baseline				
Flu vaccine (ever)	21 (33.3)	43 (37.4)	58 (42.3)	0.21
Flu vaccine (past year)	11 (35.5)	16 (16.3)	34 (47.9)	0.001
Intend to vaccinate (next year)	34 (53.1)	74 (62.7)	77 (55.4)	0.14
1 y follow-up				
Flu vaccine (ever)	36 (49.3)	71 (68.9)	60 (43.2)	0.001
Flu vaccine (past year)	29 (82.9)	61 (87.1)	44 (72.1)	0.088
Intend to vaccinate (next year)	54 (68.4)	83 (81.4)	84 (58.7)	0.001

conducted using SPSS version 18.0. Given the nature of the data collection (via phone survey), there was virtually no missing data for all variables in the study. Missing data were treated as missing, and therefore were not included in analysis.

Conclusion

These findings suggest that a school-delivered educational intervention targeting parents and teens may influence influenza vaccination in rural communities and motivate parents to get their child vaccinated. Future influenza vaccination efforts geared toward the parents of rural middle- and high-school students may benefit from addressing barriers and benefits of influenza vaccination.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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References

1. Thompson WW, Shay DK, Weintraub E, Brammer L, Bridges CB, Cox NJ, et al. Influenza-associated hospitalizations in the United States. JAMA 2004; 292:1333-40; DOI:10.1001/jama.292.11.1333; PMID:15367555.
2. Thompson WW, Shay DK, Weintraub E, Brammer L, Cox N, Anderson LJ, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. JAMA 2003; 289:179-86; DOI:10.1001/jama.289.2.179; PMID:12517228.
3. Heron MP, Smith BL. Deaths: leading causes for 2003. Natl Vital Stat Rep 2007; 55:1-92; PMID:17408087.
4. Heron M. Deaths: leading causes for 2004. Natl Vital Stat Rep 2007; 56:1-95; PMID:18092547.
5. Kung HC, Hoyert DL, Xu J, Murphy SL. Deaths: Final Data for 2005. Natl Vital Stat Rep 2008; 56:1-120; PMID:18512336.
6. Glezen WP. Serious morbidity and mortality associated with influenza epidemics. Epidemiol Rev 1982; 4:25-44.
7. Fox JP, Cooney MK, Hall CE, Foy HM. Influenzavirus infections in Seattle families 1975–1979. II. Pattern of infection in invaded households and relation of age and prior antibody to occurrence of infection and related illness. Am J Epidemiol 1982; 116:228-42; PMID:7114034.
8. Fox JP, Hall CE, Cooney MK, Foy HM. Influenzavirus infections in Seattle families 1975–1979. I. Study design, methods and the occurrence of infections by time and age. Am J Epidemiol 1982; 116:212-27; PMID:7114033.
9. Fiore AE, Shay DK, Haber P, Iskander JK, Uyeki TM, Mootrey G. Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP) 2007. MMWR Morb Mortal Wkly Rep 2007; 56:1-54; PMID:17625497.
10. Glezen WP. Herd protection against influenza. J Clin Virol 2006; 37:237-43; DOI:10.1016/j.jcv.2006.08.020; PMID:17008123.
11. Centers for Disease Control and Prevention. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Recom Rep 2001; 50:1-31.
12. Fiore AE, Shay DK, Broder K, Iskander JK, Uyeki TM, Mootrey G, et al. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP) 2008. MMWR Recomm Rep 2008; 57:1-60; PMID:18685555.
13. Euler G, Lu P, Shefer A, et al. Influenza Vaccination Coverage Among Children and Adults—United States 2008–09 Influenza Season. MMWR Morb Mortal Wkly Rep 2009; 58:1091-5.
14. Potter R, Pabst L, Fiore A. Influenza vaccination coverage among children aged 6 months—18 years—eight immunization information system sentinel sites, United States 2008–09 influenza season. MMWR Morb Mortal Wkly Rep 2009; 58:1059-62; PMID:19798018.
15. Rand CM, Shone LP, Albertin C, Auinger P, Klein JD, Szilagyi PG. National health care visit patterns of adolescents: implications for delivery of new adolescent vaccines. Arch Pediatr Adolesc Med 2007; 161:252-9; DOI:10.1001/archpedi.161.3.252; PMID:17339506.
16. Elster A, Jarosik J, VanGeest J, Fleming M. Racial and ethnic disparities in health care for adolescents: a systematic review of the literature. Arch Pediatr Adolesc Med 2003; 157:867-74; DOI:10.1001/archpedi.157.9.867; PMID:12963591.
17. Szilagyi PG. Universal influenza vaccination challenges and logistics: children 2005 [cited November 21, 2008]; Available from: http://www.medicine.emory.edu/id/ecirve/faculty_speaker_slides/Szilagyi_PGS%20Flu_3.ppt
18. Reynolds K, Pass M, Galvin M, et al. Schools as a setting for health promotion and disease prevention. In: Raczynski J, DiClemente R, Eds. Handbook of Health Promotion and Disease Prevention. New York: Kleuwer Academics 1999; 23-50.
19. Vernon ME, Bryan G, Hunt P, Allensworth D, Bradley B. Immunization services for adolescents within comprehensive school health programs. J Sch Health 1997; 67:252-5; DOI:10.1111/j.1746-561.1997.tb03442.x; PMID:9358376.
20. Luce BR, Zangwill KM, Palmer CS, et al. Cost-effectiveness analysis of an intranasal influenza vaccine for the prevention of influenza in healthy children. Pediatrics 2001; 108:24.
21. US Census Bureau. School Enrollment–Social and Economic Characteristics of Students: October 2008 [cited 2010 January 19]; Available from: http://www.census.gov/population/www/socdemo/school/cps2008.html
22. The promise and challenge of adolescent immunization. Am J Prev Med 2008; 35:152-7; DOI:10.1016/j.amepre.2008.03.034; PMID:18617084.
23. Szilagyi PG, Rand CM, McLaurin J, Tan L, Britto M, Francis A, et al. Delivering adolescent vaccinations in the medical home: a new era? Pediatrics 2008; 121:15-24; DOI:10.1542/peds.2007-1115C; PMID:18174317.
24. Carpenter LR, Lott J, Lawson BM, Hall S, Craig AS, Schaffner W, et al. Mass distribution of free, intranasally administered influenza vaccine in a public school system. Pediatrics 2007; 120:172-8; DOI:10.1542/peds.2006-2603; PMID:17591766.
25. Allison MA, Reyes M, Young P, Calame L, Sheng X, Weng HY, et al. Parental Attitudes About Influenza Immunization and School-Based Immunization for School-Aged Children. Pediatr Infect Dis J 2010; 8:751-5; PMID:20308935.
26. Painter JE, Sales JM, Pazol K, Grimes T, Wingood GM, DiClemente RJ. Development, theoretical framework and lessons learned from implementation of a school-based influenza vaccination intervention. Health Promot Pract 2010; 11:42-52; DOI:10.1177/1524839909360171; PMID:20488968.

