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Human Papillomavirus Vaccination Rates and State Mandates for Tetanus-containing Vaccines

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Abstract

Objective—We sought to examine nationally the association between school mandates for adolescent tetanus-containing vaccines (Td and/or Tdap) and adolescent female human papillomavirus (HPV) vaccination.

Methods—Each state was categorized by whether a school mandate for adolescent Td and/or Tdap vaccines were enacted. Mean HPV vaccine series initiation levels among adolescent females were compared between each mandate category.

Results—Mean HPV vaccine series initiation levels were significantly lower in states without Td/Tdap vaccine mandates than in those with mandates (42.9% vs. 47.3%; $p=0.004$).

Conclusions—School mandates for adolescent Td/Tdap vaccination may have a carry-over effect on HPV vaccination.

Keywords

human papillomavirus; HPV; tetanus; diphtheria; pertussis; Tdap; Td; school; mandate

Introduction

Recent analyses demonstrate that utilization of the human papillomavirus (HPV) vaccine by adolescent females is far below national vaccination goals. (Centers for Disease Control and Prevention, 2010) As of 2009, initiation of the 3-dose series among 13–17 year old girls was estimated at only 44.3 %, and series completion 26.7%. In the past, mandates requiring vaccination for school attendance have resulted in substantial increases in vaccination coverage for both adolescents (Olshen et al., 2007; Wilson et al., 2005) and younger children. (Centers for Disease Control and Prevention, 2007; Briss et al., 2000) However, mandates requiring HPV vaccination for adolescent girls' school attendance have been

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Conflict of Interest

Since June 2009 Amanda Dempsey has served as an advisory board member for Merck, providing advice on male HPV vaccination. This company had no role in the design or analysis of this study, and is unaware of the study's results. Sarah Schaffer has no potential conflicts of interest to declare.

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controversial (Haber et al., 2007) - only 2 locales have enacted such mandates (Virginia (VA) and the District of Columbia (DC)). (National Conference of State Legislators)

The public resistance to school mandates for HPV vaccination is likely to delay their implementation. However, it is possible that mandates related to other adolescent vaccines have already had a “carry-over” effect on HPV vaccination rates. In New York City Kharbanda et. al (Kharbanda et al., 2010) demonstrated that a 6th grade school mandate for the tetanus-diphtheria-acellular pertussis (Tdap) vaccine was associated with a substantial increase in Tdap utilization among other, non-mandated adolescent age groups. However, adolescent utilization of the meningococcal vaccine (MCV4), which is targeted to adolescents but was not mandated at the time, did not increase at the same high rate in this study. These results suggest a carry-over effect across adolescent ages, but not across different vaccine types. A limitation of this previous study was its narrow geographic scope. Given that many states have school mandates for tetanus-containing vaccines already in place, and that HPV vaccines are more likely to be provided to adolescent females when other adolescent-targeted vaccines are also being given, (Dempsey, 2010) we sought to determine at a national level whether HPV vaccine utilization rates differed between states with and without mandates for tetanus-containing vaccines.

Methods

We reviewed data from the Immunization Action Coalition (<http://www.immunize.org/laws/tdap.asp>) which categorizes each state and DC by the presence or absence of a mandate requiring a tetanus-containing vaccine (Td and/or Tdap) for middle school entry, the type of mandate(s) present (Td, Tdap or both) and the month and year that mandates began. Given that our main outcome variable was state-specific HPV vaccination coverage through 2009, (Centers for Disease Control and Prevention, 2010) we categorized states (no mandate, Td mandate only, Tdap mandate only, Td and/or Tdap mandate) according to mandates that had been enacted during or before the 2009–2010 academic year. The HPV vaccine mandates in DC and VA did not go into effect until the 2010–2011 year so these two locales remained grouped with the other states in our analysis.

We compared the 2009 state-specific mean HPV vaccine series initiation rate (≥ 1 dose of the HPV vaccine series) among 13–17 year old females (Centers for Disease Control and Prevention, 2010) by mandate classification category. For each mandate category, descriptive statistics were generated. Comparisons of mean vaccination rates between the different mandate groups were made using 2-sided unpaired t-tests with assumptions of unequal variance (for the comparison of any vs. no mandate) and single factor ANOVA methods (for the comparison among the 4 mandate groups). A p-value ≤ 0.05 was considered statistically significant.

