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Examining Predictors of Willingness to Receive the Catch-Up HPV Vaccine among Age-Eligible African American Women

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Abstract

Background: Young African American women (YAAW) have the highest prevalence of human papillomavirus (HPV) infection nationwide and are two times more likely to develop cervical cancer than their Caucasian counterparts. While two commercial vaccines exist, they are vastly underutilized by medically underserved YAAW. Identifying strategies to bolster HPV vaccine uptake among this population is a critical preventive strategy. A pilot study assessed the feasibility of implementing a smart phone-app based intervention (SABI) to promote HPV vaccine uptake among YAAW seeking care in an emergency department (ED) setting. Within this pilot study, predictors of willingness to receive the catch-up HPV vaccine among YAAW were examined.

Methods: A cross sectional survey was completed by 19 YAAW, aged 18 to 26 years, in a local ED and 21 from an online survey. Survey questions provided quantitative and qualitative data. A content analysis of messages identified as motivators for SABI participation were framed as themes. These themes were stratified within related constructs of both the health belief model and social cognitive theory.

Results: The most common predictors of SABI participation were knowledge/awareness (32.3%), perceived barriers (18.2%), cues to action (17.1%), self-efficacy (15.1%), and perceived vulnerability/susceptibility (15.1%).

Conclusions: Using SABIs to promote HPV vaccination among YAAW in an ED setting is feasible given the high level of acceptability of this approach. Predictors of willingness to participate were framed as theoretical constructs that have mixed conclusions regarding prediction ability in the HPV vaccine literature. Further research regarding the influence of these factors on SABI participation is warranted.

Keywords: *Biomedical intervention; Human papillomavirus; Surveys; and African Americans*

Abbreviations: YAAW: Young adult, African American women; HIV: Human Immunodeficiency Virus; HPV: Human Papillomavirus; HBM: Health Belief Model; ED: Emergency Department; SABI: Smartphone-App Based Intervention

Introduction

Human papillomavirus is the causative agent for cervical cancer and several other cancers including anal, penile and oropharyngeal cancer [1]. The standard recommendation and primary prevention strategy against HPV infection and cervical cancer is to target women aged 13-26 years for the catch-up HPV vaccine uptake [2-4], This approach stems from previous research concluding that widespread HPV vaccine uptake can avert 70-90% of incident cervical cancer cases [5, 6]. Still, young adult women continue to have low vaccination rates of 10-12% [7-9] and young adult, African American women (YAAW) experience disproportionate health disparities, and lead HPV morbidity/mortality rates [10-13].

Globally, several factors affect a person's willingness to accept vaccinations for preventive purposes, including an undefined value of knowing HPV status prior to vaccine uptake [14-17]. The existing literature is saturated with cross sectional studies aimed at understanding vaccine acceptability and intention to vaccinate among age-eligible female populations. In studies assessing vaccine acceptability, several variables were significantly associated with reluctance to vaccine uptake; however, race was not assessed. Those variables included inconvenience associated with the three series vaccine design [15] or being a born again or evangelical Christians [18]. Among research involving mostly Caucasian study participants, financial constraints and lack of insurance coverage [18-22], uncertainty about the duration of protection [15, 23-27], questions of the vaccine's safety [26, 28, 29], peer influences suggesting it's 'too late' to be vaccinated [22] and social risks accompanying vaccine trial participation, [28] were identified as barriers to vaccine uptake.

African American women, reported that resistance and barriers to HPV vaccine uptake stem from cultural barriers fueling distrust of vaccines [25, 28, 30, 31]. Barriers identified in research studies comprised of mostly African American women included limited knowledge and awareness about HPV infection [18, 30, 32, 33], a lack of perceived susceptibility/severity of HPV/cervical cancer [15, 18, 25], vaccine associated costs [18, 30], perception that the vaccine will cause HPV [25, 30], side effects and adverse events of the vaccine [21, 25, 30], and the absence of a guarantee that the vaccine will protect from HPV [25]. Conversely, African American women were more likely to be receptive to vaccine uptake if they had several opportunities to obtain the vaccine [23, 25], believed their peers would support the vaccination [25], were sexually active [34], felt susceptible to HPV infection [34], had multiple sex partners [34], perceived the vaccine as a 'cervical cancer vaccine', and did not receive regular Pap smear screenings [35].

