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Association Between Knowledge of Human Papillomavirus, Related Cancers, and Barriers to Information

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Walden University
2023

Abstract

Association Between Knowledge of Human Papillomavirus, Related Cancers, and

Barriers to Information

by

Joycelyn M. Larbie

MS, Walden University, 2016

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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February 2023

Abstract

Globally, over 250,000 women die every year from cervical cancer and human

papillomavirus (HPV). The purpose of this quantitative study was to discover the

relation between sociodemographic factors of age, educational attainment, socioeconomic

status, personal belief, and knowledge about HPV and related cancers. A cross-sectional

design was used to determine statistical relationships. Secondary de-identified data from

the Health Information National Trends Survey 2018 was accessed from the National

Center Institute and was employed in the study. The study used a simple random

technique to select a sample of 3,504 women. Logistic regression was used to estimate

the odds of knowing about HPV and related cancers. The binary logistic regression model

explained between 37.5% and 60.4% of the variance in the dependent variable. All the

independent variables predicted knowledge about HPV and were statistically significant.

Higher socioeconomic status was associated with knowledge of HPV and related cancers,

$OR = 54.3$, 95% Cl [2.20, 134.5], $p= .015$. Access to HPV information, particularly from

the internet, improves respondents' knowledge of HPV and related cancers $OR = 3.24$,

95% Cl [1.42, 7.43], $p=.005$. Educational programs should target women of lower

socioeconomic status and society at large to be more informed about HPV and related

cancers. Additionally, the internet is an important tool that can be used to spread

knowledge of HPV and related cancers to those at risk. Implications for positive social

change include successful implementation of programs and policies to increase awareness

of HPV, its risks, and methods of prevention.

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Section 1: Foundation of the Study and Literature Review

Introduction

The human papillomavirus (HPV) infection is a microscopic viral disease that is sexually transmitted and medically linked to warts of the genitalia and cervical cancer in women (CDC, 2022). Although HPV affects both men and women, it is prevalent in women during their sex life (Burd, 2003; Okunade et al., 2017). The primary mode of transmission of HPV is through sexual intercourse; however, genital skin contact can also lead to the passage of the virus to a sexual partner (World Health Organization [WHO], 2018). The Centers for Disease Control and Prevention (CDC) reported that approximately 79 million people are infected with HPV, with an additional rate of 14 million individuals becoming infected each year (CDC, 2018).

There are over 100 distinct types of HPV that have been identified (Akanbi et al., 2015); however, Types 16 and 18 are responsible for cervical cancer and genital warts in women (Okunade et al., 2017). Globally, cervical cancer ranks fourth among the leading causes of death among women whereas in developing countries, HPV remains the second leading killer disease after breast cancer (Ifemelumma et al., 2019). As identified by WHO (2018), signs and symptoms of cervical cancer include postcoitus bleeding, bleeding between periods, increased and pungent vaginal discharge, bleeding after menopause, pelvic and back pain, weight loss, swelling of lower extremities, and fatigue. Vaginal discharge and bleeding can be suggestive of contraceptive side effects; however, bleeding may also be suggestive due to other conditions such as cervical ectopy. Early presentations of women with these symptoms and recognition of these symptoms by

health professionals can increase prompt diagnosis which may reduce deaths and allow timely use of fertility-preserving treatment options. It has been noted that women experiencing these symptoms may delay their seeking of medical attention (Lim, 2013); a deficiency of cervical cancer referral systems and late treatment of cervical cancer lesions can expose more women to mortality especially in developing countries (Mwaka, 2015). Screening programs are one of the effective ways of alleviating cervical cancer. Therefore, the aim of this study was to establish the contribution of one's personal belief on HPV and how demographic factors, including self-knowledge, can impact the fight against HPV. The first section of the dissertation introduces the research by highlighting the problem statement, the purpose of the study, the study's objectives, research questions and hypotheses, and the theoretical foundation that will guide the study. This section will conclude with a discussion on the study's significance, a brief overview of the methodology, and a review of the literature that highlights important and pertinent information that ensures the viability of the study.

Problem Statement

Globally, HPV has been associated with cervical cancer. According to WHO (2019), HPV has been ranked as the fourth common form of cancer in women. It is unknown how individuals' personal beliefs and demographic backgrounds impact the source of information that women collect on HPV, and how this information influences both their awareness and responsiveness to vaccines. Therefore, the problem being studied was that because individual demographics, including racial and ethnic differences (Saadeh et al.,2020), age (Batthacharya et al., 2018), and knowledge (Ryan et al., 2019)

have been highlighted as affecting the type of HPV and level of risk, it is important to understand how knowledge and source of information are impacted by different demographic life areas. It should be noted that Osazuwa-Peters et al. (2018) reported that the majority of individuals obtain information regarding HPV from the Internet and found that these individuals who obtained information from this platform had increased knowledge and awareness than individuals who do not use the Internet to gather information.

This study is important in many ways because HPV has been associated with more than 266,000 deaths since 2012 with 528,000 new cases and the number is growing (see Kloksy et al., 2016). The largest chunks of these viral infections have been reported in developing regions of the globe where they account for approximately 12% of all female cancers (Kloksy et al., 2016). Furthermore, HPV is a global health concern because WHO (2019) reported that majority of its infections exhibit no symptoms and cervical cancer (99%) have been associated with genital HPV infections. The virus also causes anogenital, neck and head cancers, and genital warts in both men and women. The viral infection is very prevalent along the reproductive tract. HPV is transmitted through sexual contact and is common amongst adolescent and adults alike.

If the spread of HPV is not addressed, it may cause more deaths than projected. The global burden of the virus has led to various nations to introduce vaccines for their citizens. For instance, the Republic of Kenya recently rolled out the vaccination for girls aged 10 years (Ministry of Health Government of Kenya, 2019). A bivalent, a quadrivalent and a nonavalent (Cervarix, Gardasil, Gardasil-9) vaccines have been

adopted by nations with the effort of combating the viral spread (Lauri et al., 2021). Additionally, there are high–risk HPV types which include HPV 16 and 18, which contribute to approximately 70% of cervical cancer. Other high-risk types are 31, 33, 45, 52, 58. The low-risk HPV strains include HPV 6 and 11, which account for about 90% of genital warts, a rare case of cancer but appear as bumps growth (Burd, 2003). Therefore, HPV needs to be addressed since it is a global threat and is ranked amongst the highest causes of death globally; this project aims at identifying any relationships between demographic characteristics, level of knowledge, and sources of information.

Purpose of Study

The purpose of this quantitative study was to determine the effect of sociodemographic factors of age, educational attainment, socioeconomic status, personal belief, and knowledge in relation to HPV, while considering the source where individuals obtain their information about this illness. It is vital to establish the contribution of one's personal belief on HPV and how other demographic factors and self-knowledge can impact decision-making processes against the disease. The study used secondary de-identified data accessed from the National Cancer Institute (NCI). The Health Information National Trends Survey (NINTS) collects nationally representative data routinely about the American public's use of cancer-related information. The data is de-identified and contain data to understand how adults 18 years and older use different communication channels, including the Internet, to obtain vital health information for themselves and their loved ones. The data will also represent the independent variables (age, educational attainment, socioeconomic status), the covariate variable (HPV status),

the dependent variable (source of information), and the mediating variables (personal belief and knowledge).

