

Acceptability of school requirements for human papillomavirus vaccine

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We characterized parental attitudes regarding school HPV vaccination requirements for adolescent girls. Study participants were 866 parents of 10–18 y-old girls in areas of North Carolina with elevated cervical cancer incidence. We calculated odds ratios (ORs) and 95% confidence intervals (CIs) by logistic regression. Approximately half (47%) of parents agreed that laws requiring HPV immunization for school attendance “are a good idea” when opt-out provisions were not mentioned. Far more agreed that “these laws are okay only if parents can opt out if they want to” (84%). Predictors of supporting requirements included believing HPV vaccine is highly effective against cervical cancer (OR = 2.5, 95% CI:1.7–5.0) or is more beneficial if provided at an earlier age (OR = 16.1, 95% CI:8.4–31.0). Parents were less likely to agree with vaccine requirements being a good idea if they expressed concerns related to HPV vaccine safety (OR = 0.3, 95% CI:0.1–0.5), its recent introduction (OR = 0.3, 95% CI:0.2–0.6). Parental acceptance of school requirements appears to depend on perceived HPV vaccine safety and efficacy, understanding of the optimal age for vaccine administration, and inclusion of opt-out provisions.

Introduction

Two prophylactic human papillomavirus (HPV) vaccines have the potential to prevent invasive cervical cancer and precancerous disease attributable to oncogenic HPV types 16 and 18.^{1,2} The quadrivalent vaccine can also prevent low-risk HPV types 6 and 11¹ that cause genital warts. The US Advisory Committee on Immunization Practices recommends routine immunization of 11 or 12 year-old females with either the bivalent HPV 16/18 or the quadrivalent HPV vaccine.³ How best to integrate these vaccines into existing medical, legal and health care policy structures to ensure the greatest public health benefit has been a topic of considerable debate.

School immunization requirements have been highly effective in increasing early childhood and adolescent vaccination rates in the US,^{4,5,6} and are currently recommended for both children and adolescents by the Task Force on Community Preventive Services.⁶ However, efforts to make HPV vaccination a requirement for girls to attend school have generated controversy, reportedly due to concerns over HPV vaccine safety, sexual transmission of HPV infection, and vaccine requirements potentially violating civil liberties.^{7,8} As of December 2009, at least 24 states and the District of Columbia (DC) had introduced legislation to require HPV vaccination for adolescent girls before attending

school, with provisions allowing parents to opt out⁸⁻¹⁰; however, only Virginia and DC have enacted such regulatory laws.

Data are currently limited regarding attitudes toward school HPV immunization requirements among parents of girls within the target age group for HPV vaccination. Further, we know little about correlates of attitudes toward HPV vaccine requirements. We thus examined parental attitudes towards school requirements for HPV vaccination of female adolescents.

Results

The median age of 866 parents surveyed was 43 y (range 21–79). Most respondents were female (94%) and reported educational attainment of college or greater (72%). Over half were white (54%), while approximately 40 percent were African American (43%). Respondents were evenly distributed among rural (47%) and urban (53%) residence (Table 1).

Overall, 46.4% of parents agreed that state-based laws requiring HPV immunization for school attendance are a good idea (Table 2). In contrast, many more parents (83.6%) agreed that “these laws are okay only if parents can opt out if they want to.” In total, 43.9% of parents disagreed with the statement that state-based laws requiring HPV immunization for school attendance are a good idea but agreed the laws are okay if parents

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Table 1. Socio-demographic characteristics and daughter's vaccination status associated with support for laws requiring HPV vaccination for school attendance

