HPV Vaccination in Correctional Care: Knowledge, Attitudes, and Barriers Among Incarcerated Women

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Abstract

Incarcerated women are at increased risk of developing cervical cancer and have high rates of human papillomavirus (HPV) infection, an important cause of cervical cancer. However, many correctional facilities do not offer HPV vaccination to female inmates. This pilot survey study, conducted with incarcerated women aged 18 to 26 at a facility that does not offer the vaccine, assessed attitudes and knowledge about HPV and the HPV vaccine, acceptability of and barriers to in-prison HPV vaccination, and self-reported HPV vaccination rates. Most participants reported that they had not received the HPV vaccine but had positive attitudes toward it and would be willing to get it in prison. Correctional facilities should consider offering this preventive service to this vulnerable population.

Keywords

human papillomavirus, preventive care, vaccines, women's health, correctional health

Introduction

Rates of cervical cancer are disproportionately high among women in correctional settings, with one study demonstrating that women in prison were nearly 5 times more likely to be diagnosed with

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cervical cancer than those in the general population (Binswanger, Krueger, & Steiner, 2009; Mathew, Elting, Cooksley, Owen, & Lin, 2005). Human papillomavirus (HPV) infection is the most common sexually transmitted infection globally and causes most cases of cervical cancer; up to 90% of all such diagnoses are attributable to the virus (Berman & Schiller, 2017; Gutierrez, 2015; World Health Organization, 2019). Women involved with the criminal justice system are particularly vulnerable to HPV infection and its complications due to sexual behaviors known to increase the risk of HPV-related diseases, as well as limited access to health care services in the community such as screening Pap smear (Binswanger, Mueller, Clark, & Cropsey, 2011; Morris et al., 1995).

Prior studies have investigated rates of abnormal Pap smears among juvenile and adult correctional populations (Gander, Scholten, Osswald, Sutton, & van Wylick, 2009; Magee, Hult, Turalba, & McMillan, 2005), and the cross-sectional prevalence of infection among female correctional populations in the United States and other countries has been estimated at nearly 50% (Bickell, Vermund, Holmes, Safyer, & Burk, 1991; de Sanjosé et al., 2000; Sequera, Valencia, Garcia-Basteiro, Marco, & Bayas, 2015). However, there are currently no comprehensive data about HPV vaccination status among incarcerated women (Binswanger et al., 2011; Gander et al., 2009).

The HPV vaccine is a two- or three-dose series (depending on age) administered over 6 months. Among females, it is recommended for all girls aged 11 or 12, though women can obtain catch-up vaccines until age 26. The vaccine can prevent infection from both carcinogenic strains of HPV and those that cause genital warts (Lloyd et al., 2015). Because it is effective against multiple HPV strains, it can protect girls and women who have already been exposed to other strains of the virus (World Health Organization, 2019). However, the vaccine is not routinely offered in most prison facilities (Colorado Department of Corrections, 2017). Vaccination against HPV is nonetheless an important preventive measure that can complement existing correctional screening protocols such as routine Pap smears (Magee et al., 2005). Moreover, incarceration presents a unique opportunity to provide preventive services to a vulnerable population that may not otherwise receive them (Nijhawan, Salloway, Nunn, Poshkus, & Clarke, 2010).

Many studies of HPV attitudes and vaccine acceptability have been conducted in the general population, but few have focused on incarcerated populations. One qualitative study of incarcerated women with histories of abnormal Pap tests suggested limited awareness of and knowledge gaps about HPV and the vaccine (Pankey & Ramaswamy, 2015). Other studies of prison populations have shown that incarcerated individuals would be amenable to in-prison vaccination against infectious diseases such as hepatitis B and HIV (Lally et al., 2006; Vallabhaneni et al., 2004). However, no studies have evaluated the acceptability of in-prison HPV vaccination nor the perceived barriers to it. The latter consideration is especially important given the history of coercion and abuse as it relates to health care in correctional facilities (American Civil Liberties Union, 2019). Additionally, no HPV studies have specifically focused on female inmates in the eligible age range for HPV vaccination.