Research Questions and Hypotheses

This study was guided by the following research questions and their corresponding hypotheses.

RQ1: Is there an association between participant demographic characteristics (age, educational level, socioeconomic level), and knowledge of HPV and related cancers?

$H_0$1: There is no association between participants demographic characteristics (age, educational level, socioeconomic level), and knowledge of HPV and related cancers.

$H_1$1: There is an association between participants demographic characteristics (age, educational level, socioeconomic level), and knowledge of HPV and related cancers.

RQ2: Do personal beliefs alter the association between participant demographic characteristics, and knowledge of HPV and related cancers?

$H_0$2: Personal beliefs do not alter the association between participant demographic characteristics, and knowledge of HPV and related cancers.

$H_1$2: Personal beliefs alter the association between participant demographic characteristics, and knowledge of HPV and related cancers.

RQ3: Is there an association between the source of information of HPV, and knowledge of HPV and related cancers after controlling for demographic factors?

$H_0 3$: There is no association between the source of information of HPV, and

knowledge of HPV and related cancers after controlling for demographic factors.

$H_1 3$: There is an association between the source of information of HPV, and

knowledge of HPV and related cancers after controlling for demographic factors.

participant

Theoretical Foundation for the Study

This study was guided by the common-sense model of self-regulation (CSM)

which is a conceptual model that highlights how individuals respond to and manage any

threats to their health (see Hagger et al., 2017). This conceptual model was helpful to this

study as it will help individuals who will typically engage in problem-solving techniques

when it comes to their health, by developing mental models of health threats, alongside

subjective and objective treatment goals, and potential practices as well as procedures

that can help them achieve their health objectives (Levanthal et al., 2016), as depicted in

Figure 1. Medical science researchers have described HPV infection as being the primary

factor of genital warts and cervical cancer (Moshi et al., 2018).

Figure 1

The Common-Sense Model of Self-Regulation
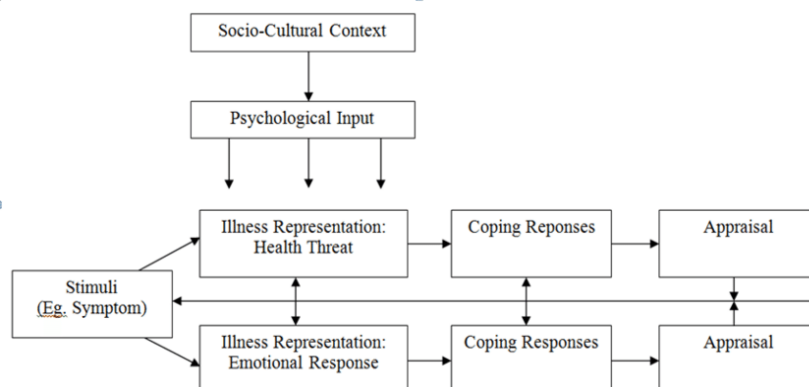
Note: Adapted from Diefenbach and Leventhal*, 1996*

This conceptual model can aid in understanding how individuals' subjective and objective beliefs and knowledge can streamline any treatment goals. It is important to note that many individuals in society lack knowledge of what HPV is while also being mainly unaware that cervical cancer produces infectious etiology (Ali et al., 2010). However, with the availability of medical testing and vaccinations, medical professions can answer questions concerning HPV from their patients. Understanding the kind of questions females may ask could assist with the preparation of nurses and doctors in explaining the condition, especially through the CSM of self-regulation. This model additionally establishes illness representation into five categories (Richardson et al., 2016). The five categories illness symptoms, determinants/causes, prevention and treatment/controllability, duration/timeline of the disease, and consequences to life quality and health. Therefore, the CSM application has been associated with chronic diseases, but the work developed from questions asked by females, maps onto the dimensions of CSM.

Nature of Study

In this study, I used a descriptive quantitative approach with a cross-sectional design using existing de-identified data. A cross-sectional design is consistent with determining any factors that predict the likelihood of having knowledge in HPV and related cancers, in relation to personal beliefs and the demographic factors of age, educational attainment, and socioeconomic status, which is the fundamental emphasis of this study. The quantitative analysis helps in identifying the extent of the influence of each of the variables in the models. This research used secondary de-identified data that was accessed from the NCI. The HINTS collects nationally representative data routinely about the American public's use of cancer-related information (HINTS, 2018). The data was de-identified and it made up of data to understand how adults 18 years and older use various sources of information to obtain vital health information for themselves. The data also represent the independent variables (age, educational attainment, socioeconomic status), the covariate variable (HPV status), the dependent variable (source of information), and the mediating variables (personal belief and knowledge).

Literature Review Search Strategy

This extensive literature review includes a variety of peer-reviewed articles and studies that focused on HPV and related factors. Specifically, this review included a discussion of HPV amongst the key variables such as age, educational attainment, and socioeconomic status. Additionally, the research will be able to provide a strong review of studies that focused on HPV in relation to personal beliefs and awareness and how they can be attributed to treatment or care. In this review, it is also important to discuss

sources where individuals receive information on HPV and related cancers when it comes to screening, treatment, and prevention strategies. Covering these topics can aid in ensuring that there is viability for this study. Therefore, this literature review was conducted to gain a broader understanding of all topics closely related to HPV, individual awareness, and personal beliefs, in conjunction with demographic factors of age, educational attainment, and socioeconomic status. Additional references, such as professional industry-focused websites were also used to generate a better understanding of the statistics of the occurrence of HPV and related cancers. Different databases were used in the literature review search strategy and included PsycINFO, PsycARTICLES, PsycCRITIQUES, PsycEXTRA, SAGE Journals, and SocINDEX, PubMed, CINAHL Plus, and EMBASE. Key search parameters included the following: *HPV AND related cancers, HPV AND awareness, HPV AND personal beliefs, HPV AND sources of information, HPV AND age, HPV AND educational attainment, HPV AND socioeconomic status, HPV AND awareness AND age AND demographic variables.*

Literature Review Related to Key Variables and Concepts

HPV and Cervical Cancer Diseases

There is substantial evidence linking HPV to 10% of all cancers, including prostate, lung, and esophageal cancer (Longatto et al., 2012). Though HPV is associated with cervical cancer, the HPV infection proportion that progresses to cancer of the cervix falls below 1% (Harper & Vierthaler, 2011). Cervical cancer is one of the top killer diseases among the minority races living in the United States and the Caribbean (Jha et al., 2017). The people living with cervical cancer or potential victims include women

with multiple partners or have women who have had exposure to HPV (Panatto et al., 2012). HPV types that are considered carcinogenic (having the potential to cause cancer) include Types 59, 31, 18, 35, 33, 45, 39, and 16 (Harper & Vierthaler, 2011). Early detection of the initial cancer conditions coupled with immediate treatment can avert the HPV infection from progressing to cancer of the cervix (Ifemelumma et al., 2019). Studies have indicated that among high-risk HPV types, HPV-16 takes the lead in global prevalence (Aimagambetova & Azizan, 2018; Khaliq et al., 2012). Research conducted in Amazon, Brazil showed that HPV-16 had a prevalence of 58.1% while HPV-59 had a prevalence of 20% (Rocha et al., 2013). The establishment of the HPV types of distribution about geographical regions is epidemiologically significant for evaluating the influence of anti-HPV vaccination programs carried out (Taira et al., 2004).