Research conducted by Bynum explored predictors of catch-up vaccine uptake among African American college women who received and those who did not receive the vaccine and found significant association between HPV knowledge, perceived severity of health outcomes, perceived barriers to vaccination, and cues to action with HPV vaccine uptake [36]. Additionally, a survey administered to 124 students ages 18-26 years recruited from two southeastern universities revealed higher perceived susceptibility among sexually active participants and those reporting multiple sexual partners [34]. African American women and sexually active participants (57%) from this study reported more interest in HPV knowledge compared to referent others [34]. These findings validate the Health Belief Model (HBM) as a theoretical framework for catch-up HPV vaccine uptake intervention strategies, a model that has been routinely used in HPV vaccine research [37-40]. The HBM argues that willingness to engage in preventive health behaviors is determined by perceived susceptibility to HPV infection, perceived severity of HPV health outcomes, perceived barriers to HPV vaccination, and cues to action for HPV vaccination [40]. Social Cognitive Theory states learning occur in a social context and are gained through observation [41]. Bandura identified three models of observation: (1) a live model demonstrating or acting out a behavior, (2) verbal instructional model which involves descriptions and explanations of a behavior and (3) a symbolic model, real or fictional characters displaying behaviors via a particular medium such as films, television or online media. The modeled behaviors serve as cues to initiate similar behaviors in others, to strengthen or weaken the learner's existing restraints against a particular behavior and/or to demonstrate new behaviors. Additionally, there are three variables: cognitive factors (knowledge, expectations, and attitudes), environmental factors (social norms, access in the community, influence on others and environment) and behavioral factors (skills, practice, and self-efficacy) that influence observation. The HBM attempts to predict health behaviors by focusing on an individual's attitudes and beliefs. The theory is organized by perceived threats (susceptibility, severity, barriers) and net benefits (perceived benefits, cues to action and self-efficacy). Utilizing a theoretical framework encompassing knowledge, perceptions and social context through observation fosters exploration of relationships between variables with prediction power.

About two-thirds of Americans own smart phones and use their device to access information for various reasons including entertainment, knowledge acquisition and business transactions and to obtain health information [42, 43]. Prevalence of smart phone use among the target population creates an opportunity to engage young adults in preventive research using a device that they would routinely use. This study contributes to the body of literature by examining the beliefs and barriers influencing the decision to utilize a mobile application designed to promote HPV vaccine uptake among young African American women, a rare cross section of a community, seeking care in an ED setting in Houston, a major US metropolitan city.

This study contributes to the body of literature by examining and reporting predictors of willingness to receive the HPV vaccine uptake among young African American women (YAAW), a rare cross section of a community, seeking care in an ED setting in Houston, a major US metropolitan city.

Methods

A thirty item survey was administered over a four month period to a convenience sample of 40 African American women aged 18-26 years, who either completed an online survey (n = 21) or sought non-emergent care in the local ED of a Level I Trauma hospital (n = 19). These respondents (1) identified themselves as African-American, (2) owned a smart phone, and (3) had been cleared for discharge from the ED. These women were approached by a research associate and were asked to participate in the study. Informed consent was obtained through the participants signing a consent form. The study was approved by the University of Texas Health Science Center at Houston's Committee for the Protection of Human Subjects, the institutional review board. Those who provided informed consent were asked to complete a 30 question survey. Respondents completed the questionnaire in a private room. The research associate stepped outside of the room to give the participant privacy, yet was accessible if the participant had any questions.

A detailed description of the methodology is provided in a previous publication [42]. Willingness to participate in a mobile application based intervention encouraging vaccine uptake was assessed by asking participants, "'Name three key factors that would encourage you to participate in a mobile application intervention geared towards improving willingness of African American women (18-24 years) to obtain the HPV vaccine." Codes were then collapsed into themes informed by Bandura's Social Cognitive Theory and the HBM. The research team then conducted a frequency analysis on emerging themes.

