

Shared Determinants for Human Papillomavirus and COVID-19 Vaccination Intention: An Opportunity for Resource Consolidation

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Abstract

Purpose: This study aimed at targeting shared factors that influence the prevention of multiple diseases, which can help address various health problems simultaneously. We identified correlates of human papillomavirus (HPV) vaccination that overlap with COVID-19 vaccination.

Design: Cross-sectional survey data.

Setting: Online Qualtrics recruitment panel.

Subject: Religious parents of 342 adolescents who were unvaccinated for HPV (response rate was 68.1%).

Measures: Outcome variables were COVID-19 vaccination intention for (1) self, (2) child, and (3) HPV vaccination intention for child. Independent variables were psychological factors. Covariates were sociodemographic and socioeconomic factors.

Analysis: We conducted multivariate linear regressions on each outcome variable after controlling for covariates.

Result: Some psychological correlates of HPV overlapped as protective factors for all three outcomes. Higher perceived vulnerability of child to HPV was associated with higher vaccination intention against COVID-19 for self ($\beta = .37$, 95% confidence interval [CI] = .25–.48), child ($\beta = .32$, .21–.44), and HPV for child ($\beta = .38$, .27–.49). Higher perceived response efficacy of HPV vaccine was associated with greater vaccination intention against COVID-19 for self ($\beta = .46$, .33–.59), child ($\beta = .41$, .28–.53), and HPV for child ($\beta = .75$, .64–.85).

Conclusion: Given the overlap in HPV and COVID-19 vaccination correlates, interventions should target shared factors that address both diseases to maximize public health efforts. A major limitation of this study is the inability to measure the actual vaccination behavior.

Keywords

human papillomavirus, HPV vaccine, COVID-19 vaccine, vaccine intention, resource consolidation, disease management, immunizations, health communications

Purpose

In a world of limited resources, it is challenging to invest in all diseases uniformly. This uneven allocation often results in the prioritization and rise of one disease over the other.¹ Both the human papillomavirus (HPV) and the 2019 coronavirus (COVID-19) are infectious diseases that are of national importance.^{2,3} However, vaccination programs for each disease are resource-intensive.⁴ HPV and COVID-19 may possess overlapping factors related to the public's vaccination intention. Targeting shared risk factors for low vaccination intention for both diseases can consolidate resources and maximize impact *via* cost-effective interventions that holistically

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promote vaccination uptake. This current study provides promising information toward that goal by examining if specific psychological factors associated with HPV vaccination intention are shared with COVID-19 vaccination intention using the same sample, time, and condition.

The theoretical frameworks that inform our investigation are the integrated behavior model (IBM)⁵ and the protection motivation theory (PMT).⁶ The PMT builds on IBM by identifying specific psychological factors that predict HPV vaccination intention. This study's objective was to identify shared psychological factors associated with HPV vaccination intention for child, and COVID-19 vaccine for self (the parent) and child. We focused our efforts on religious parents who identified as Christians, given these parents (1) have high vaccination hesitancy⁷ and (2) represent a significant part of the US population (73%).⁸

Methods

Design

Consenting participants completed an online cross-sectional survey between September 28 and October 8, 2020. Participants provided an online/electronic informed consent. The Institution Review Board of the University of Illinois, Chicago, approved the study materials and procedures (IRB Protocol #2020-1033).

Sample

We recruited participants using the Qualtrics Panel System (QPS). QPS used multimodal recruitment strategies such as targeted email lists and social media. Eligibility criteria were (i) ≥ 18 years at the time of recruitment, (ii) parents/guardians of at least one child aged 11–17 years who have never been vaccinated against HPV, (iii) identify as Christian, (iv) live in the United States, and (v) English speakers. Potential participants were invited *via* email. Fraud detection attention check procedures were embedded in the survey to ensure high data quality.

Measures

We assessed three dependent variables on a 5-point Likert scale: the likelihood of (1) COVID-19 vaccination intention for self (the parent), (2) COVID-19 vaccination intention for child, and (3) HPV vaccination intention for child ($\alpha = .90$).⁹

We assessed three psychological factors as independent variables using validated measures. (1) Perceived vulnerability to HPV was assessed with three items⁹ on a 5-point scale ($\alpha = .92$), (2) perceived severity of HPV was measured with three items ($\alpha = .85$)¹⁰ on a 5-point scale, and (3) perceived response efficacy of the HPV vaccine was measured with three items ($\alpha = .93$).¹¹

For covariates, we assessed self-reported age (for self and child), sex (for self and child), race, marital status, household income, employment status, and education.

Data Analysis

In addition to standard descriptive statistics and bivariate analysis, we used three multivariate linear regressions, respectively, for our aforementioned three dependent variables. The three models included 12 predictors—specifically the three predictors and nine covariates described. Covariates were selected based on past literature and relevant socio-ecological models.¹²

Results

Table 1 shows participants' (N = 342) characteristics. Participants had mean vaccination intention for COVID-19 for self (3.19 ± 1.57), child (3.09 ± 1.55), and HPV for child (3.02 ± 1.32). Bivariate analysis showed that $< \$75,000$ household income was associated with lower vaccination intention for COVID-19 for self ($\beta = 1.24, .91\text{--}1.57$), child ($\beta = 1.23, .89\text{--}1.56$), and HPV ($\beta = .61, .31\text{--}.91$) than those with $> \$75,000$. Multivariate linear regressions (Table 2) showed three overlapping psychological factors across intentions. Parents who reported higher perceived vulnerability of their children to HPV also reported higher COVID-19 vaccination intention for self ($\beta = .37, .25\text{--}.48$), child ($\beta = .32, .21\text{--}.44$), and HPV vaccination intention for child ($\beta = .38, .27\text{--}.49$). Higher vaccination intention for COVID-19 for self ($\beta = .21, .05\text{--}.38$) and HPV for child ($\beta = .33, .17\text{--}.49$) were positively associated with perceived severity of HPV. Finally, perceived response efficacy to HPV vaccine was also positively associated with intention to receive the COVID-19 vaccine for self ($\beta = .46, .33\text{--}.59$), child ($\beta = .41, .28\text{--}.53$), and HPV vaccine for child ($\beta = .75, .64\text{--}.85$).