High-risk HPV serotypes HPV-16 and HPV-18 have been associated with head and neck tumors (Jo et al., 2019). However, HPV infection is related to the survival of primary cancer patients whose bodies have E7 expressed in their nuclei (Hellman et al., 2014). Other pathological factors are responsible for the survival of prostate cancer patients after the action of E7. For instance, E7 is a biomarkers of a cervical cancer cell and are the ones driving the cancer progression, therapeutic approaches targeting E6 have been proved to be highly efficient in terms of focused removal of abnormally propagating malignant cells. These factors include a high Gleason score during diagnosis, high nuclear grade, ages of more top than 72, and capsule infiltration (Pascale et al., 2013).

In South Africa, cancer of the cervix is confirmed to be the second leading determinant of mortality in women (Fakunle & Maree, 2019). Disparities in

socioeconomic status, inequalities in the access of health care and HIV infection, and HPV exposure are to blame for the proliferation in cancer of cervix cases in multiracial third-world countries (Hoque & Van Hal, 2014). A retrospective cohort study conducted on women visiting two different hospitals in Turkey and Italy revealed a higher prevalence of HPV etiological factors like the first sexual encounter at young ages and promiscuity in the previous 3 months. Other factors like oral contraceptives and smoking were also identified as cervical cancer etiological factors in this group but were less pronounced (Schettino et al., 2019).

HPV and Cervical Cancer Diagnosis

The screening of cervical cancer can be carried out using methods like HPV DNA test, colposcopy, and Papanicolaou smear (Pap-tests) (Kostrikis, 2018). However, it is worth noting that colposcopy is not used alone but rather combined with other screening methods (Ifemelumma et al., 2019). The four strategies put forward for cancer control by the WHO include prevention of cancer, early detection, and diagnosis, treating cancer, and palliative care (Aniebue & Onyeka, 2014). In an effort to spread of HPV infection and prevent cervical cancer regions of scarce health resources, the WHO recommends as the cheapest means: cryotherapy and visual examination of the cervix with acetic acid. These are widely used in developing countries such as Tanzania (Moshi et al., 2018).

One of the challenges in the effort of reducing cervical cancer in most third-world countries is the late diagnosis. Detection of cervical cancer at late stages renders the therapeutic measures futile (Moshi et al., 2018). The standard diagnosis and treatment options are also to blame due to inequity in the distribution of health care. Women in

developing countries cannot access easily radical trachelectomy, administered to women with early-stage cervical cancer in childbearing age, due to lack of equipment and expertise, and late-stage diagnosis (Ferreira & Koifman, 2019). Protracted duration of treatment, the unpleasantness of the procedure, inadequate funding of HPV and cervical cancer treatment programs, and poor record-keeping for follow-ups complicates dealing with HPV and cervical cancer (Aniebue & Onyeka, 2014). Apart from inequity in distribution of health care, this late diagnosis is attributable to reduced use of the screening programs since research revealed that only 20.6% of the respondent in the study had ever gone for cancer screening while only 27.3% knew that cervical cancer screening is done after every 3 years (Ifemelumma et al., 2019).

HPV Treatment

The most basic level to wage war against HPV infection, and to an extent, cervical cancer is equipping the health systems with the capability of offering therapeutic services and creating the demand for the prevention services to the otherwise indifferent populace. Knowledge only about cervical cancer and HPV infection may fall short in stirring substantial health-seeking behavior (Moshi et al., 2018). Further, a nonresearched based HPV and cervical cancer control strategies can be of noneffect since they disregard the new patterns of prevalence after each subsequent intervention in the population (Saldaña et al., 2019).

A significant step in the fight against the cancer of the cervix is the use of the vaccines. Cervarix© and Gardasil© are the two prophylactic vaccines administered to adolescents (boys and girls) before their first sexual encounter in a bid to close the global

cancer divide. These vaccines are effective before infection with any serotype of HPV; hence, the WHO targets girls aged 9 to 13 years (Okunade et al., 2017). Since the vaccines are preventive, this age group is targeted by the vaccination programs, especially in regions where the cervical cancer treatment services vaccines are not available (Akanbi et al., 2015). These vaccines gained prominence since they contain only attenuated genetic material from more than one origin, are noninfectious and prophylactic to some other cancers associated with HPV (Akanbi et al., 2015).

Among the two vaccines, Cervarix© is more effective in cancer prevention in both cervical screened populace and unscreened populace since it is prophylactic to more than five HPV serotypes and offers long-lasting immunity. It is safe as only few side-effects are associated with its vaccination (Harper & Vierthaler, 2011). The HPV vaccine implementation in developing countries is the only way to reduce HPV and cervical cancer incidence and mortality since poor infrastructure, non-adherence to population, and weak political commitment cripple secondary prevention approaches (Filho et al., 2012). However, if the therapeutic effect of the HPV vaccine is short-lived, then the programs need to focus on the older members of the society (Saldaña et al., 2019).

Though the use of vaccines is a significant step in the fight against cervical cancer and HPV, the scarcity of resources in the public health systems of the developing countries hinders its progress. The choice of an anticervical cancer strategy is based on its optimality in the targeted population and may encounter barriers when conveying information related to HPV, its vaccines, and cancer of the cervix (Saldaña et al., 2019).

The efficiency of HPV vaccine implementation discussion raises an issue of whether the HPV vaccination applies to both genders. Gender-indiscriminate immunization aims at total eradication of HPV and, consequently, the cancers associated with the virus. The near-to-eradication of HPV is achievable only when the vaccination of both genders is done before and after the first sexual encounter. During immunization, women are the priority in the target audience. It is difficult to achieve 100% coverage in vaccination even in a single-gender due to negligence and reluctance observable in the many of the potential vulnerable population (Saldaña et al., 2019). Though these vaccines are available in many countries across the world, they are expensive for individual parents to procure for their daughters (Hoque & Van Hal, 2014). Besides poverty or the cost of the vaccination as the reason for low coverage of the HPV vaccination forums, the masses in different countries believe that the government should fund costly health interventions. According to Dursun et al. (2009), 80% of the women thought that the government was responsible for paying the vaccination costs.

The introduction of HPV vaccines in rural and remote areas like India and other developing countries needs to be preceded by an exploratory study on the acceptability and knowledge levels on the safety of the vaccines. Thus, a multimedia campaign on awareness and government involvement in the screening programs would be useful in reducing cervical cancer prevalence (Khanna et al., 2015). However, there exist communication gaps in the relay of HPV and its cancer-related information which indicates a problem with the sources and the method of relay either by parents, media, friends, health care providers, and school systems (Hodge, et al., 2014). The attitude

towards HPV vaccination challenges health intervention hence weakening the trajectory to subside cancer of cervix and HPV infections. A Bahamian and U.S.- based study by Blackman et al. (2013) revealed that Blacks in Bahamas and the United States had mixed views on whether girls and boys should receive the HPV vaccine. However, most U.S. Blacks and Bahamian Blacks showed a willingness to vaccinate their daughters with 41% and 51%, respectively.