Results

Over half of our study population (62.5%) was 20-23 years of age. Most (82.5%) had some form of income, 72.5% had a usual source of medical care and over half (60%) had some college education. The age of first sexual encounter for our participants was 16-17 years (43.6%) and the majority had 1-2 sexual partners in their life (77.5%). Seventy percent used their mobile devices often to always and 75% stated they would be somewhat to very comfortable with an HPV app on their mobile phone.

Variables		(N) %
Age (years)	18-19	4 (10.0)
	20-21	15 (37.5)
	22-23	10 (25.0)
	24-26	11 (27.5)
Income	Yes	33 (82.5)
	No	7 (17.5)
Usual source of medical care	Yes	29 (72.5)
	No	11 (27.5)
Education Level	Junior High	3 (7.5)
	High School/GED	5 (12.5)
	Some College	24 (60.0)
	College	3 (7.5)
	Graduate School	5 (12.5)
Age of Sexual Onset (years)	Under 16	4 (10.0)
	16	9 (23.1)
	17	8 (20.5)

	18	8 (20.5)
	19	3 (7.7)
	20	2 (5.1)
	21	2 (5.1)
	23	1 (2.6)
	24	2 (5.1)
Number of Lifetime Sexual Partners	0	8 (20.0)
	1	22 (55)
	2	9 (22.5)
	More than 5	1 (2.5)
Frequency of mobile phone use	Never	4 (10.0)
	Not often	3 (7.5)
	Sometimes	5 (12.5)
	Often	4 (10.0)
	Very often	7 (17.5)
	Always	17 (42.5)
Comfort with HPV app on mobile phone	Not comfortable	11 (27.5)
	A little comfortable	3 (7.5)
	Somewhat comfortable	9 (22.5)
	Comfortable	11 (37.5)
	Very comfortable	6 (15.0)

Table 1: *Socio-demographic characteristics of the study population.*

Knowledge and awareness (32.3%) was the leading predictor of catch-up vaccine uptake among YAAW who were willing to use an SABI. Additionally, perceived barriers to utilizing a mobile application that encourages HPV vaccine uptake (18.2%), cues to action (17.1%), self-efficacy (15.1%) and perceived vulnerability/susceptibility (15.1%) were identified as variables influencing willingness to utilize a SABI for vaccine uptake.

Theory	Themes	N	% Total	% of Theory specific responses
Health Belief Model		84		
	Knowledge/Awareness	32	32.3	38.1
	Perceived susceptibility /vulnerability	15	15.1	17.9
	Perceived severity	2	2.0	2.4
	Perceived barriers	18	18.2	21.4
	Cues to action	17	17.2	20.2
Social Cognitive Theory		47	NA	NA
	Knowledge/Awareness	32	32.31	68.1
	Self-Efficacy	15	15.1	31.9

Table 2: *Categorical description of qualitative responses to free text item stratified by theoretical construct.*

Themes	Direct Quotes
Knowledge/Awareness	
	The mobile app will allow women to see that there are other diseases that may not be life threatening but do have major effects on your future.
	Creates awareness for women
	Provides more information about cancer, ways to avoid the virus
	Educates about STIs
Will encourage regular Pap tests	
	Have more knowledge of the vaccine if it was a mobile app
Perceived Barriers	
	Price
	If I could hide my identify
	If the app were private/discrete
	Confidentiality
Cues to Action	
	Quicker way to spread information
	Easy to use
	Entertaining/fun
Self-Efficacy	
	Allows women to be more proactive in their sexuality
	Serves as a reminder about HPV vaccine
	Encourages protection
	Allows me to be in control of my own health
	I can save myself
	I can stay healthy
Perceived Susceptibility/Vulnerability	
	I believe nowadays YAAW are more safe than you think
	If I were in the age range for the vaccine
	If someone close to me had HPV
	If I were sexually active, I would think about it
	Why is this only for Black women?
	If I were not married
Perceived Severity	
	Scare tactics about cancer and HPV

Table 3: *Direct Quotes from participants and corresponding themes.*

Discussion

This is the first study to explore theoretically-based predictors of willingness to receive the catch-up HPV vaccine, specifically among YAAW who either: 1) sought non-emergent care in an ED setting or 2) were college women recruited online. By examining mediating and moderating factors to increase use of preventive biomedical interventions, designed to reduce HPV-associated disparities through vaccination [40], we identified strategies to effectively intervene in the behavioral norms exploiting health disparities of a vulnerable population, YAAW. The public health implications of the study findings are far reaching, as the behavioral norms of the targeted population will filter down to subsequent generations.