Results

As of September 2009, there were 20 states with no Td/Tdap school mandate for adolescents, 7 states with only a Td mandate, 4 states with mandates requiring either Td or Tdap and 20 states with only a Tdap mandate (Table 1). There was a wide range of average HPV vaccination series initiation within each mandate category (Figure 1) and no statistically significant differences in HPV vaccination levels when the four mandate groups were compared with one another (F statistic 0.815; p-value=0.492). However, when states were divided into those with and without *any* tetanus-containing vaccine (Td and/or Tdap) mandate we found significantly higher levels of HPV vaccine series initiation in states with a tetanus-containing vaccine mandate (47.3%) than those without (42.9%; p = 0.004).

Discussion

More than three years have passed since HPV vaccine first became available in the U.S. Current HPV vaccine utilization levels among adolescent females are still well below national vaccination targets. Low utilization levels call for identification of policies or procedures that may increase vaccine utilization among this population. To our knowledge, ours is the first analysis to examine nationally whether school mandates for other adolescent-targeted vaccines (Td and/or Tdap) are associated with differences in HPV vaccine utilization.

We found that HPV vaccine series initiation was substantially higher among adolescents residing in states where a mandate for a tetanus-containing vaccine was already enacted. Though causality cannot be determined by our results, this finding suggests that a carry-over effect from Td/Tdap to HPV vaccination may be occurring in many locales. Our results are preliminary however, and should be interpreted with caution. It will be important in future studies to examine in greater detail if and how such carry-over effects happen. An additional limitation of our study is that we did not assess any state demographics and how these may have been associated with vaccination uptake, and we were also not able to examine within-state variability in vaccination rates which can be affected by local factors.

One can hypothesize many ways in which a Tdap/Td mandate could have indirect effects to increase adolescent HPV vaccine utilization. For example, school mandates for one adolescent vaccine may lead both parents and providers to place a higher importance on adolescent vaccination more generally, which in turn leads to increased community demand for HPV vaccination and increased likelihood that a provider will have the vaccine available. From a provider perspective, implementing office procedures to stock, provide and track a mandated vaccine (i.e. Tdap) may facilitate the stocking and provision of other, non-mandated vaccines like HPV. A carry-over effect could also have an effect at a broader societal level. In states with school mandates for tetanus-containing vaccines, adolescent vaccination may be more “normalized” from a societal perspective. This could create parental and adolescent expectations for vaccination at adolescent preventive care visits, and perhaps even increased availability of the HPV vaccine through insurance plans or other resources (e.g. Health Department) in the area. Additional work will be needed to determine the extent to which mandates for other vaccines indirectly affect HPV vaccine utilization, and how this compares to the direct effects from HPV-vaccine-specific mandates themselves. Given that two locales (DC and VA) have enacted school mandates for HPV vaccination for the 2010–2011 school year, this comparison will soon be possible. Until the controversy surrounding HPV vaccine-related school mandates has subsided, carry-over effects from mandates for other adolescent vaccines may help augment HPV vaccination rates among adolescents.

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Figure 1. Box plots of average HPV vaccine series initiation (≥ 1 dose) by Td/Tdap Mandate category

Note: Mean values denoted numerically. Median values denoted by heavy bar within the box. Lower and upper quartiles denoted by the bottom and top of boxes, respectively. Minimum and maximum values denoted by the lower and upper whiskers, respectively.

Table 1

Td/Tdap Mandate Status Among the 50 States and D.C. as of September 2009

Td/Tdap Mandate Category	States
No Mandate	AR, CA, CT, DE, GA, HI, ID, IN, IA, ME, MD, MI, MS, NE, OH, OK, SC, SD, TN, WV
Td Mandate Only	AL, AK, MA, MN, MO, MT, WY
Td and/or Tdap Mandate	IL, KY, RI, VT
Tdap Mandate Only	AZ, CO, DC, FL, KS, LA, NV, NH, NJ, NM, NY, NC, ND, OR, PA, TX, UT, VA, WA, WI