	School requirements for HPV vaccination "are a good idea"			
	Total (N=866)		Agree	
	n	% [†]	%	OR (95%CI)
Socio- Demographic Characteristics				
Parent's age, years				
<40	241	49.2	46.2	1
40-44	326	26.5	47.2	1.0 (0.7-1.7)
>45	306	24.2	45.9	1.0 (0.6-1.7)
Parent's residence				
Rural	428	47.3	42.3	1
Urban	438	52.7	50.1	1.4 (0.9-2.0)
Parent's race				
White	607	52.0	43.4	1
Black	204	38.1	51.5	1.4 (0.9-2.1)
Other	55	9.9	42.6	1.0 (0.4-2.2)
Parent's education				
<High school	187	28.3	46.7	1
>Some college	679	71.7	46.3	1.0 (0.6-1.7)
Parent's marital status				
Married or living together	730	83.3	46.3	1
Divorced	59	6.2	50.8	1.3 (0.5-2.5)
Single or never married	39	10.4	47.5	1.1 (0.4-2.5)
Parent's annual household income (US dollars)				
<50,000	321	46.6	46.4	1
≥50,000	545	53.3	46.4	1.0 (0.7-1.4)
Daughter's age, years				
>16	332	32.5	49.4	1
13-16	378	45.4	48.1	0.91 (0.6-1.4)
9-12	156	22.0	38.3	0.63 (0.3-1.1)
Vaccination initiation by daughter				
Daughter has had ≥1 dose of HPV vaccine				
No	761	89.6	43.1	1
Yes	105	10.4	75.0	5.0 (2.0-10.0)*
Will get daughter HPV vaccine in the next year[†]				
Definitely or probably will not	258	32.4	9.4	1
Definitely or probably will	465	62.0	61.8	16.7 (10.0-25.0)*
Do not know/ Refused	38	5.7	30.5	5.0 (1.4-10.0)*

Proportions, odd ratios and confidence intervals are weighted. Odd ratios (OR) and 95% confidence intervals (CI) adjusted for parent's age, daughter's age and residence.

* $p < .05$; [†]Among caregivers whose daughter has not been vaccinated

can opt out. Only 9.7% did not agree with either statement, and opposed school HPV vaccine requirements regardless of opt-out provisions.

Factors associated with agreement with policies requiring HPV vaccination, when opt-out provisions were not mentioned, appear in Tables 1 and 3. Parents' socio-demographic characteristics, including age, residence, education, race, marital status, reported income, and daughter's age were not associated with agreement with HPV vaccine school requirements (Table 1). Parents whose daughters had initiated HPV vaccine were more likely to agree with requirements requiring vaccination (OR = 5.0) as were those who intended HPV vaccination for their daughters within the next year (OR = 16.7).

Parents were less likely to agree with HPV vaccination requirements if they believed that the vaccine was unsafe (OR = 0.3) or caused lasting health problems (OR = 0.2)(Table 3). Some parents reported beliefs that HPV vaccination may increase their daughters' sexual activity (19%), and those who did were less likely to approve of school entry requirements (OR = 0.4). Parents who believed HPV vaccine was being "pushed by drug companies" (OR = 0.3), or wanted to wait to decide whether to vaccinate their daughters (OR = 0.3) were also less likely to agree with HPV vaccination requirements.

Parents were more likely to agree with such requirements if they perceived more benefits from vaccination at earlier ages (OR = 16.1) or that HPV vaccine was effective in preventing cervical cancer (OR = 2.5) or genital warts (OR = 1.7). Parents were also more likely to agree with requirements for HPV vaccination if they anticipated greater regret if their daughters were not vaccinated and later acquired an HPV infection that could lead to cervical cancer (OR = 10.0).

Beliefs that the decision to give HPV vaccines should be the parents' alone (OR = 0.3) and that the vaccine was too new for school requirements (OR = 0.3) were associated with less agreement with HPV vaccination requirements. Parents who believed that all girls and all boys should get HPV vaccine were more likely to agree with HPV vaccination requirements (OR = 33.3; OR = 7.9, respectively).

Discussion

Many US states have considered policies that require HPV vaccination prior to entry into middle school.¹⁰ Of parents surveyed, approximately half thought such requirements are a good idea. However, the vast majority, over 80%, agreed with school entry requirements when they included opt-out provisions. Parents supportive of requirements had favorable opinions of HPV vaccine safety and efficacy, believed that the vaccine offered more benefits if their daughters were vaccinated sooner, or had vaccinated or intended to vaccinate their daughters against HPV. Parents less supportive of vaccination requirements

Table 2. Agreement with school requirements for HPV vaccine among 866 parents of female adolescents in North Carolina

"Some states are trying to pass laws that would require all 11 and 12 year-old girls to get the HPV vaccine before they are allowed to start 6th grade."		"I think these laws are a good idea."		
		Agree, n (%)	Disagree, n (%)	Total, n (%)
"Okay to have these laws only if parents can opt-out."	Agree	330 (39.7)	382 (43.9)	712 (83.6)
	Disagree	58 (6.7)	96 (9.7)	154 (16.4)
	Total	388 (46.4)	478 (53.6)	866 (100.0)

Note: All percentages shown are out of the total sample and are weighted.

reported more concerns related to HPV vaccine safety, its promotion by drug companies, its relatively short time on the market, and potential for the vaccine to increase their daughters' sexual activity.