Although knowledge and awareness was the leading predictor of catch-up vaccine uptake among this population who were willing to use an SABI, cost and concerns of confidentiality were identified as perceived barriers to utilizing a SABI whereas easy and quick access on how to obtain the catch up vaccine and encourage regular pap tests were coded as cues to action. Self-efficacy was quantified as the belief that a mobile app could encourage vaccine uptake to protect against HPV and cancer, allowing the women to be more proactive in their sexual health. Finally, perceived vulnerability/susceptibility was quantified by responses such as:
'African American women are safer than you think.'
'If I were not married, I would get the vaccine.'
'If someone close to me had HPV I would get the vaccine.'

Higher perceived severity of HPV associated health outcomes has been linked to HPV vaccine acceptability among a primarily African American sample (62%) of young women [44]. However, findings of a systematic review did not support this correlation in three studies [18, 45-47]. Future research studies would benefit from further exploring the relationship between perceived severity of cervical cancer, rather than HPV infection, to HPV vaccine acceptability [18].

More recently, lower perceived severity of HPV health outcomes was found significantly correlated with HPV vaccine uptake [36]. A finding on correlations between HPV knowledge and awareness with catch-up HPV vaccine acceptability has been mixed [18, 45-47]. Although qualitative, our findings support the relationship with HPV knowledge and awareness, lower perceived barriers, and cues to action with willingness to receive the catch-up HPV vaccine. Conversely, we did not identify a relationship between perceived severity and willingness to receive the catch-up HPV vaccine.

Our study, similar to Rosenthal 2010, identified a correlation between self-efficacy and perceived susceptibility and willingness to receive the catch-up HPV vaccine [48]. Previous studies did not identify an association between perceived susceptibility to infection and benefit of vaccination with vaccine uptake [36, 49]; conversely, others identified sexual activity and multiple partners as predictors of perceived susceptibility to HPV infection and indicators of significant interest in getting the catch-up HPV vaccine [34, 50-53]. To this end, perceived susceptibility remains an important construct in the HPV vaccination research literature [18, 54].

Health disparities driven by lack of health care access and insurance status are drivers for underserved populations utilizing the ED as a public health safety net [55-58]. This study focused on a subset of the ED population, YAAW seeking non-emergent care in an ED setting. The literature supports the premise that health care access and insurance status, operationalized as cost estimates, are mediating and moderating factors influencing the decision to vaccinate [18, 32, 40, 45, 59-62]. This relationship may explain the focus on 'free' and 'price' as perceived barriers to catch-up HPV vaccination among our population.

Strategic steps towards the unanimous goal of increasing catch-up HPV vaccine uptake must include continued health education to increase HPV knowledge and awareness [34, 63]. The existing literature and our study findings present support for implementation of a mobile app-based intervention targeting YAAW. Providing a knowledge component with case scenarios that incorporate perceived barriers, susceptibility, cues to action and self-efficacy on a SABI presents a plausible option to facilitate closure of the existing gap in knowledge and vaccine uptake. The public health implications of our study findings are far reaching, as the behavioral norms of the

targeted population will filter down to subsequent generations, especially as these women begin to model sexual health preventative behaviors.

Limitations

The primary limitation of the study is the small sample size; thus, it is not possible to perform a regression analysis to adjust for any potential confounders, such as education. This pilot study should be replicated with a larger sample size and at other EDs. Another study limitation is that the data was based on self-report. Lastly, the population is not representative of the general population in the Houston area, as several participants are highly educated YAAW and have a usual source of care. The internet population was largely recruited from local universities, contributing to this outcome. These limitations challenge the generalizability of study findings. However, this pilot study paves the way for additional research in this area.

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