Structural barriers in the health systems slow the progress of vaccination programs once they have been rolled out (Vorsters et al., 2017). The health-care personnel face a problem in giving the three-time dose since the target group may forget to go for subsequent appointments. Some of the children in the vaccination target group visit the health center while ill, and this makes the vaccine administering difficult. Further, other state laws prohibit medical personnel from administering a vaccine to children of the HPV vaccine target age groups (Palmer et al., 2015).

HPV Vaccination Reluctance

HPV is asymptomatic and coupled with a lack of knowledge, are two of the reasons for its high prevalence. A vague perception of HPV severity, lack of the conception on the health benefits for therapeutic action and feeling unsusceptible to an illness influences the uptake of the HPV vaccine (Hosseini et al., 2014). Various women cited monogamy and the practice of safe sex as the reasons for reluctance to consent to the HPV vaccine, while women aged over thirty years showed little resistance to vaccination (Dursun et al., 2009).

Daughters may not likely show willingness due to cultural settings and parent-daughter interaction since adolescents are unlikely to discuss personal issues with parents at ages 9-13 as they approach puberty. Young girls generally refuse to consent to HPV immunization due to enlightenment on ill-effects of the HPV vaccine like edema, pain on the injection points, and erythema as a response to increased levels of high serum antibodies (Akanbi et al., 2015). However, the Global Advisory Committee for the Safety of Vaccines has confirmed that no more than one case in a million vaccinated individuals develops Guillain-Barre syndrome. The committee further cleared fears that the HPV vaccine caused Complex Regional Pain Syndrome (CRPC) (Cervantes & Doan, 2018).

HPV awareness can be done while administering intervention through obtaining consent. The informed consent is meant for the dissemination of information on HPV so that the target group can link HPV to cervical cancer before they consider vaccination. Nevertheless, some parents, religious groups, and public health activists hinder the immunization progress based on reasons not supported by research. This hesitancy toward immunization progress is a global phenomenon. A study in Lagos (Okunade et al., 2017) found that women attending a university-based clinic indicated 10.5% unwillingness to have their daughters vaccinated while 7.4% were indifferent to consent their daughters' vaccination. The reasons posed for defiance against HPV immunization were sexual risk behaviors like promiscuity and lowering of the age at first sexual encounter for women (Laidsaar-Powell et al., 2014). According to Okunade et al. (2017), the cost of vaccination (55.6%), the perceived health effects of the vaccine (48.1%), and its unavailability (25.9%) were behind the indifference and unwillingness to the consent

of women that have daughters receive vaccination against HPV. The cost of HPV vaccine acquisition is high since, in developing countries, many of the rare vaccines are offered through pro-women health humanitarian groups (Wittet et al., 2017).

Regarding the discretion to vaccination, 75.4% of the university women agreed to immunize their daughters once they mature enough to know about sex, while 19.6% felt that their daughters had to grow first and decide for themselves. Five percent of the university women suggested a vaccination before marriage for their daughters. If these results are anything to go by, then many will die of cervical cancer since even below 15 years of age, a substantial number of girls (35%) have had their first sexual encounter before they understand what sex is (Hoque & Van Hal, 2014).

In the United States, African American parents cited safety reasons for not willing to vaccinate their daughters, while the Bahamians did not indicate any reason. A majority (90%) asserted that they still needed assurance on the performance and reliability of the vaccine (Blackman et al., 2013). School-based immunization interventions are highly effective in developed and third-world countries alike. However, successful implementation of countrywide programs globally depends on the degree of awareness of these vaccines among separate groups (Hoque & Van Hal, 2014). Health providers cited a safety concern from parents for their daughters as a reason they would not consent to vaccination. Parents expressed misgivings over the vaccine as it may cause adverse health effects to their daughters of the target ages 9-13 years (Palmer et al., 2015). US Blacks felt that their daughters should not be vaccinated without parental consent (57%) against the Bahamian Blacks (80%) (Blackman et al., 2013).

HPV knowledge, its vaccination, and access to the vaccines can be deterred by cultural factors that may blend be of both religious and moral values of the health provider and patient. Most parents do not feel comfortable with their daughters getting the immunization for sexually transmitted diseases at an early age. Entrenched to the cultural barriers is the myth that the vaccination would trigger promiscuity among adolescents. The health care providers' estimation of pre-first-time sexual adolescents may face friction due to the culture of the target audience. Cultural norms also prohibit discussion matters between parents and daughters, while the HPV vaccine is seen as a preserve of girls and not boys (Palmer et al., 2015).

The alignment of the society's mindset that only the female gender is the target group for HPV vaccination is widespread. A study of women from different cities in Turkey gave a connotation for this since 70% of the females unresistingly would consent to the HPV vaccination, 64% of the women expressed a readiness to allow their daughters to receive HPV vaccination while only 59% of the women responded would consent to the immunization of their boys (Dursun et al., 2009).

HPV Awareness and Personal Beliefs

An investigation into the differences in knowledge and perceptions about the HPV among the blacks in the Bahamas compared to blacks in the US (Blackman et al., 2013), showed 89.5% in the US and 61.5% in the Bahamas knew about the HPV. With this percentage, 28.2% of US blacks versus 33.2% Bahamian blacks knew that HPV is responsible for genital warts. Among the respondents, 13.8% of the US blacks compared

to 7.5% of the Bahamian blacks were not informed about the existence of different serotypes of HPV that cause genital warts and cervical cancer.

HPV education and cervical cancer awareness are successful through the input of the media. A study in an Italian and Turkish region (Schettino et al., 2019) showed a significant association between a move to go for Pap-tests and media publicizing of information regarding HPV and cervical cancer. An Italian study compared the initiative to go for HPV testing during and after media awareness. The first group underwent Pap tests during the television awareness, and the second group got it two years later (Group 2). After educating the public on the safety of Pap-tests, its effectiveness, and HPV testing, 11.9% of the women in the first group responded by going for Pap-tests compared to 0.9% in the second group. This positive change implies that running an HPV and cervical cancer campaign simultaneously with Pap-tests programs improves the screening coverage. The campaign was effective in reaching remote residence women (De Vito et al., 2014).

The television-based sensitization, learning institutions, and the internet were identified as the most preferred sources of information on HPV by the students. In return, they communicated the knowledge to siblings and their families (Hodge et al., 2014). A high social, economic class is linked to having technology like TV and access to the internet. According to Moshi et al. (2018), a study to assess women's knowledge of cancer of the cervix showed that 87.1% of the women in the highest economic class and 84.6% of urban residents knew about cervical cancer. Hence the awareness campaigns against cancer should have the focus on remote rural areas and the folks in the lower end

of the wage gap. Though media is at the front of publicizing HPV vaccines in various countries and soliciting the public to go for screening and vaccination, a flaw emerges in the ce ycation of the message to the audience. A majority of 80% of the Native Americans perceived that the media sensitization about the vaccine implicated females as the only victims of HPV infection (Hodge et al., 2014).