Among women in a state prison who were in the appropriate age range for HPV vaccination, we aimed to (1) evaluate women's attitudes toward and knowledge of HPV and the HPV vaccine, (2) assess the acceptability of receiving the HPV vaccine in prison, (3) identify women's perceived barriers to in-prison vaccination, and (4) describe women's self-reported HPV vaccination rates.

Method

This pilot study took place in a women's state prison that does not currently offer the HPV vaccine. The prison incarcerates women aged 18 and above. Recruitment took place between December 2016 and January 2017. The study was approved by the Colorado Multiple Institutional Review Board and Colorado Department of Corrections (DOC) Office of Planning and Analysis.

All English-speaking women at the prison who were age 18 to 26 as of the first day of data collection were eligible for the study, including those in high-security units. The majority of participants met a study investigator in a private room in the medical clinic to learn about the study,

review a paper consent form, and, if consent was given, take the voluntary, structured survey. If a woman was not permitted to leave her high-security unit, study procedures took place in a private room in that unit using a paper consent and paper survey. Women who were transferred to another facility or released prior to meeting the researcher, or who could not be contacted after three attempts due to court or work obligations, were excluded from the study.

Verbal informed consent was obtained from participants to avoid the loss of privacy associated with signed consent forms. No incentives were given for participation, per DOC policy.

Due to concerns about low literacy rates in this population, the 10-minute survey was verbally administered, and participant responses were manually inputted into a secure REDCap database by a member of the research team (Harris et al., 2009). If a paper survey was used, responses were transferred into REDCap immediately after meeting with the participant.

No identifiable information was collected, and neither the DOC staff nor off-site study investigators knew individual women's responses or participation status. Respondents were asked not to share survey content with other women in the facility, and correct answers to survey knowledge questions were provided via an informational pamphlet only after all study data had been collected.

Survey questions addressing attitudes were developed using a health belief model framework and included perceived susceptibility, severity, benefit, and barrier constructs (Burak & Meyer, 1997; Dempsey, Zimet, Davis, & Koutsy, 2006). Responses to these attitude questions were quantified with a 5-point Likert-type scale ranging from *strongly disagree/very unlikely* to *strongly agree/very likely*. Knowledge questions were partially adapted from HPV studies conducted in the community and validated national health surveys including the Behavioral Risk Factor Surveillance System Questionnaire (Centers for Disease Control and Prevention, 2014; Dempsey et al., 2006; Marlow, Zimet, McCaffery, Ostini, & Waller, 2013; Sherman et al., 2016). Participants were also asked to provide demographic information that included incarceration and sexual history.

Data analysis took place between January and April 2017. Descriptive statistics were used to examine demographic variables and participant responses to survey questions. Average knowledge scores were calculated for each participant by dividing the number of correct responses on knowledge questions by the total number of such questions.

Random forest and logistic regression were used to develop a predictive model for acceptability of in-prison HPV vaccination. Random forest analysis was used to winnow down the number of independent variables and identify those of high importance using the "cforest" function in the "party" package in R (version 3.4.3) (Hothorn, Buhlmann, Dudoit, Molinaro, & van der Laan, 2006; Strobl, Boulesteix, Kneib, Augustin, & Zeileis, 2008; Strobl, Boulesteix, Zeileis, & Hothorn, 2007). This method was chosen for two reasons: (1) it avoided inflating Type I error rates that are associated with univariate analyses and (2) it is a nonparametric approach that was designed to be used when the number of predictors outnumber observations, which was the case in this study. We used variable importance measures appropriate for ordered categorical dependent variables (Janitza, Tutz, & Boulesteix, 2016).

The dependent variable in the random forest analysis was "How likely are you to get the HPV vaccine if it is offered in prison?" Answers were rated on a 5-point Likert-type scale from 1 (*very unlikely*) to 5 (*very likely*). Seventy-three other variables were included as predictors in the analysis, including demographic and pertinent survey questions (Online Appendix A). Because variable importance indices do not have set cutoff levels, variable importance plots were examined and those variables with higher importance levels relative to other variables were selected for follow-up analysis. These selected variables were then entered into an ordered logistic regression model to determine the effect size and direction of each selected variable on the dependent variable. Statistical significance was set at $p < .05$. All analyses were conducted using R (The R Foundation, 2018).

