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HPV Vaccine and Behavioral Disinhibition

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Abstract

Objectives—We sought to identify characteristics of parents who believe in sexual disinhibition and that Pap smears can safely be stopped after females receive HPV vaccine.

Methods—We surveyed 647 parents of adolescent girls living in areas of North Carolina with elevated rates of cervical cancer. We report data primarily from a survey conducted in Fall 2008.

Results—Only 16% (101/647) of parents agreed that teenage girls who receive HPV vaccine may be more likely to have sex. Parents who believed in vaccine-induced sexual disinhibition were more likely to be older (OR 1.89; 95% CI 1.09, 3.26) or report conservative political views (OR 2.26; 95% CI 1.37, 3.73). Parents were less likely to believe in sexual disinhibition if they had greater knowledge about HPV vaccine (OR 0.52; 95% CI 0.32 0.85) or if their daughters had received HPV vaccine (OR 0.31; 95% CI 0.17, 0.57). While few parents (5%, 30/647) believed that women could safely stop getting regular Pap smears after receiving HPV vaccine, this belief was somewhat more common among racial and ethnic minority parents (16%) and among fathers (13%).

Conclusions—Few parents believed that HPV vaccine is likely to lead to increased sexual activity among females or reduce the need for vaccinated women to have regular Pap smears in the future. Characterizing parents who hold beliefs in behavioral disinhibition is important as clinicians encountering parents in practice may desire information about this population.

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Author Contributions

C.L. Schuler performed the data analysis and wrote the initial manuscript draft. P.L. Reiter assisted with and provided guidance for data analysis and the writing process. J.S. Smith provided guidance for the data analysis and writing process. N.T. Brewer conceived of the study, supervised its implementation, provided guidance, and assisted with the writing. All authors helped to conceptualize ideas, interpret findings, and review drafts of the manuscript.

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Although we do not believe we have any conflicts of interest, we wish to share the following information in the interest of full disclosure.

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Keywords

risk compensation; risk homeostasis; HPV vaccine; cervical cancer; screening

INTRODUCTION

Prophylactic human papillomavirus (HPV) vaccines are one of the most promising new tools in the battle against cervical cancer. The US and many other countries have licensed vaccines to prevent infection with HPV types that cause the majority (>70%) of cervical cancers.[1] Despite the promise of current generation HPV vaccines, concern that girls receiving it may become more sexually active [2] has undermined discussions of the merits of widespread vaccine provision.[3,4] Vaccination leading to increases in sexual behavior is an example of a class of hypothesized phenomena known as behavioral disinhibition.[5,6] Another type of potential behavioral disinhibition would be failure to continue protective health measures, such as regular Pap smear testing, after HPV vaccination.[5]

Although belief in HPV vaccine-induced sexual disinhibition appears to be rare [2], it may be problematic, as parental concerns about this issue are correlated with decreased interest in vaccinating daughters against HPV.[7–12] Parents' beliefs in a reduced need for continued cervical cancer screening after HPV vaccination would be particularly important, if such beliefs lowered adherence to screening recommendations. This potential problem would be especially concerning if it affected populations at elevated risk for cervical cancer, including African Americans, Hispanics [13], and impoverished women.[14] While parents' beliefs in sexual disinhibition have been examined as a barrier to HPV vaccination [7–12,15–18], we know little about parents who hold such beliefs.[19,20] Furthermore, no studies we are aware of have explored correlates of parents' beliefs about the need for cervical cancer screening after HPV vaccine.

Our study sought to identify characteristics of parents who believed HPV vaccine leads to increased sexual behavior and reduced need for regular Pap smear testing. Given that the concerns voiced in the media about behavioral disinhibition have come largely from social or religious conservatives [3,4], we hypothesized that people who hold more conservative political and religious views may be more likely to endorse beliefs in sexual disinhibition. Those with lower knowledge of HPV vaccine may also be more likely to believe in behavioral disinhibition following HPV vaccination.

METHODS

Study Design

Data are from the Carolina HPV Immunization Measurement and Evaluation (CHIME) Project that examined HPV vaccine decision making in an area with an elevated rate of invasive cervical cancer. The CHIME Project interviewed caregivers of adolescent girls aged 10–18 years as part of a longitudinal study described previously.[21,22] We selected five counties in southeastern North Carolina that had 1) high cervical cancer rates (incidence >10 cases/100,000 women annually from 1993–2003 and mortality > 4 deaths/100,000 women annually from 1994–2004); 2) ≥20% African American residents; and 3) ≥1,500 girls in the targeted age range of 10–18 years old. One selected county was urban, and the four others were rural.