A Nigerian based study of women attending a gynecological clinic in Lagos University Teaching Hospital (Okunade et al., 2017), revealed that 36.7% had heard about HPV infection, 87% majority of these knew it was an STI while a 91.5% of these knew that it caused cancer of the cervix. In another study investigated, the perception of Nigerian women on HPV, its vaccine, and cancer of the cervix, analysis showed that 72.9% never knew about the HPV vaccine and Pap-tests (Ekpo, 2012). These results contrast another Nigerian study where the respondents showed a 77.2% willingness to take the vaccine after being enlightened on the importance of vaccination. Among the respondents, 64.3% knew about cervical cancer, while only 23.9% knew about HPV. A majority of 81.5% never knew that HPV infection was cervical cancer in women (Akanbi et al., 2015). Knowledge about post-coitus bleeding as a common symptom of cancer of the cervix is essential. A study by Ifemelumma et al. (2019) indicates that among the ladies who participated in the survey, 57.7% knew about this symptom. This unfamiliarity suggests that the target audience for HPV education, HPV vaccinations, and anti-cervical cancer programs would be directed toward women of reproductive age for sufficient awareness and coverage.

Occupation impacts the flow of information to a majority of the population. In another study, the majority of those who had heard about HPV were single women who had not had sex (Khanna et al., 2015). Pre-sexual debut is a strategic point to maximize on in averting cervical cancer since the prophylactic aspect of the HPV vaccine is pronounced before sexual debut. An HPV vaccine with a long–life effect is recommended for young members of the population before any potential exposure to HPV for a guaranteed immunity against the virus (Saldaña et al., 2019).

Knowledge of the existence of HPV vaccines is still inadequate. According to Blackman et al. (2013), 66.9% of US blacks compared to 50.6% Bahamian blacks were aware of the HPV vaccine, while the knowledge about the vaccines came through advertisement (commercials). The two groups, however, knew the eligibility age for receiving the HPV vaccine. In another study (Ifemelumma et al., 2019), 59 % of the respondents perceived that being sexually active for over three years or more than 21 years of age for a female was enough for her to consider going for cervical cancer screening. One of the primary reasons for the gap in the knowledge about HPV is because most of the vaccine programs rolled out in different countries offer information to a targeted group, which is below reliability since it is not given consistently. Teachers as opposed to health teams deliver the information, hence the information lack professional strength. The programs were rolled out irregularly (Wong et al., 2016). The majority target groups of young adults were adolescents, who are reached through school-based immunization programs, whose consent must be made by their parents (Laidsaar-Powell et al., 2014). In a study based on master's students at Kwa Zulu University, 58.7% felt it

necessary to explain to their daughters that HPV is a sexually transmitted infection, while 80.3% were willing to discuss issues of sex with their daughters if they showed interest (Hoque & Van Hal, 2014).

The education, income of the parents, race, the knowledge about cervical cancer, the proximity to vaccination centers, and age of the girls and prior awareness of the HPV vaccine's importance determines the acceptance of vaccines among girls in learning institutions. The teachers are highly likely to convince the schoolgirls to take the HPV vaccine (Al-Naggar et al., 2012).

An Indian-based study (Khanna et al., 2015) in Odisha of women aged between 18 and 49 discovered that 68.8% of those sampled respondents were not informed on HPV, and only 11.9% could link the causality of HPV to cervical cancer. The same study showed that only 15% of the women knew that the current medical facilities could provide care for cervical cancer. Many women recognized that vaccination against HPV was the antidote for cervical cancer in women, while 74.8% believed that if their children were to be vaccinated, they (women) would be responsible for making the decision. A study conducted on Australian University female freshmen students revealed that 10% of the students have never heard of HPV, 18% have never associated HPV causality to cervical cancer, 64% were never aware HPV is highly contagious, and 51% never knew that early first sexual encounter increases the risk of HPV infection (Laidsaar-Powell et al., 2014).

There is a stigma associated with HPV, which hinders information and health-seeking behaviors among the youth. Some cultures believe that sex discussion is taboo,

and conservatives therefore seek to protect the women and children from moral harm (Cacciotti et al., 2014). A study among the Native Americans youths found out that discussion about HPV and other STIs with parents would elicit adverse reactions (Jeudin et al., 2013). The youth feared being viewed as infected or sexually active. In rural areas, youth often shy away from knowledge about HPV, since they have no one to turn to for such information (Hodge et al., 2014). Healthcare providers also face a dilemma in disseminating information on HPV and its vaccines, since most of the patients do not have health coverage for themselves or their daughters. With the prohibitive cost of vaccines and the difficulty in getting vaccines reimbursement also hinder the efforts of health care providers. These policy and cost-related factors also resurface through parents resisting the vaccination of their children (Palmer et al., 2015).

A gap in the current knowledge even exists among the educated that are expected to have children vaccinated against other general sicknesses. According to a study by Hoque and Van Hal (2014), the respondents' willingness to have their daughter's vaccinated rose by 9.2% from 88% after the researcher read the cancer factsheet for them. Detailed elaboration on efficacy and safety of the vaccine provided to the parents would increase their willingness to receive HPV vaccination. A Tanzanian based study by Moshi et al. (2018), found a significant association between awareness of cervical cancer and levels of education. Among the women, 44.3% of those without formal training had not heard about cancer of the cervix, while 50.2% of teenagers 15 years of age and older were not informed about this cancer. This relationship between education and cancer awareness implies that cervical cancer must be also controlled from the literacy level

dimensions (Simmons et al., 2017) since the uniformed teenagers are or should be school-going students and yet do not have basic health literacy.

Cervical cancer screening is a technique that is still unknown to many people. A study to assess whether women were aware of the screening methods showed that 89.2% of respondents knew about the Pap-tests, while only 74.5% knew about the existence of the HPV vaccine (Ifemelumma et al., 2019). This lack of knowledge regarding screening methods makes countering cervical cancer, a third of the cancer burden in developing countries, taxing even after 6% of the global GDP is allocated into control (Ginsburg et al., 2018). This widespread HPV infection, combined with ineffective cancer screening programs help explain a proportion of cervical cancer load (Ifemelumma et al., 2019).

Culture often shapes the way information is communicated, including sex-linked issues. Discussions about HPV and related cancers have an impact on the American natives if they are culturally appropriate, and come from friends and relatives (Hodge et al., 2014). Culture may hinder the spread of information on HPV and its vaccines, especially in Africa, the Middle East, and Asia. Many cultural norms prohibit speaking about cancer, prohibit women from speaking sexuality matters with their daughters, and regard the ability of women to give birth. These norms culture deter women from making health decisions for themselves; hence, they are denied access to cancer health care. The flow of information to the general population is obstructed (Aniebue & Onyeka, 2014). Cultural issues may be involved in poor health-seeking behavior in places where cancer screening programs have been established. Some cultural aspects make people have

insufficient knowledge of HPV and its association with cervical cancer, as well as the need for screening and vaccination (Ifemelumma et al., 2019).

The   cess to information on HPV, HPV vaccines, and related cancers can be deterred from the health care provider's end. Health providers who are ill-informed on vaccine, prevalence, and efficacy of HPV would be inefficient in offering education to patients. Further, the providers with little strategies and communication skills to convince hesitant patients also cripple the coverage of vaccination strategies (Palmer et al., 2015). The providers are so influential in closing the knowledge gap; hence, their efforts are reliable in the success of vaccination initiatives.