Table 1. Study Sample Demographics.

Demographic Characteristics	N = 97
Mean age, years (standard deviation)	24 (± 2)
Race, n (%)	
White	46 (47%)
Hispanic	21 (22%)
Black/African American	8 (8%)
American Indian/Alaska Native	3 (3%)
Native Hawaiian/Pacific Islander	1 (1%)
Other or more than one race	18 (19%)
Sexual orientation, n (%)	
Straight	36 (37%)
Bisexual	31 (32%)
Gay or lesbian	26 (27%)
Asexual	2 (2%)
Decline	2 (2%)
Education, n (%)	
Less than high school graduate	30 (31%)
High school graduate or GED	40 (41%)
Some college	24 (25%)
College degree	3 (3%)
Insurance prior to incarceration, n (%)	
Medicaid	62 (64%)
Private insurance	24 (25%)
Military	2 (2%)
No insurance	6 (6%)
Don't know	3 (3%)
Ever sexually active	95 (98%)
Has received the HPV vaccine	33 (34%)
Received all three shots	19/33 (57%)
Months already spent in prison, median (interquartile range)	17 (9, 30)
Months remaining on sentence, median (interquartile range)	19 (7, 48)

Note. HPV = human papillomavirus.

Results

Of the 968 women in the facility on the first day of data collection, 142 were aged 18 to 26 and English-speaking. One woman in the appropriate age range was ineligible to take the survey due to language barriers. Twenty-eight women were unavailable due to transfer, release, work, or court. Seventeen women declined to participate. A total of 97 women consented and were included in the final sample, for an overall response rate of 68% (97/142).

Participants ranged in age from 19 to 26. On average, participants were 24 years old (± 2). Participants were most likely to be White (47%, 46/97), identify as straight/heterosexual (37%, 36/97), have obtained a high school or equivalent degree (41%, 40/97), and have been sexually active at any point in their lives (98%, 95/97). The median sentence length was 36 months (interquartile range 24 to 79). Thirty-four percent (33/97) reported ever receiving the HPV vaccine, and 57% (19/33) of those reported completing the full vaccine series. Seven women were not sure of their HPV vaccination status and were included among the women who reported never receiving it. See Table 1 for complete demographic characteristics of the study sample.

Eighty-five percent (82/97) of participants had heard of HPV and 57% (55/97) had heard of the HPV vaccine. The average knowledge score among all participants on all HPV and vaccine

Table 2. Responses to Knowledge Questions.

Knowledge Questions	Correct Responses % (N = 97)
HPV is a sexually transmitted disease (true)	63 (61)
HPV can cause	
Abnormal pap smears (true)	74 (72)
Genital warts (true)	43 (42)
Cervical cancer (true)	59 (57)
Oral cancer (true)	20 (19)
Bladder infection (false)	17 (16)
Skin cancer (false)	51 (49)
HPV infection usually goes away on its own (true)	0 (0)
The HPV vaccine cannot prevent other sexually transmitted diseases like HIV and chlamydia (true)	62 (60)
The HPV vaccine works in women who are already sexually active (true)	76 (74)
The HPV vaccine works in women who have already been exposed to HPV (true)	29 (28)
Average knowledge score among all participants	41 ± 22%

Note. HPV = human papillomavirus.

questions was 41% ($\pm 22\%$). Knowledge scores were highest for the question “the HPV vaccine works in women who are already sexually active” (76% correct). Scores were lowest for the question “HPV infection usually goes away on its own” (0%). See Table 2 for further information about participant knowledge.