Trained staff conducted phone interviews using computer-assisted telephone equipment with caregivers in households identified primarily through a non-overlapping targeted list frame of directory-listed residential telephone numbers with available recent household

demographic information (95%) or random-digit-dialing (5%). We oversampled households likely to include an adolescent aged 10–18 years and African American households, as well as rural telephone exchanges.[22] Households containing at least one female child aged 10–18 years were eligible to participate. For households that contained more than one female child in the targeted age range, software randomly chose one child as the index child for the interviews. Staff interviewed individuals who self-identified as parents, grandparents, or another caregiver responsible for the index child. Staff attempted to interview female caregivers, but interviewed male caregivers if a female caregiver was unavailable.[21,22] As most (97%) caregivers were parents, we subsequently refer to respondents as parents.

Of the 1220 eligible parents, 889 (73%) completed baseline interviews between July and October 2007.[22] Staff conducted follow-up interviews in October and November 2008 with 650 (74%) of the 873 parents who agreed to be recontacted.[21] We excluded data for three parents who prematurely ended their follow-up interviews, resulting in an analytic sample of 647 parents. All participants provided verbal consent for the study and received \$10 for completing each interview. The University of North Carolina Institutional Review Board approved the study.

Measures

Outcomes—The follow-up survey assessed belief that sexual disinhibition would occur after HPV vaccination: “If a teenage girl gets the HPV vaccine, she may be more likely to have sex.” Response options were “strongly disagree,” “somewhat disagree,” “somewhat agree,” and “strongly agree.” As the distribution of responses was skewed, we dichotomized responses into “agree” (responded “strongly agree” or “somewhat agree”) and “did not agree” (other responses).

The survey assessed agreement with a statement regarding cervical cancer screening disinhibition: “Do you think a woman can safely stop getting regular Pap smears after getting the HPV vaccine?” Response options were “yes,” “no,” or “I don’t know.” We coded responses of “no” as correct and other responses as incorrect.

Correlates—The survey assessed characteristics of the daughter, parent, and household (Table 1). The survey assessed knowledge about HPV vaccine using a 4-question index (HPV vaccine prevents most cervical cancers, there is an HPV vaccine that can prevent most genital warts, health officials recommend that all 11–12 year old girls should get the HPV vaccine, and HPV vaccine works best if girls get it before they start having sex). We classified parents as having “low HPV vaccine knowledge” (0–2 questions answered correctly) or “high HPV vaccine knowledge” (3–4 questions answered correctly). Items assessed parents’ perceived likelihood that their daughters will get HPV infection (1 item) or cervical cancer (1 item), with each item accompanied by a 4-point response scale ranging from “no chance” to “high chance” (coded 1–4).

The survey used subscales from the Carolina HPV Immunization Attitudes and Beliefs Scale (CHIAS) [23] to assess perceived effectiveness of HPV vaccine (2 items) and perceived barriers to getting daughters vaccinated (5 items). Perceived effectiveness items had 4-point response scales that ranged from “slightly” to “extremely” (coded 1–4). Four of the perceived barriers items had response options of “not hard at all” (coded as 1), “somewhat hard” (coded as 2.5), and “very hard” (coded as 4), and the fifth barrier item had a 4-point response scale ranging from “strongly disagree” to “strongly agree” (coded 1–4).

The follow-up survey assessed all measures, except as noted. The baseline survey assessed perceived barriers to HPV vaccination, perceived effectiveness of HPV vaccine, and some

demographic characteristics including household urbanicity based on the census block where the parent lived.[24]

Data Analysis

The main outcomes were parents' beliefs that HPV vaccination may lead to sexual disinhibition and decreases the need for future regular Pap smear testing. We first examined bivariate associations of potential correlates with each outcome using logistic regression. For each outcome, we then constructed a multivariate logistic regression model that included variables statistically significant in bivariate analyses ($p < 0.05$). We performed analyses using unweighted data in SPSS 18 (Chicago, IL). Statistical tests were two-tailed and used a critical alpha of 0.05.

RESULTS

Most parents were 40–49 years of age (59%) and non-Hispanic white (74%). Many parents identified as born-again or evangelical Christians (65%) and reported conservative political views (57%). More than one third of respondents believed their daughters may be sexually active or might become sexually active in the next year (34%), and 16% of parents believed their daughters were already sexually active or will be in the next year (Table 1).