Parents who believed HPV vaccine had been on the market for too short a time were more likely to be opposed to school HPV vaccination requirements. Efforts to enact requirements for HPV vaccine have differed from other vaccines, in that there was relatively little time between recommendations for HPV vaccine by advisory committees and when legislators proposed school entry requirements.¹¹ Thus, public knowledge about HPV vaccine, experience with HPV vaccine implementation, and data on vaccine safety were relatively limited at that time. This is important because parents who reported greater concerns about HPV vaccine safety and longer term health problems were more likely to be opposed to school requirements. Monitoring of HPV vaccine safety is currently ongoing through both passive and active systems.¹²⁻¹⁴ As of June 2011, more than 35 million doses of the quadrivalent HPV vaccine had been distributed in the US, and careful analysis of reports to the passive Vaccine Adverse Events Reporting System (VAERS) during this time frame did not find a common pattern to reports that would suggest that serious adverse events were caused by HPV vaccine.^{12,13}

Differences between HPV infection and other vaccine preventable diseases may contribute to resistance to school requirements.⁹ HPV vaccines are primarily intended to prevent a genital cancer caused by a sexually transmitted virus. Requirements have been made for other adolescent vaccines in many states.¹⁵ However, most other requirements for school entry have been for vaccines to prevent infections that are highly transmissible through casual contact,¹⁶ although there are exceptions such as tetanus.⁷ Nonetheless, while concerns have been expressed about required HPV vaccination due to its prevention of a sexually transmitted infection,¹⁷ school immunization requirements have previously been implemented for hepatitis B^{17,18} which is primarily transmitted sexually in the US.

Beliefs that HPV vaccination may result in a girl being more likely to have sex, while endorsed by less than 1 in 5 parents, were more common among parents who disagreed with school requirements. Some opponents of HPV vaccine have suggested that the administration of the vaccine to middle school girls could encourage sexual promiscuity.¹⁹ However, studies have not found that vaccination against other infectious agents increases behavioral disinhibition or risky behaviors.²⁰

The present study, to our knowledge, is among the first to examine specific factors associated with support of or opposition

to required school-entry provision of HPV vaccine among parents of female adolescents eligible for HPV vaccine. Additional study strengths include a large sample size and a focus on women living in rural counties with elevated cervical cancer rates. Study limitations include the collection of data from one geographical area of North Carolina, and thus the generalizability to other regions of the US will need to be established. Although most households in the US have telephones,²¹ a selection bias could potentially exist since all participants were contacted by phone. Our results are also based on parents' attitudes toward hypothetical HPV vaccination requirements for school entry, rather than actual policies.

Our findings suggest that public support for HPV vaccine school immunization requirements will depend on education of parents about HPV vaccine safety and efficacy, as well as the benefits of vaccination at the recommended age range. If proposed requirements contain opt-out provisions, public education about these provisions is also likely to increase acceptability, given our finding that the vast majority of parents of adolescent girls favored requirements with opt-out provisions. For other vaccines state mandates do allow some exemptions. In addition to medical exemptions for required vaccination allowed by all 50 states,²² 48 states allow religious exemptions, and 18 states permit exemptions for "philosophical reasons."²² For HPV vaccination requirements, all currently proposed state regulations offer provisions allowing parents to "opt out" of giving their daughters HPV vaccine,^{10,23} although opt-out provisions differ by state.^{7,24,25} In the two jurisdictions where laws on requirements for HPV vaccination have already been enacted, Washington DC and the state of Virginia, parents can opt out for any reason.¹⁰ States will also have to weigh the potential downside of opt-out provisions, given that in geographical areas with broader exemptions for other required vaccines, decreased vaccine uptake and an increased incidence of vaccine-preventable disease has been observed, as compared with areas without such exemptions.^{23,26,27} States that pass school requirements will also need to ensure that the necessary financial support and logistical systems are in place for vaccine delivery to adolescents.²⁸

Requiring HPV vaccination for school entry is one strategy to increase immunization coverage among adolescents, which may also potentially decrease existing cervical cancer health disparities.²⁹ However, outside the US, other strategies that do not involve school-entry requirements have been effective. Countries such as Australia, Canada, and the UK have achieved notably high rates of HPV vaccine coverage among female adolescents