27. Coleman MS, Washington ML, Orenstein WA, Gazmararian JA, Prill MM. Interdisciplinary epidemiologic and economic research needed to support a universal childhood influenza vaccination policy. Epidemiol Rev 2006; 28:41-6; DOI:10.1093/epirev/mxj008; PMID:16740584.
28. King JC Jr, Cummings GE, Stoddard J, Readmond BX, Magder LS, Stong M, et al. A pilot study of the effectiveness of a school-based influenza vaccination program. Pediatrics 2005; 116:868-73; DOI:10.1542/peds.2005-1301; PMID:16322144.
29. Schmier J, Li S, King JC Jr, Nichol K, Mahadevia PJ. Benefits and costs of immunizing children against influenza at school: an economic analysis based on a large-cluster controlled clinical trial. Health Aff (Millwood) 2008; 27:96-104; DOI:10.1377/hlthaff.27.2.w96; PMID:18216044.
30. Effler PV, Chu C, He H, Gaynor K, Sakamoto S, Nagao M, et al. Statewide School-located Influenza Vaccination Program for Children 5–13 Years of Age, Hawaii USA. Emerg Infect Dis 2010; 16:244-50; PMID:20113554.
31. King JC Jr, Stoddard JJ, Gaglani MJ, Moore KA, Magder L, McClure E, et al. Effectiveness of school-based influenza vaccination. N Engl J Med 2006; 355:2523-32; DOI:10.1056/NEJMoa055414; PMID:17167135.
32. White T, Lavoie S, Nettleman MD. Potential cost savings attributable to influenza vaccination of school-aged children. Pediatrics 1999; 103:73; DOI:10.1542/peds.103.6.e73; PMID:10353970.
33. Wilson T. Economic evaluation of a metropolitan-wide, school-based hepatitis B vaccination program. Public Health Nurs 2000; 17:222-7; DOI:10.1046/j.1525-446.2000.00222.x; PMID:10840293.
34. Monto AS, Davenport FM, Napier JA, Francis T Jr. Effect of vaccination of a school-age population upon the course of an A2-Hong Kong influenza epidemic. Bull World Health Organ 1969; 41:537-42; PMID:5309469.
35. Monto AS, Davenport FM, Napier JA, Francis T Jr. Modification of an outbreak of influenza in Tecumseh, Michigan by vaccination of schoolchildren. J Infect Dis 1970; 122:16-25; DOI:10.1093/infdis/122.1-2.16; PMID:5433709.
36. Davis MM, King JC Jr, Moag L, Cummings G, Magder LS. Countywide school-based influenza immunization: direct and indirect impact on student absenteeism. Pediatrics 2008; 122:260-5; DOI:10.1542/peds.2007-2963; PMID:18595972.
37. Shih T, Fan X. Comparing response rates from web and mail surveys: A meta-analysis. Field Methods 2008; 20:249-71; DOI:10.1177/1525822X08317085.
38. Champion V, Skinner C. The Health Belief Model. In Glanz K, Rimer B, Viswanath K, (Eds.), Health behavior and health education: Theory, research and practice. San Francisco, CA: Jossey-Bass 2008; 4:45-65.
39. Fishbein M, Ajzen I. Belief, attitude, intention and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley 1975.