Belief in Sexual Disinhibition

Only 16% (101/647) of parents agreed that girls receiving HPV vaccine may be more likely to have sex: 4% (27/647) of parents indicated “strongly agree” and 11% (74/647) indicated “somewhat agree.” In multivariate analyses, parents who believed in sexual disinhibition were more likely to be aged 50 years and older (compared to those aged 40–49 years) (OR 1.89; 95% CI 1.09, 3.26) or to report conservative political views (OR 2.26; 95% CI 1.37, 3.73) (Table 1). Parents were less likely to believe in sexual disinhibition if they had higher knowledge about HPV vaccine (OR 0.52; 95% CI 0.32, 0.85) or if their daughters had received one or more doses of HPV vaccine (OR 0.31; 95% CI 0.17, 0.57). Belief in sexual disinhibition was more common among born-again Christian parents and parents who perceived HPV vaccine to be less effective, in bivariate analysis. Neither of these associations was statistically significant in multivariate analyses.

Belief in Need for Pap Smear Screening

Few parents (5%, 30/647) believed that women could stop getting regular Pap smears after getting HPV vaccine, and thus we consider these analyses to be exploratory. Fewer non-Hispanic white parents (17/479, 4%) and non-Hispanic African American parents (7/131, 5%) answered the question incorrectly compared to parents of other racial and ethnic groups (6/37, 16%). Additionally, more male parents (5/38, 13%) compared to female parents (25/609, 4%) believed that regular Pap smears are unnecessary after HPV vaccination. These associations remained statistically significant in multivariate analyses, as parents of other racial and ethnic groups (compared to non-Hispanic white, OR 5.00; 95% CI 1.81, 13.77) and male parents (OR 3.41; 95% CI 1.19, 9.78 versus female parents) were more likely to believe that vaccinating eliminates the need for future regular Pap smears. Parents of other races and ethnicities were also more likely to believe regular Pap testing was no longer needed compared to non-Hispanic African American parents; this association was not statistically significant in multivariate analyses (OR=3.04; 95% CI 0.94 to 9.88; $p=0.06$). Analyses identified no other associations with potential correlates.

DISCUSSION

Belief that HPV vaccination may promote risky behaviors was rare among North Carolina parents who completed baseline and follow-up interview for the CHIME Project. Older parents and those with conservative political views were more likely to believe in sexual disinhibition, while parents with greater vaccine knowledge or whose daughters had received at least one dose of HPV vaccine were less likely to hold this belief. Belief that regular Pap smears are unnecessary after HPV vaccination was infrequent. This is consistent with past research showing that most adult women and parents recognized the need for Pap smear screening after HPV vaccination.[25,26] However, belief that Pap smears may safely be stopped was somewhat more common among male parents and those from minority racial and ethnic groups.

Only 16% of parents in our study agreed that HPV vaccination could increase sexual behavior in girls. The proportion of parents we found who held this belief is consistent with previous studies, where estimates ranged from 6–12% before HPV vaccine licensure and as high as about 30% in more recent studies.[2,19,20,25,27] Taken together, these estimates suggest some variability in sexual disinhibition beliefs and that they may be changing over time.

While behavioral disinhibition has been studied extensively without clear conclusions in fields as diverse as safety belts [28,29] and HIV medications [30], behavioral changes after HPV vaccination have been studied only hypothetically and remain unproven.[5,19] Researchers should empirically examine whether HPV vaccination affects sexual behavior and cervical cancer screening habits, an area currently unexplored. High quality longitudinal studies comparing vaccinated and unvaccinated females on these behaviors would provide valuable evidence. If such research were to show no compensatory changes in behavior after vaccination, these data could allow policymakers and public health officials to refocus their concerns on cervical cancer prevention. However, if future studies were to indicate behavior change following vaccination, increasing communication about current guidelines for continued screening after HPV vaccine takes on special importance.

Our findings suggest political conservatism, but not religion, drives concerns about sexual disinhibition. While born-again Christians were more likely to believe HPV vaccine may encourage sexual activity in bivariate analyses, controlling for political leaning eliminated the association. The association between political conservativeness and belief in sexual disinhibition remained statistically significant in the multivariate model. Born-again Christians may not be highly concerned about sexual disinhibition if they believe their daughters will not be sexually active until marriage, regardless of vaccination, possibly explaining the lack of a multivariate association. Belief in sexual disinhibition was also more common among older parents. Previous studies have reported similar or null findings for the association between parent age and belief in disinhibition.[19,20]

A reasonable question is whether we have correctly conceptualized the relationship between disinhibition beliefs and HPV vaccination. Although concerns about sexual disinhibition are associated with reluctance to vaccinate in cross-sectional and qualitative studies [7–12], our longitudinal study found that parents' beliefs at baseline about sexual disinhibition and other potential harms did not predict initiating HPV vaccination for their daughters in the 14 months that followed.[21] Thus, we think that disinhibition beliefs are not a motivator of vaccine uptake. Instead, we believe the opposite is more likely the case. Parents who get HPV vaccine for their daughters may justify their actions by giving less credence to sexual disinhibition concerns.[31] This conceptualization is congruent with our finding that parents

with vaccinated daughters were less likely to believe in sexual disinhibition, but we will need to confirm these cross-sectional findings using longitudinal data.