Table 3. Parental attitudes associated with support for laws requiring HPV vaccination for school attendance

	School requirements for HPV vaccination are a good idea			
	Total (N=866)		Agree	
	N	% [†]	%	OR (95%CI)
Attitudes toward HPV vaccine				
HPV vaccine is unsafe				
Disagree	530	61.1	56.3	1
Agree	101	12.7	24.7	0.3 (0.1-0.5)*
Do not know/ Refused	235	26.2	33.7	0.4 (0.2-0.6)*
HPV vaccine causes lasting health problems				
Disagree	333	37.2	62.5	1
Agree	214	27.2	28.8	0.2 (0.1-0.4)*
Do not know/ Refused	319	35.5	42.9	0.5 (0.3-0.8)*
If a teenage girl gets HPV vaccine, she will be more likely to have sex				
Disagree	654	77.0	51.5	1
Agree	170	18.7	29.6	0.4 (0.2-0.6)*
Do not know/ Refused	42	4.2	28.4	0.3 (0.2-0.8)*
HPV vaccine is being pushed by drug companies				
Disagree	446	52.7	58.4	1
Agree	289	30.0	30.2	0.3 (0.2-0.5) *
Do not know/ Refused	131	17.3	38.0	0.4 (0.2-0.8) *
HPV vaccine is so new, want to wait a while before deciding to get daughter vaccinated[†]				
Disagree	221	30.0	61.7	1
Agree	522	67.5	32.8	0.3 (0.2-0.6) *
Do not know/ Refused	18	2.4	71.8	1.7 (0.4-5.0)
More benefit if daughter gets HPV vaccine sooner[†]				
Disagree	158	19.4	7.4	1
Agree	512	68.8	54.9	16.1 (8.4-31.0)*
Do not know/ Refused	91	11.7	33.1	6.5 (2.6-16.4)*
Perceived HPV vaccine effectiveness against cervical cancer				
Slightly/ Moderately	286	35.0	37.0	1
Very/ Extremely	359	40.0	62.6	2.5 (1.7-5.0) *
Do not know/ Refused	221	25.0	33.7	0.9 (0.5-1.4)
Perceived HPV vaccine effectiveness against genital warts				
Slightly/ Moderately	308	40.2	45.1	1
Very/ Extremely	245	26.0	57.4	1.7 (1.0-2.5) *
Do not know/ Refused	313	33.9	39.5	0.8 (0.5-1.3)
Anticipated regret if daughter not vaccinated and later acquired type of HPV that can lead to cervical cancer[†]				
Not at all/ a little/	87	11.6	6.7	1
Moderate/ a lot	653	86.2	48.5	10.0 (5.0-50.0) *
Do not know/ Refused	21	2.2	22.3	5.0 (0.9-25.0)
Attitudes toward HPV vaccine requirements				
Decision to give HPV vaccine should be parents' alone				
Disagree (includes do not know/ refused)	195	20.8	70.5	1
Agree	671	79.2	40.0	0.3 (0.2-0.5) *

Table 3. Parental Attitudes Associated with Support for Laws Requiring HPV Vaccination for School Attendance (continued)

	School requirements for HPV vaccination are a good idea			
	Total (N=866)		Agree	
	N	% [†]	%	OR (95%CI)
HPV vaccine is too new for laws like these				
Disagree	197	24.1	67.2	1
Agree	660	72.9	38.6	0.3 (0.2-0.6) *
Do not know/ Refused	9	3.0	68.8	1.1 (0.1-10.0)
All girls should get HPV vaccine				
Disagree	227	25.3	4.6	1
Agree	574	65.3	62.4	33.3 (16.7-100.0) *
Do not know/ refused	65	10.8	49.1	20.0 (5.0-50.0) *
All boys should get HPV vaccine				
Disagree	198	25.1	15.8	1
Agree	564	63.9	58.3	7.9 (3.6-17.4)*
Do not know/ refused	104	11.0	47.8	5.2 (2.0-13.5)*

Note: Proportions, odd ratios, and confidence intervals are weighted. Odds ratios (OR) and 95% confidence intervals (CI) adjusted for parent's age, daughter's age, and residence. * $p < .05$; [†]Among caregivers whose daughters had not been vaccinated.