Poverty contributes significantly to hindering the knowledge of HPV, the uptake of its vaccines and penetration of the sensitization to fight cervical cancer since radiotherapy services are difficult to procure due to their scarcity, the cost of undergoing sessions and few experts available in health facilities (Tsu & Levin, 2008; Balaji et al., 2020). Ignorance about the HPV and its causality relation to cervical cancer, poverty, and toleration of male infidelity, in turn, increases the spread of HPV and worsens the situation. Early marriages, further, increase the HPV prevalence due to the link between initial first sexual encounter and HPV infection. In societies where the vaccines are available, the general populace fears to go for vaccinations, which are deemed to be government strategies to control fertility (Aniebue & Onyeka, 2014). However, this is not the case in all regions, since a majority feel that the vaccine would not encourage risky sexual behaviors, and discussion with daughters on sexuality matters was necessary before vaccination (Blackman et al., 2013).

A study that involved the nations of Turkey and Italy (Schettino et al., 2019), two countries that are geographically remote from one another, yet showed a similar knowledge about cervical cancer screening. Italian respondents revealed a higher understanding of the HPV vaccine, an inclination to use the vaccine, and greater readiness to go for Pap smear test than Turkish respondents. The Turkish respondents were less willing to consent to HPV vaccinate for their daughters. The ignorance of HPV and its related cancers is not confined only to folks in remote, underdeveloped countries. University-educated people are expected to be knowledgeable on HPV and cervical cancer since their control may be part of their corporative social responsibility. A study of master's level students at the University of Kwa Zulu-Natal in South Africa showed that 74% knew about cervical cancer, while only 26% understood HPV clearly (Hoque & Van Hal, 2014).

HPV and Age

There are many studies that have been completed that have focused on HPV and age. Many younger females have demonstrated how by receiving HPV vaccinations, their chance of developing cervical cancer decreases. For example, Palmer, (et al., 2019) completed a study that examined over 138,000 records that compared two groups of women: unvaccinated women born in 1988 and vaccinated women born in 1995 and 1996. The results of the study concluded that vaccinated women who were born in 1995 and 1996 saw a reduction in prevalent cervical intraepithelial neoplasia by up to 88%. Therefore, younger individuals who received vaccinations appear to experience less of a chance of developing preinvasive cervical disease.

Additionally, studies have also suggested that age has to do with HPV prevalence. Brotherton et al. (2019), completed a study in Australia that found that HPV based cervical screening can generate precise HPV prevalence estimates. For example, the authors reported that based upon over 116,000 patient records, Australian women that were between the ages of 25 to 74 years of age had a 9.2% chance of being diagnosed with oncogenic HPV. The authors also found that by examining the different patient records that HPV 16 and 18 appeared stable by age due to the HPV vaccine. Other oncogenic forms of HPV did not appear to follow any age patterns. In comparison, Burger et al. (2017) completed a study that attempted to better understand how casual occurrences of HPV infections can turn into cervical cancer. Although the authors found that new infections of HPV can occur at any age, they concluded that only a small number of infections are acquired in mid-adulthood and can be seen as vaccine preventable.

HPV and Educational Attainment

There are limited studies that have focused directly on the relationship between HPV diagnosis and an individual's level of educational attainment. However, in some studies, educational attainment has been discussed amongst other variables, including that of Thompson (Thompson et al., 2020). For example, the authors completed a study that focused on 27- 45-year-old females and their levels of awareness and knowledge of HPV and the HPV vaccination. The results of the study found that over 70% of respondents of the survey were aware of HPV and over 65% of respondents were aware of an HPV vaccination. However, the results of the study further highlighted that the respondents

were more likely to be aware of both HPV and the vaccination if they had a higher level

of education as well as having previous cancer information seeking behaviors. The

authors stated that respondents who had a college degree was positively associated with

cervical cancer knowledge.

Vickers et al. (2019), conducted a study that examined the factors associated with

HPV vaccination uptake and HPV-associated cancers. Collecting data throughout the

state of Alabama, the authors reported that the state of Alabama ranked 15th throughout

the United States when it came to HPV cancer rates. These authors concluded the

counties in the state of Alabama that had the highest rate of HPV vaccinations were that

of areas that had extreme poverty rates and African American adults who had low

educational attainment rates.

<div align="center">**Definitions**</div>

The following terms will be used throughout this study and are defined as

follows:

Age: In this study, age as a continuous variable was measured by the process of

clearly defining parameters into measurable elements. For instance, in the proposal age

was measured in number of years. Therefore, the age of an individual was applied to

determine the knowledge of HPV. It can be assumed that HPV knowledge increases as an

individual grows older.

Educational attainment: Educational attainment was defined as the level of

education that an individual had obtained. Educational attainment was measured by the

data reflecting whether an individual has achieved a certain level of education (e.g., high school, GED, undergraduate, graduate, etc.).

Human papillomavirus (HPV) infection: The human papillomavirus (HPV) infection is a microscopic viral disease that is sexually transmitted and medically linked to warts of the genitalia and cervical cancer in women. Although HPV affects both men and women, it is prevalent in women during their sex life (Burd, 2003; Okunade et al., 2017). The primary mode of transmission of HPV is through sexual intercourse; however, genital skin contact can also lead to the passage of the virus to a sexual partner (WHO, 2018).

Human papillomavirus (HPV) vaccination: The HPV vaccination targets HPV types that commonly cause cervical and related cancer. The vaccination also prevents against HPV types that cause genital warts (Gillison et al., 2017).

Personal beliefs: In this study, personal beliefs as a categorical variable were defined as something that an individual personally holds to be true. Therefore, in this study, personal beliefs were measured by attitudes, myths, religion, and misconceptions, including the respondent's evaluation of whether such beliefs influence the choice of seeking knowledge on HPV.

Socioeconomic status: Socioeconomic status as a categorical variable refers to the economic status of an individual which is usually measured in three levels i.e., low income, middle income, and high income. The variable is applied to determine whether the level of income earned by an individual correlate with knowledge of HPV.

Source of information: In this study, source of information refers to various platforms that create awareness about HPV which include social media platforms like Facebook and Twitter, newspapers, magazines, radio, and TV programs. The variable was measured by evaluating media accessibility by assessing smartphones, TVs, and radio ownership. Also, purchase of healthy magazines and journals measure the source of information available to people on HPV. HPV and related cancers were measured by asking respondent to answer a question in a Yes or No format (e.g., Do you know about HPV, or have you heard about HPV? A. Yes, B. No).

Scope and Delimitation

In this study, I applied a descriptive quantitative approach with a cross-sectional design using existing de-identified data. I used secondary de-identified data accessed from the NCI limited to how adults 18 years and older use various sources of information to obtain vital health information for themselves. The study was limited to American women, above the years of 18, forgoing other variables or population of people. In this study, the secondary de-identified data also included other variables such as that of patients' age, level of educational attainment, and socioeconomic status. Therefore, this study was delimited to individuals who presented the secondary data within these categories and variables. The results of this study may not be representative enough of the whole populations of the United States and the rest of the world; generalization should not be adopted. There may be a compromise by questionnaires on the research external and internal validity as respondents found it hard disclosing their private and personal information. In such studies, respondents opt to give socially accepted answers

as opposed to the actual perception, behaviors, and attitude towards the cancer screening. There might have been issues with language barrier, making respondents not to finish answering all the questions, since the language used was medical laden, this presented a threat to both external and internal validity. Also threats to external validity may have presented via voluntary participation. Generally, this study was limited to a quantitative, descriptive, and cross-sectional design lacking comparison and control groups.