Sixty-four percent (62/97) of women somewhat or strongly agreed that vaccines in general do more good than harm, and respondents had largely positive attitudes toward the HPV vaccine in particular. Sixty-six percent (64/97) somewhat or strongly agreed that the HPV vaccine could save their lives and 53% (51/97) somewhat or strongly agreed that the HPV vaccine is safe, while only 12% (12/97) somewhat or strongly agreed that it has dangerous side effects. Most women somewhat or strongly agreed that a cervical cancer diagnosis would have negative consequences on their lives (78%, 76/97), potentially including death (77%, 75/97). However, the majority somewhat or strongly agreed that they had no increased risk of HPV infection and cervical cancer compared to women who had never been incarcerated ([58%, 56/97] and [64%, 62/97], respectively). Furthermore, less than half of the participants somewhat or strongly believed that the HPV vaccine is effective at preventing cervical cancer (40%, 39/97), though this was higher than the proportion of women who somewhat or strongly believed that the vaccine can prevent genital warts (25%, 24/97).

Regarding acceptability, 47 of the 63 women (75%) who reported never receiving the HPV vaccine stated that they would be somewhat or very likely to get the vaccine during incarceration if it was offered. Fourteen percent (9/63) stated that they would be somewhat or very unlikely to accept it and 11% (7/63) were neutral.

Results from the random forest analysis indicated seven variables that were important for predicting participant acceptability of in-prison HPV vaccination (Table 3). Subsequent ordered logistic regression demonstrated that three of these seven variables were statistically significantly associated with acceptability. Identifying as gay/lesbian or asexual compared to identifying as straight/heterosexual (odds ratio [OR] = 0.01, 95% confidence interval [CI] = [<0.01 , 0.44]), somewhat disagreeing that one’s behaviors put oneself at risk of contracting HPV compared to strongly agreeing that one had risky behaviors (OR = 0.03, 95% CI [<0.01 , 0.50]), and declining to learn more about HPV and the vaccine compared to desiring more information (OR = 0.16, 95% CI [0.03, 0.96]) were negatively associated with in-prison vaccination acceptability.

Table 3. Independent Variables With High Importance Relative to Dependent Variable in Random Forest Analysis.

Variables With High Importance (Reference Response)	OR	Confidence Interval
"Have you ever heard of the cervical cancer vaccine or HPV shot?" (yes)		
No	0.55	[0.10, 3.11]
"The HPV vaccine is safe" (strongly agree)		
Somewhat agree	0.18	[0.008, 3.95]
Neutral	0.10	[0.008, 1.25]
Somewhat disagree	0.19	[0.006, 5.40]
Strongly disagree	0.05	[0.002, 1.31]
"My behaviors put me at risk of getting HPV" (strongly agree)		
Somewhat agree	1.58	[0.12, 20.9]
Neutral	7.22	[0.50, 103.3]
Somewhat disagree*	0.03	[0.001, 0.50]
Strongly disagree	3.37	[0.40, 28.1]
"Would you be interested in learning more about HPV and the vaccine?" (yes)		
No*	0.16	[0.03, 0.96]
"I do not want prison employees giving me vaccines" (yes)		
No	0.60	[0.12, 3.04]
"In the past 5 years, who have you had sex with?" (men only)		
Women only	28.3	[0.84, 950.8]
Both men and women	5.25	[0.58, 47.5]
I have not had sex	0.37	[0.01, 12.3]
Participant sexual orientation (heterosexual or straight)		
Gay or lesbian*	0.01	[<0.01, 0.43]
Bisexual	0.41	[0.06, 3.11]
Asexual	0.00	0.00

Note. HPV = human papillomavirus.
*Statistically significant after logistic regression analysis.

Participants were asked about specific barriers to in-prison vaccination, regardless of HPV vaccination status. Many women cited barriers such as uncertainty about how to obtain more information about the vaccine (56%, 54/97), concerns that they would not receive help in the event of an adverse reaction (37%, 36/97), and wariness about prison employees administering the vaccine (27%, 26/97). Several women had unclassified concerns (10%, 10/97). Responses are listed in Table 4.