through school-based delivery programs that provide HPV vaccine free of charge, without school-entry requirements.^{30,31} Australia successfully implemented a school-based approach and achieved uptake rates for the 3-dose HPV vaccine series on the order of 70–80% within the first year.³² In the US, HPV vaccination initiation rates among female adolescents aged 13–17 were 44% in 2009, with only a little over one quarter (27%) completing the three doses series.³³ Further examination of the feasibility and impact of school-based immunization programs in the US is needed. Over the next few years, data will likely be available from states that have adopted school HPV immunization requirements with opt-out provisions as well as from pilot school-based immunization programs.³⁴ Information from all of these efforts may provide important insights about optimal approaches to increase HPV vaccine coverage in the US, thereby reducing the burden of cervical cancer and other HPV-related diseases.

Methods

Caregivers (i.e., parents or guardians) of adolescent girls aged 10–18 y were interviewed between July and October 2007 as part of the Carolina HPV Immunization Measurement and Evaluation (CHIME) Project in five southeastern North Carolina counties with elevated rates of invasive cervical cancer, as previously described.³⁵ In brief, nine counties clustered in southeastern North Carolina met study inclusion criteria (higher than average cervical cancer rates and $\geq 20\%$ African-American residents). After matching eligible counties on population size, proportion of African American residents, and cervical cancer rates, we randomly selected four rural counties to study (Duplin, Harnett, Sampson, and Wayne counties), and chose the one urban county (Cumberland) in this region. The vast majority of caregivers interviewed (97%) reported being the parent of the index child, and thus we refer to participants as parents. Parents were selected

using a dual-frame, probability sample. Most participants (95%) came from a targeted-list frame consisting of directory-listed residential telephone numbers with available demographic information, while the remainder of the sample (5%) came from a non-overlapping, list-assisted random digit dialing telephone frame. Rural residence was based on US Census classification for the census block where the respondent was living.³⁶ Trained interviewers attempted to interview the primary female caregiver; if she was not available, they interviewed the next available caregiver. Of 1,220 eligible parents, 889 (73%) parents participated.³⁵ The University of North Carolina institutional review board approved the study protocol.

The telephone survey included questions on attitudes toward school HPV vaccination requirements, respondents' socio-demographic characteristics, parents' beliefs about HPV vaccines, HPV vaccine initiation by daughters, and intentions to have daughters vaccinated. Questions on attitudes were selected based on a systematic review of the literature on HPV vaccine acceptability in the US.³⁷ Potential predictors of agreement with HPV vaccine requirements included health belief model constructs (beliefs about likelihood and severity of cervical cancer; beliefs about HPV vaccine benefits, safety, and perceived barriers; and doctor's recommendation), as well as demographic characteristics of parents and their daughters.³⁸ After stating that "some states are trying to pass laws that would require all 11 and 12 year-old girls to get the HPV vaccine before they are allowed to start 6th grade," interviewers asked whether parents agreed with the statement, "I think these laws are a good idea." We dichotomized responses as being in agreement (somewhat and strongly agree) or opposition (somewhat and strongly disagree). Parents were then asked whether they agreed with the statement: "It is okay to have these laws only if parents can opt out if they want to." Analyses excluded data for parents who answered "don't know" to either question (n = 23).

We assessed predictors of positive parental attitudes toward HPV vaccine school requirements, by evaluating which factors were associated with agreement with the general statement, “These laws are a good idea,” when opt-out provisions were not mentioned. We calculated odds ratios (ORs) and corresponding 95% confidence intervals (CIs) using logistic regression models that adjusted for socio-demographic factors that could be

associated with parents’ attitudes toward vaccination, including parent’s age, daughter’s age, and rural vs. urban residence. We applied sampling weights to analyses to account for the study design and adjust the sample to reflect the county populations using 2000 US census data³⁹ Statistical tests were two tailed, with a critical α of 0.05. Data were analyzed in SAS 9.1 (SAS Institute Inc., Cary, NC).