Significance, Summary, and Conclusion

HPV is asymptomatic and when coupled with a lack of knowledge, allows for its high prevalence (Reiter et al., 2011). A vague perception of HPV severity, lack of the conception on the health benefits for therapeutic action and feeling unsusceptible to an illness influences the uptake of the HPV vaccine (Hosseini et al., 2014). There is substantial evidence linking HPV to 10% of all cancers, including prostate, lung, and esophageal cancer (Longatto et al., 2012). Though HPV is associated with cervical cancer, the HPV infection proportion that progresses to cancer of the cervix falls below 1% (Harper & Vierthaler, 2011). Cervical cancer is among the top killer diseases among the minority races living in the United States and the Caribbean (Jha et al., 2017).

People living with cervical cancer or potential victims are those women with multiple partners or have exposure to HPV (Panatto et al., 2012). The HPV types considered carcinogenic include Types 59, 31, 18, 35, 33, 45, 39 and 16 (Harper & Vierthaler, 2011). Early detection of the initial cancer conditions coupled with immediate treatment, can avert the HPV infection from progressing to cancer of the cervix (Ifemelumma et al., 2019). Studies indicate that among the high-risk HPV types, HPV-16

takes the lead in the global prevalence (Aimagambetova & Azizan, 2018; Khaliq et al., 2012). Research conducted in Amazon, Brazil, showed that HPV 16 had a prevalence of 58.1% while HPV 58 had a prevalence of 20% (Rocha et al., 2013). The purpose of this quantitative study was to determine the effect of the socio-demographic factors of age, educational attainment, socioeconomic status, personal belief, and knowledge in relation to HPV, while considering the source where individuals obtain their information about this illness.

Section 2 provides a strong overview of the study's methodology. The section will begin with a discussion on the target population and research design, while then discussing the sampling procedure and methods of data collection. The section will then conclude with a data analysis plan, the operationalization of constructs, threats to validity, and ethical procedures.

Section 2: Research Design and Data Collection

Introduction

Section 1 highlighted on the introduction to the study, problem statement, purpose of the study, research questions and hypothesis, theoretical foundation to the study, nature of the study as well as literature review. Section 2 explains the procedure and techniques that were used to collect and analyze the data and provides an overview of the study methodology by capturing research design and rationale, target population, and data collection and analysis. The section concludes discussion on the instrumentation and operationalization of constructs.

Research Design and Rationale

I employed a quantitative methodology that used a cross-sectional design. The use of a cross-sectional design was appropriate for this study because it helps to determine any statistical inferences about the population that is being studied and their variables (see Neuman, 2016). Additionally, a cross-sectional design is the most appropriate research design when examining populations, who share a variety of background or demographic characteristics (Sjögren et al., 2017). The data included independent variables (age, educational attainment, socioeconomic status), the dependent variable (Knowledge of HPV and its related cancer). Logistic regression was used to predict the odds of having knowledge of HPV (respondent awareness on Human Papillomavirus) and its related cancers based on background factors, personal relevance factors, and information career factors. The cross-sectional design was consistent with determining the factors that predict the likelihood of having knowledge in HPV and related cancers as

it can utilize a logistic regression analysis, which is the fundamental emphasis of this doctoral study. Other studies that have investigated HPV have also used a cross-sectional design. For example, Granda et al. (2018) used a cross-sectional design to examine the association between parents' knowledge, beliefs, and acceptance of the HPV vaccine for their daughters. In their study, the authors examined different demographic variables as well as religious beliefs. Additionally, Scherer et al. (2018), used a cross-sectional design to examine associations between psychological traits, HPV vaccine, and intentions in young adults in the United States. Therefore, using a quantitative cross-sectional design was appropriate for identifying the extent of the influence of each of the variables in the models.

Methodology

Target Population

I used secondary de-identified data that was accessed from the NCI. The HINTS collects nationally representative data routinely about the American public's use of cancer-related information (HINTS, 2018). A total of 3,504 respondents were used for the study. The data was de-identified and contained data to understand how adults, 18 years and older, use various sources of information to obtain vital health information for themselves.

Sampling Procedure

Sampling aims at performing random selection of the representative sample; the choice of the correct number helps in answering the study question with a necessary level of accuracy (Davies et al., 2008). The two extremes in the choice of a sample are quite

disadvantageous. Recruiting more subjects than required leads to waste of time and resources, while recruiting less than needed provides insufficient numbers to make statistically significant results when answering the study question. Due to central limit theorem, large sample sizes yield good estimation to populations since the sample mean can be the estimator of population means (Jacobsen, 2016).

The sample size of 200 was calculated as follows (see Ifemelumma et al., 2019):

$n_0 = \frac{Z^2 * p(1-p)}{\varepsilon^2}$ is the default sample size formula

p=is the proportion of subjects in the population realized from previous studies or a pilot study.

Z =is the standard normal deviate due to the 95% confidence interval

ε=is the maximum allowable error.

In this study, I used the conventional 0.05 as the level of significance.

If the sample is less than n_0/N is less than 7%, n_0 is taken as the sample size. Otherwise, I calculated the sample size as

$n = \frac{n_0}{1 + \frac{n_0 - 1}{N\varepsilon^2}}$

where N is the population size.

Methods of Data Collection

In this research study, secondary data from the 2018 HINTS was used for data analysis. The HINTS collects nationally representative data routinely about the American public's use of cancer-related information. The data was de-identified and contain information to understand how adults 18 years and older use different communication

channels, including the Internet, to obtain vital health information for themselves. The survey collected the health information of U.S. residents concerning socioeconomic status, educational attainment, and personal beliefs. Secondary de-identified data was accessed from the NCI.

Instrumentation and Operationalization of Constructs/Variables

It is important to discuss the operationalization of constructs that were used in this study. Even though I did not used any instruments to collect the data for this study, it important to understand how the different variables were measured. The collected data represent the independent variables (age, educational attainment, socioeconomic status), the covariate variable (HPV status), the dependent variable (source of information), and the mediating variables (personal belief and knowledge).

Age: In this study age was measured in number of years. It can be assumed that HPV knowledge increases as an individual grows older.

Educational attainment: In this study, educational attainment was defined as the level of education that an individual had. In this study, educational attainment was measured by the data reflecting whether an individual has achieved a certain level of education (e.g., high school, GED, undergraduate, graduate, etc.).

Personal beliefs: In this study, personal beliefs were defined as something that an individual personally holds to be true. A five-point Likert-type scale made up of strongly agree, agree, neither agree nor disagree, disagree and strongly disagree were used to measure respondent personal beliefs regarding HPV and its related cancers. The main

idea was to find out whether such beliefs influence the choice of seeking knowledge on HPV.

Socioeconomic status: Socioeconomic status refers to the economic status of an individual which is usually measured in three levels i.e., low income, middle income, and high income. Respondent's incomes were ranked from low income, middle income, and high income. The variable was applied to determine whether the level of income earned by an individual correlate with knowledge of HPV.