Discussion

This pilot study examined in-prison HPV vaccine acceptability among an eligible population that is at high risk for HPV-associated diseases. Although HPV vaccination was unavailable to the participants in this facility, our study showed that women in prison (1) have low self-reported rates of HPV vaccination, (2) have positive attitudes toward the HPV vaccine, and (3) would be willing to receive the HPV vaccine while incarcerated despite knowledge gaps and several prison-specific barriers. Our data also suggest that most women will age out of HPV vaccine coverage by the time they are released but would be incarcerated long enough to receive the complete 6-month, three-shot series. Failing to provide this important and effective vaccine may have serious health consequences for women who are incarcerated during this crucial eligibility period.

As of 2014, 40% of adults in the general population reported receiving at least one dose in the HPV vaccine series compared to 35% of women in our study (Williams et al., 2016). However, while

Table 4. Barriers to In-Prison HPV Vaccination.

Barriers	% (N = 97)
I am not sure how to get more information about the vaccine	56 (54)
I don't think I'll be able to get help if I have a bad reaction	37 (36)
I don't want prison employees giving me vaccines	27 (26)
I don't want to pay for it	21 (20)
I don't like needles	21 (20)
It will be hard to get all three shots	21 (20)
I am not sure how to ask for it	11 (11)
I am worried that other inmates will find out	9 (9)
It is against my religious beliefs	1 (1)
Other	10 (10)
None	12 (12)

Note. HPV = human papillomavirus.

HPV vaccine completion rates are low in the general population, self-reported completion of the three-shot series was high in this sample among women who had ever received the vaccine (Wid-dice, Bernstein, Leonard, Marsolo, & Kahn, 2011).

Awareness and knowledge of HPV and the vaccine has trended up in the general population (Blake et al., 2015; Gerend & Magloire, 2008; Sherman et al., 2016) but has lagged in underserved populations, which tend to have significant demographic overlap with incarcerated populations (Galbraith et al., 2016; Pankey & Ramaswamy, 2015; Strohl et al., 2015; Watkins, Reitzel, Wetter, & McNeill, 2015). Although infection and vaccine awareness in this sample was higher than in a prior study of incarcerated women (Pankey & Ramaswamy, 2015), vaccine awareness was lower than in the general population, where it has ranged from around 60% to nearly 90% in recent years (Beshers, Murphy, Fix, & Mahoney, 2015; Blake et al., 2015; Bond et al., 2016; Glenn et al., 2015). Awareness of the vaccine was also far lower in this population than awareness of the virus itself, which mirrors findings in the general population (Garcini et al., 2015).

Overall knowledge scores in this underserved study sample were also low compared to female community samples, although survey measures were different in each study (Bynum, Brandt, Friedman, Annang, & Tanner, 2011; Garcini et al., 2015; Marlow et al., 2013). Incarcerated populations tend to have low literacy, which may, in part, explain the knowledge gaps identified in this study (Binswanger et al., 2011; Ramaswamy et al., 2017). Neither awareness nor knowledge was found to have an association with acceptability.

High acceptability in this setting mirrors community studies in which HPV vaccine acceptability rates have ranged from 65% to 90% among adults, as well as studies showing that underserved populations have particularly high rates of vaccine acceptability (Blake et al., 2015; Gerend, Lee, & Shepherd, 2007; Gerend & Magloire, 2008; Kahn, Rosenthal, Hamann, & Bernstein, 2003; Scarinci, Garcés-Palacio, & Partridge, 2007).

Identifying as lesbian, gay, bisexual, and transgender was associated with lower vaccine acceptability. Limited data on lesbian women have shown that they have low perceived risk of contracting HPV, which may be due to the belief that HPV infection is a risk only in women who have sex with men (Lechuga, Vera-Cala, & Martinez-Donate, 2016; Price, Easton, Telljohann, & Wallace, 1996). Decreased perception of HPV infection risk and decreased interest in obtaining more information about the virus and vaccine were also associated with lower acceptance. Risk perception in particular has been repeatedly shown to align with HPV vaccine acceptance among unincarcerated individuals (Galbraith et al., 2016; Gerend et al., 2007; Gerend & Magloire, 2008).