References

- Garland SM, Hernandez-Avila M, Wheeler CM, Perez G, Harper DM, Leodolter S, et al. Quadrivalent vaccine against human papillomavirus to prevent anogenital diseases. *N Engl J Med* 2007; 356:1928-43; PMID:17494926; <http://dx.doi.org/10.1056/NEJMoa061760>
- Harper DM, Franco EL, Wheeler CM, Moscicki AB, Romanowski D, Roteli-Martins CM, et al. Sustained efficacy up to 4.5 years of a bivalent L1 virus-like particle vaccine against human papillomavirus types 16 and 18: follow-up from a randomised control trial. *Lancet* 2006; 367:1247-55; PMID:16631880; [http://dx.doi.org/10.1016/S0140-6736\(06\)68439-0](http://dx.doi.org/10.1016/S0140-6736(06)68439-0)
- Centers for Disease Control and Prevention. Quadrivalent Human Papillomavirus Vaccine: Recommendations of the Advisory Committee on Immunization Practices (ACIP). 3-23-2007.
- Hinman AR, Orenstein WA, Williamson DE, Darrington D. Childhood immunization: laws that work. *J Law Med Ethics* 2002; 30(Suppl):122-7; PMID:12508514
- Averhoff F, Linton L, Peddecord KM. A middle school immunization law rapidly and substantially increases immunization coverage among adolescents. *Am J Public Health* 2004; 94:978-84; PMID:15249302; <http://dx.doi.org/10.2105/AJPH.94.6.978>
- Task Force on Community Preventive Services. Recommendations regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med* 2000; 18(1S):92-6
- Opel DJ, Diekema DS, Marcuse EK. A critique of criteria for evaluating vaccines for inclusion in mandatory school immunization programs. *Pediatrics* 2008; 122:e504-10; PMID:18676536; <http://dx.doi.org/10.1542/peds.2007-3218>
- Charo RA. Politics, parents, and prophylaxis—mandating HPV vaccination in the United States. *N Engl J Med* 2007; 356:1905-8; PMID:17494922; <http://dx.doi.org/10.1056/NEJMp078054>
- Colgrove J, Abiola S, Mello MM. HPV vaccination mandates—lawmaking amid political and scientific controversy. *N Engl J Med* 2010; 363:785-91; PMID:20818883; <http://dx.doi.org/10.1056/NEJMs071003547>
- National Conference of State Legislatures. HPV Vaccine: State Legislation and Statutes. <http://www.ncsl.org/programs/health/HPVvaccine.htm>. 2008.
- Wynia MK. Public health, public trust and lobbying. *Am J Bioeth* 2007; 7:4-7; PMID:17558977; <http://dx.doi.org/10.1080/15265160701429599>
- Centers for Disease Control. Reports of Health Concerns Following HPV Vaccination. 2010. <http://www.cdc.gov/vaccinesafety/Vaccines/HPV/gardasil.html>
- Slade BA, Leidel L, Vellozzi C, Woo EJ, Hua W, Sutherland A, et al. Postlicensure safety surveillance for quadrivalent human papillomavirus recombinant vaccine. *JAMA* 2009; 302:750-7; PMID:19690307; <http://dx.doi.org/10.1001/jama.2009.1201>
- CDC’s Reports of Health Concerns Following HPV Vaccination <http://www.cdc.gov/vaccinesafety/vaccines/hpv/gardasil.html>. 2011.
- Centers for Disease Control. Tetanus, Diphtheria, (Pertussis) Mandates for Secondary Schools. March 2010. www.immunize.org/laws/tdap.pdf. 2010.
- Orenstein WA, Hinman AR. The immunization system in the United States - the role of school immunization laws. *Vaccine* 1999; 17(Suppl 3):S19-24; PMID:10559531; [http://dx.doi.org/10.1016/S0264-410X\(99\)00290-X](http://dx.doi.org/10.1016/S0264-410X(99)00290-X)
- Schwartz JL, Caplan AL, Faden RR, Sugarman J. Lessons from the failure of human papillomavirus vaccine state requirements. *Clin Pharmacol Ther* 2007; 82:760-3; PMID:17971822; <http://dx.doi.org/10.1038/sj.cpt.6100397>
- Immunization Action Coalition. State mandates on immunization and vaccine preventable diseases. <http://www.immunize.org/>. 6-11-2007.
- Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: a theory-informed, systematic review. *Prev Med* 2007; 45:107-14; PMID:17628649; <http://dx.doi.org/10.1016/j.ypmed.2007.05.013>