Parents with greater knowledge of HPV vaccine were less likely to believe in sexual disinhibition. These parents may have had better access to educational materials on HPV vaccines that may have also helped dispel myths about HPV vaccine. Given that males tend to have poorer knowledge of HPV than females [32,33], it is not surprising that a lower proportion of the fathers answered correctly about the need for Pap smears after HPV vaccination. Considering more parents from minority racial and ethnic groups also held this belief, educational programs targeted to men and minority parents may be warranted. Initiatives to educate the public on the need for continued cervical cancer screening are especially important given that the current generation HPV vaccines do not provide protection against all carcinogenic HPV types.

Strengths of our study include a wide range of potential correlates examined and a study design that oversampled African American households and rural telephone exchanges. However, our study included parents from only one geographic area who spoke English, and the majority of parents self-identified as born-again or evangelical Christians. As surveys were by phone, our findings may not represent segments of the population without a landline telephone. Recent research suggests that bias from this source is likely minimal in surveys of the general adult population, but it may be more substantial in surveys of younger or impoverished adults.[34] We were also unable to conduct follow-up interviews with about a quarter of parents who agreed to be recontacted. Given our study population and potential study limitations, future studies are needed to establish the generalizability of our findings.

Debates regarding HPV vaccine have focused on concerns about sexual disinhibition, whether to require the vaccine for school admittance [35], and cost-effectiveness, but they have missed some issues that concern many parents. Clinicians should be prepared to discuss common concerns about HPV vaccine, including whether the vaccine is unusually painful or causes fainting [36], but they should also be aware they are unlikely to encounter many parents concerned with sexual disinhibition after HPV vaccination. Although parent concern about increased sexual behavior is rarely the primary reason limiting HPV vaccine uptake [21], better understanding parents who hold such beliefs may allow physicians to work more effectively with families to improve vaccine uptake and policy makers to pursue the ultimate goal of HPV disease prevention more efficiently. Future research is needed to further explore behavioral disinhibition following HPV vaccination and beliefs about such disinhibition among other populations.

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Table 1

Parents' beliefs in sexual disinhibition among adolescent girls following HPV vaccination

| | No. of parents (%) | No. of parents believing sexual disinhibition may occur after HPV vaccine (%) | Bivariate OR (95% CI) | Multivariate OR (95% CI) |
|---|--------------------|---|-----------------------|--------------------------|
| Total | 647 (100) | 101 (16) | | |
| Daughter Characteristics | | | | |
| Age (years) | | | | |
| 11–12 | 106 (16) | 19 (18) | ref | -- |
| 13–15 | 194 (30) | 29 (15) | 0.81 (0.43, 1.52) | -- |
| 16–17 | 171 (26) | 24 (14) | 0.75 (0.39, 1.44) | -- |
| 18–20 | 176 (27) | 29 (16) | 0.90 (0.48, 1.71) | -- |
| Received one or more doses of HPV vaccine | | | | |
| No/don't know ¹ | 416 (64) | 87 (21) | ref | ref |
| Yes | 231 (36) | 14 (6) | 0.24 (0.14, 0.44)** | 0.31 (0.17, 0.57)** |
| Received meningococcal vaccine | | | | |
| No/don't know ² | 413 (64) | 66 (16) | ref | -- |
| Yes | 234 (36) | 35 (15) | 0.93 (0.59, 1.44) | -- |
| Received tetanus booster vaccine | | | | |
| No/don't know ³ | 82 (13) | 16 (20) | ref | -- |
| Yes | 565 (87) | 85 (15) | 0.73 (0.40, 1.32) | -- |
| Chances daughter has had sex | | | | |
| Not sexually active and won't be in next year | 327 (51) | 58 (18) | ref | -- |
| May be sexually active or may become sexually active in next year | 219 (34) | 26 (12) | 0.63 (0.38, 1.03) | -- |
| Currently sexually active or will become sexually active in next year | 101 (16) | 17 (17) | 0.94 (0.52, 1.70) | -- |
| Parent Characteristics | | | | |
| Age (years) | | | | |
| <40 | 133 (21) | 24 (18) | 1.47 (0.86, 2.51) | 1.49 (0.85, 2.60) |
| 40–49 | 384 (59) | 50 (13) | ref | ref |
| ≥50 | 130 (20) | 27 (21) | 1.75 (1.04, 2.94)* | 1.89 (1.09, 3.26)* |
| Race/Ethnicity | | | | |
| Non-Hispanic White | 479 (74) | 69 (14) | ref | -- |