In contrast to studies conducted with community populations, physician recommendation was not associated with HPV vaccine acceptability in this study. This could be due to the fact that most participants reported that their providers had not spoken to them about the vaccine at all (Gerend et al., 2007; Howerton et al., 2007; Kahn et al., 2003; Zimet et al., 2000). However, many prison studies demonstrate high rates of mistrust between inmates and medical staff, which suggests that a physician recommendation could potentially have the opposite of its intended effect (Mostashari, Riley, Selwyn, & Altice, 1998). This view is supported by the findings that many participants in this study expressed concern about prison medical staff administering the vaccine as well as the unclassified fear that a prison-administered HPV vaccine may contain another substance entirely.

Limitations

This pilot study should be interpreted in light of several important limitations. First, this was a small study conducted with a limited sample in a single correctional site; results may not be generalizable to other correctional populations.

Survey studies are susceptible to response bias. To reduce this threat, researchers assured participants that all responses were anonymous, and DOC staff members were not present when the survey was administered. This study relied on unverified self-report of vaccination status; given the number of vaccines individuals receive, particularly in childhood, it is possible that women remembered their HPV vaccination history incorrectly. Finally, we used an unvalidated survey adapted from prior instruments that have not been validated for use with incarcerated women. Future studies should be undertaken to develop and validate a tool for assessing HPV vaccination attitudes in this population.

Conclusions

As of 2009, only 39 states offered HPV vaccination to juvenile correctional populations (Henderson, Rich, & Lally, 2010). While there are no comprehensive data on HPV vaccination policies in adult facilities, availability of the vaccine in correctional settings is believed to be low. Given high HPV risk and high rates of vaccine acceptability among this population, women's prisons should consider offering routine HPV vaccination to women who are aged 26 and under.

Our data suggest that in-prison HPV vaccination programs for adult women are likely to be successful due to high rates of patient acceptance, a reasonable number of eligible patients, and appropriate lengths of stay that would allow patients to receive the entire vaccine series. Knowledge was not associated with acceptability in this study; however, educating women about HPV prior to administering the vaccine may promote behavioral changes that reduce the likelihood of contracting or transmitting the infection and other sexually transmitted infections, particularly since most women in this sample were already sexually active and because women frequently resume sexual activity after release (Wiehe et al., 2015). Such education could be accompanied by advice on mitigating that risk, including discussing safe sex practices and the importance of timely preventive care such as Pap smears.

In-prison vaccination efforts may also be successful if correctional facilities address barriers. For example, because many respondents were concerned about untreated side effects, facilities could ensure that patients can be seen quickly and at no cost if postinoculation symptoms arise. Even so, some barriers may be difficult to overcome without systemic changes that improve trust between staff and inmates.

Offering HPV vaccination to incarcerated women confers individual and public health benefits by protecting both the vaccine recipient and her sexual partners. Sexually active women who have already contracted HPV may still be protected against strains that they have not previously been

exposed to (Centers for Disease Control and Prevention, 2016). In the long term, in-prison HPV vaccination could prove to be an important public health measure for both community and correctional health care systems by reducing the burden of abnormal Pap smears and cervical cancer cases among women who are released into their communities, regardless of whether they recidivate.

Future studies could investigate vaccination rates and in-prison vaccine acceptability among larger and more diverse correctional samples. Prior to initiating HPV vaccine programs, it would also be valuable to assess the prevalence of high-risk HPV infection among incarcerated women and review their true HPV vaccination histories. This information would aid in analysis of cost-effectiveness, which is an important consideration for prisons that often operate with limited resources and funding (Nelson, 2012).

Correctional facilities are in a unique but often overlooked position to provide preventive services such as HPV vaccination to a population that has limited access to health care outside of prison. We hope that the results of this study will encourage facilities to reconsider their vaccination policies and broaden the preventive services available to the women in their care.

Declaration of Conflicting Interests

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Amanda Dempsey serves on advisory boards for Merck, Pfizer, and Sanofi Pasteur and provides consultation services to Pfizer; she does not receive research funding from these agencies. Ingrid Binswanger receives royalties from UpToDate for educational content on health care for incarcerated adults. The other authors disclosed no potential conflicts of interest with respect to the research, authorship, or publication of this article. For information about *JCHC*'s disclosure policy, please see the Self-Study Program.

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Supplemental Material

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