- Brewer NT, Cuite CL, Herrington JE, Weinstein ND. Risk compensation and vaccination: can getting vaccinated cause people to engage in risky behaviors? *Ann Behav Med* 2007; 34:95-9; PMID:17688401; <http://dx.doi.org/10.1007/BF02879925>
- Blumberg SJ, Luke JV, Cynamon ML. Telephone coverage and health survey estimates: evaluating the need for concern about wireless substitution. *Am J Public Health* 2006; 96:926-31; PMID:16571707; <http://dx.doi.org/10.2105/AJPH.2004.057885>
- CDC’s Report on Childcare and School Immunizations Requirements. 2008 May 20, 2009.
- Association of Immunization Managers. Position Statement, School and Child Care Immunization Requirements. <http://www.immunizationmanagers.org>. 2010.
- Haber G, Malow RM, Zimet GD. The HPV vaccine mandate controversy. *J Pediatr Adolesc Gynecol* 2007; 20:325-31; PMID:18082853; <http://dx.doi.org/10.1016/j.jpag.2007.03.101>
- Laugesen MJ, Paul RR, Luft HS, Aubry W, Ganiats TG. A comparative analysis of mandated benefit laws, 1949-2002. *Health Serv Res* 2006; 41:1081-103; PMID:16704673; <http://dx.doi.org/10.1111/j.1475-6773.2006.00521.x>
- Omer SB, Salmon DA, Orenstein WA, deHart M, Halsey NA. Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *N Engl J Med* 2009; 360:1981-8; PMID:19420367; <http://dx.doi.org/10.1056/NEJMs0806477>
- Omer SB, Pan WK, Halsey NA, Stokley S, Moulton LH, Navar AM, et al. Nonmedical exemptions to school immunization requirements: secular trends and association of state policies with pertussis incidence. *JAMA* 2006; 296:1757-63; PMID:17032989; <http://dx.doi.org/10.1001/jama.296.14.1757>
- National Vaccine Advisory Committee (NVAC). Mandates for Adolescent Immunization: Recommendation from National Vaccine Advisory Committee (NVAC). *AJPM*. 35[2]. 2008.
- Horlick G, Shaw FE, Gorji M, Fishbein DB. Delivering new vaccines to adolescents: the role of school-entry laws. *Pediatrics* 2008; 121(Suppl 1):S79-84; PMID:18174324; <http://dx.doi.org/10.1542/peds.2007-11151>
- Shefer A, Markowitz L, Deeks S, Tam T, Irwin K, Garland SM, et al. Early experience with human papillomavirus vaccine introduction in the United States, Canada and Australia. *Vaccine* 2008; 26(Suppl 10):K68-75; PMID:18847559; <http://dx.doi.org/10.1016/j.vaccine.2008.05.065>
- Annual HPV vaccine coverage in England in 2009/2010 http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_123826.pdf
- Garland SM, Brotherton JM, Skinner SR, Pitts M, Saville M, Mola G, et al. Human papillomavirus and cervical cancer in Australasia and Oceania: risk-factors, epidemiology and prevention. *Vaccine* 2008; 26(Suppl 12):M80-8; PMID:18945417; <http://dx.doi.org/10.1016/j.vaccine.2008.05.041>
- Centers for Disease Control and Prevention. National, state, and local area vaccination coverage among adolescents aged 13-17 years—United States, 2009. [Electronic version]. *MMWR Morb Mortal Wkly Rep* 2010; 59:1018-23; PMID:20724968
- Hayes, K.A., Entzel, P, Berger, W, Caskey, R.L., Shlay, J.A., Stubbs, B., Smith, J.S.& Brewer, N.T., (2011). Early lessons learned from extramural vaccination programs that offer HPV vaccine in US schools.
- Hughes J, Cates JR, Liddon N, Smith JS, Gottlieb SL, Brewer NT. Disparities in how parents are learning about the human papillomavirus vaccine. *Cancer Epidemiol Biomarkers Prev* 2009; 18:363-72; PMID:19190161; <http://dx.doi.org/10.1158/1055-9965.EPI-08-0418>
- U.S.Census Bureau. Census glossary. http://factfinder.census.gov/home/en/eps/glossary_a.html. 2008.
- Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: a theory-informed, systematic review. *Prev Med* 2007; 45:107-14; PMID:17628649; <http://dx.doi.org/10.1016/j.ypmed.2007.05.013>
- Brewer NT, Gottlieb S, Reiter PL, McRee, AL, Liddon N, Markowitz L, Smith JS. Longitudinal Predictors of HPV Vaccine Uptake”, *Sex Transm Dis*. 2010 Sep 10.
- US Census Bureau. State Population Estimates. <http://www.census.gov/popest/states/asrh/SC-EST2007-03.html>. 2009.