| | No. of parents (%) | No. of parents believing sexual disinhibition may occur after HPV vaccine (%) | Bivariate OR (95% CI) | Multivariate OR (95% CI) |
|--|--------------------------|---|-----------------------|--------------------------|
| Non-Hispanic African American | 131 (20) | 25 (19) | 1.40 (0.85, 2.32) | -- |
| Other ⁴ | 37 (6) | 7 (19) | 1.39 (0.59, 3.28) | -- |
| Gender | | | | |
| Female | 609 (94) | 94 (15) | ref | -- |
| Male | 38 (6) | 7 (18) | 1.24 (0.53, 2.89) | -- |
| Marital status | | | | |
| Married/living as married | 554 (86) | 84 (15) | ref | -- |
| Other (divorced, widowed, separated, never married) | 93 (14) | 17 (18) | 1.25 (0.70, 2.22) | -- |
| Education | | | | |
| High school or less | 122 (19) | 21 (17) | ref | -- |
| Some college or more | 525 (81) | 80 (15) | 0.87 (0.51, 1.46) | -- |
| Born again or evangelical Christian | | | | |
| No | 230 (36) | 26 (11) | ref | ref |
| Yes | 417 (65) | 75 (18) | 1.72 (1.07, 2.78)* | 1.43 (0.86, 2.37) |
| Political views | | | | |
| Moderate/liberal | 277 (43) | 26 (9) | ref | ref |
| Conservative | 370 (57) | 75 (20) | 2.45 (1.52, 3.95)** | 2.26 (1.37, 3.73)* |
| HPV vaccine knowledge | | | | |
| Low (0, 1, or 2 questions correct out of 4) | 332 (51) | 71 (21) | ref | ref |
| High (3 or 4 questions correct out of 4) | 315 (49) | 30 (10) | 0.39 (0.25, 0.61)** | 0.52 (0.32, 0.85)* |
| Perceived likelihood of daughter getting HPV | 2.26 (0.69) ⁵ | | 0.75 (0.54, 1.04) | -- |
| Perceived likelihood of daughter getting cervical cancer | 2.23 (0.62) ⁵ | | 0.78 (0.55, 1.12) | -- |
| Perceived barriers to getting daughter HPV vaccine | 1.57 (0.57) ⁶ | | 1.25 (0.88, 1.79) | -- |
| Perceived effectiveness of HPV vaccine | 2.53 (0.61) ⁷ | | 0.65 (0.46, 0.93)* | 0.82 (0.55, 1.21) |
| Household Characteristics | | | | |
| Annual household income | | | | |
| <\$60,000 | 259 (40) | 48 (19) | ref | -- |
| ≥60,000 | 361 (56) | 47 (13) | 0.66 (0.42, 1.02) | -- |
| Not reported | 27 (4) | 6 (22) | 1.26 (0.48, 3.28) | -- |

| | No. of parents (%) | No. of parents believing sexual disinhibition may occur after HPV vaccine (%) | Bivariate OR (95% CI) | Multivariate OR (95% CI) |
|------------|--------------------|---|-----------------------|--------------------------|
| Urbanicity | | | | |
| Rural | 321 (50) | 50 (16) | ref | -- |
| Urban | 326 (50) | 51 (16) | 1.01 (0.66, 1.54) | -- |

Note: The multivariate model did not include variables with dashes (--). HPV = human papillomavirus, OR = odds ratio, CI = confidence interval, ref = referent group, SD = standard deviation.

¹ Includes 9 parents who indicated don't know

² Includes 99 parents who indicated don't know

³ Includes 15 parents who indicated don't know

⁴ Includes Hispanic ($n=19$), Asian ($n=4$), American Indian or Alaska native ($n=5$), Native Hawaiian or Pacific Islander ($n=3$), other ($n=5$), missing ($n=1$).

⁵ Continuous variable reported as mean (SD), 4-point response scale: "no chance" (coded as 1) to "high chance" ($=4$).

⁶ Continuous variable reported as mean (SD), 3-point response scale: "not hard at all" (coded as 1), "somewhat hard" ($=2.5$), and "very hard" ($=4$); one item used a 4-point response scale: "strongly disagree" (coded as 1), to "strongly agree" ($=4$).

⁷ Continuous variable reported as mean (SD), 4-point response scale: "slightly" (coded as 1), to "extremely" ($=4$).

* $p<0.05$

** $p<0.001$