Discussion

This current study is the first to provide emerging evidence of the similarities and possible overlap between factors influencing low COVID-19 and HPV vaccination intentions among a diverse hard-to-reach population of religious parents of unvaccinated adolescents for HPV. We identified psychological factors jointly associated with HPV and COVID-19 vaccine intention as perceived (1) vulnerability to HPV, (2) severity of HPV, and (3) response efficacy of HPV vaccine.

Our findings offer a significant response to the increasing call among healthcare leaders for cost-effective interventions that target multiple infectious diseases (such as HPV and COVID-19) concurrently.¹ Preventive interventions addressing shared psychological predictors of vaccine intentions are efficient methods for responding to these calls to action. Considering the roles of parents' perception in COVID-19 and HPV vaccination, and the increase in misinformation and

Table 1. Participants' Characteristics (N = 342).

Participants' Psychological and Outcome Characteristics	M (SD)
Perceived vulnerability to HPV	3.71 (1.13)
Perceived severity of HPV	4.32 (.82)
Perceived response efficacy of HPV vaccine	3.61 (1.12)
COVID-19 vaccination intention for self	3.19 (1.57)
COVID-19 vaccination intention for child	3.09 (1.55)
HPV vaccination intention for child	3.02 (1.32)
Participants' sociodemographic and socioeconomic characteristics	
Parents' age: mean = 41.33 years (standard deviation = 5.47). Child's age: mean = 14.08 years (standard deviation = 2.05)	
Parent's sex: Female (46%), males (54%)	
Child's sex: Female (34%), males (66%)	
Race: White (87%), non-White (13%)	
Marital status: Married (89%), non-married (11%)	
Highest education: Less than a college degree (25%), college or more (75%)	
Household income: Less than \$75,000 (31%), over \$75,000 (69%)	
Employment status: Employed (83%), unemployed/retired/disabled/others (17%)	

Table 2. Multivariate Linear Regression on Vaccination Intentions.

COVID-19 Vaccination Intention for Self	
Psychological Factors	β (95% CI)
Perceived vulnerability of child to HPV	.37 (.25–.48) ^a
Perceived severity of HPV	.21 (.05–.38) ^b
Perceived response efficacy of HPV vaccine	.46 (.33–.59) ^a
COVID-19 vaccination intention for child	
Perceived vulnerability of child to HPV	.32 (.21–.44) ^a
Perceived severity of HPV	.16 (–.01–.32)
Perceived response efficacy of HPV vaccine	.41 (.28–.53) ^a
HPV vaccination intention for child	
Perceived vulnerability of child to HPV	.38 (.27–.49) ^a
Perceived severity of HPV	.33 (.17–.49) ^a
Perceived response efficacy of HPV vaccine	.75 (.64–.85) ^a

^a $P < .0001$, ^b $P < .01$.

conspiracy theories that downplay the severity of vaccine-preventable diseases,¹³ health messages should be designed with strong emotional appeals and facts to elevate parents' risk perception.¹⁴ Our study also illuminates the existing SES disparity in vaccination. Parents with < \$75,000 household income reported lower vaccination intention. We therefore recommend affordable vaccination options and simplifying communication materials to address hesitancy among this vulnerable population. Finally, healthcare providers should offer information related to COVID-19 vaccination to patients who visit for HPV vaccination.

Limitations

First, our cross-sectional assessment lacks the measurement of actual vaccination. Second, our use of convenient

sampling provided an opportunity to reach a difficult-to-get population but also threatens our studies' generalizability. Third, excluding non-English speakers (who tend to be very religious)¹⁵ may have underestimated our effect sizes.

Conclusion

The timely identification of shared psychological risk factors of low vaccination intention for HPV and COVID-19 suggests that these seemingly unrelated diseases have some common preventive links. Specifically, modifiable psychological factors may predict vaccination intention for both HPV and COVID-19 vaccines.

So What? (Implications for Health Promotion Practitioners and Researchers)

What is already known on this topic?

HPV and COVID-19 vaccination hesitancy are public health problems of national significance. However, addressing both issues is very cost-intensive.

What does this article add?

We identified shared factors associated with HPV and COVID-19 vaccination intentions for self and child. Modifying these factors can alter vaccination against both infections.

What are the implications for health promotion practice or research?

Interventions that target these shared factors may decrease the burden of both HPV and COVID-19 cost-effectively.

Author Contributions

AO and YM contributed to the design and implementation of the research, AO, YM, LC, and OO contributed to the analysis of the results and to the writing of the manuscript.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval

The Institution Review Board (IRB) of the University of Illinois, Chicago, approved the study materials and procedures (IRB Protocol #2020-1033).

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