Data Analysis Plan

Data was analyzed using Statistical Package for the Social Sciences (SPSS V.25). Data was cleaned before it was analyzed. Cleaning data aids in increasing its validity (Gesicho et al., 2020). The results were presented using descriptive statistics which was displayed in the form of tables and charts. The variables that were analyzed are age, education attainment, marital status, occupation status, annual income, knowledge of HPV and source of information. Finally, logistic regression was used to estimate the odds of knowledge of HPV and its related cancers variables of interest

<div align="center">

Logistic Regression

</div>

Logistic regression was used to estimate the odds of knowledge of HPV and its related cancers variables of interest. The dependent variables knowledge of HPV and its related cancer was measured using a nominal scale. Respondent were asked the question "do you know about HPV or heard about HPV" and were expected to choose either answer Yes or No. Logistic regression does not assume homoscedasticity. Further, it

neither does require the response variables to be normally distributed, nor is it based on

linearity between the response variable and the explanatory variable (Hussain, 2008).

Assumptions

In this study, the independent variables were linearly related to the log of the odd

of the response variables. There was no existence of multicollinearity between the

independent variables. The logistic analysis required a large sample size due to the

reduced strength of the maximum likelihood estimation in determining the coefficients

when compared to ordinary least squares. Since the dependent variable was binomial, I

transformed the binary measurements of the variable from (0, 1) range to the

range$(-\infty, \infty)$. For the measurement of the dependent variable, Yes was coded 1 and No

was coded 0.

Taking the probability of success to be p and that of failure to be 1-p, hence

$\frac{p}{1-p}$ was the odds. Odds are the probability of an event occurring relative to the

probability of the event not occurring (Park, 2013). The logit of transformation is thus:

Logit ($\frac{p}{1-p}$) or logit (p) the logit of success probability (p). This implies any value

of p lying in the range (0, 1) has a corresponding value in logit (p) in the range $(-\infty, \infty)$

The logistic regression coefficients represent the increase in the response variable

in terms of its logged odds as the independent variable increases by one unit. The

exponentiated value of the regression coefficient is the Odds Ratio (OR) associated with

every increase in a single unit in the independent variable. If OR is equal to one it is an

indication that the independent variable (exposure variable) does not affect the odds of

response variable(outcome),OR greater than 1 indicates higher odds of outcome are

associated with the exposure variable and OR less than one shows that lower odds of

response variable are associated with the exposure variable (Park, 2013).

Therefore for any n binomial observations with p taking the form $p_i = \frac{y_i}{n_i}$ for i=1, 2,

3…n, the mean of Y_i is E (Y_i) =$n_i p_i$. The logistic regression for the association of p_i on

the values x_{1i} ,x_{2i},…,x_{ki} on k independent variables $x_1,x_2,…,x_k$.

$$\text{Logit } (p_i) = \log \left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots \beta_K x_{ki}$$

The equation gives the probability of success:

$$P_i = \frac{\exp\left(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots, + \beta_k x_{ki}\right)}{1 + \exp\left(\beta_0 + \beta_1 + \beta_2 + \ldots, + \beta_k\right)}$$

The logistic regression belongs to the class of generalized linear models.

Confounding Variables

The concept of confounding variables is important and fundamental in

investigating a cause-and-effect relationship. Confounding variables refer to the variables

in a model that are related to both the independent and dependent variables. The presence

of confounding variables in a model distorts the relationship between the outcome and

exposure. In this research study, the effects of confounding variables on the relationship

between the source of information on the HPV virus and the social demographic factors.

To investigate the statistical confounding effects of these two variables, two

adjusted models will be created omitting the confounding variables to access the possible

effects resulting from including the two variables. Statistically, identifying the

confounding variables is done by establishing the association between outcome and

exposure in the absence of the confounding variable. If the association differs with a

10%, it implies a possible confounding variable, otherwise confounding variable not

present.

$$\text{Logit } (p_i) = \log \left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots \beta_K x_{ki}$$

Omitting variable x_{ji}, say educational attainment

Omitting variable x_{hi}, say personal beliefs and knowledge

The odds ratio obtained from the logistic regression model is used to explain the

association between the independent variables and the dependent variables. Thus, after

controlling for the possible confounding variables, the measure of association (odds ratio)

is calculated, and the change is investigated to rule out the effects of a confounding

variable.

Logistic Regression Model Evaluation

I used several criteria for checking the efficacy and adequacy of the model in

fitting the data. Overall evaluation of the model is done using the likelihood ratio test, the

Hosmer-Lemeshow goodness of fit, and Pearson chi-square analysis. The significance of

the individual coefficient is evaluated using Wald Chi-Squared Test, likelihood ratio test,

and odds ratios. The predictive accuracy of the logistic regression model is evaluated

using Receiver Operating Characteristic curve and the classification table.

Likelihood Ratio Test

This test tests a null hypothesis versus the alternative hypothesis:

H_0:$\beta_1 = \beta_2 = \cdots = \beta_k = 0$

H_1:$\beta_1 \neq \beta_2 \neq \cdots \neq \beta_k \neq 0$

This test gauges the strength of the relation between the response variables and all the independent variables combined. A logistic model provides a good fit if there is an improvement upon being fitted using the k explanatory variables in comparison with the null model. The comparison between the -2loglikelihood null model and the -2loglikelihood of the full (given) model is done. The comparison is made by taking the difference to yield G statistic which is a χ^2 with k df.

$G = \chi^2 = $(-2loglikelihood of a null model) - (-2loglikelihood of a full model)

We reject the null hypothesis if the p-value is less than 0.05 the conventional level of significance. We then conclude that there exists an independent variable that predicts the response variable.

The likelihood ratio test can also assess the significance of coefficients by comparing the G statistic with a χ^2-distribution with one degree of freedom.

The G-statistic is calculated as follows:

$G = -2\ln\frac{L_0}{L_{:1}}$ where

L_0 is the probability when the parameter is zero.

L_1 is the probability at the MLE of the coefficient.

The Hosmer-Lemeshow Goodness of Fit

The Hosmer-Lemeshow test is employed to compare the similarity between the predicted probabilities and the observed probabilities using a predetermined subgrouping of the outcome. It is based on the Pearson chi-square test, where the predicted probabilities divide into ten groups, and the observed versus the predicted frequencies are compared in a 2x10 table.

The Hosmer- Lemeshow Goodness of Fit is defined as

$$H=\sum_{k}^{10}\frac{(OB_k-EX_k^2)}{EX_k}$$

Where OB_k is the observed events, and EX_k is the expected events follows a chi-square distribution with 8 degrees of freedom. Smaller values of H with p-values that are closer to one indicate that the data is well fitted.

Threats to Validity

There are some threats to validity that need to be addressed in this study. Threats to validity can be defined as any factors within a study that can limit the generalization of the results (Baldwin, 2018). One of the primary threats to validity in this study included that of selection bias. This study is using secondary de-identified data from the entire United States, selection bias was limited. However, it was ensured that the respondents of this study were randomly selected.

Other threats to validity can occur in the variables being studied. The choice of parameters affects the quality of research outcomes. Also, IV treatment/operationalization and administration of treatment affects validity. In this study, possible threats might occur in both independent and dependent variables. In independent variables it may happen if treatments largely vary from one event to another, lack of representatives and lack of impact. In dependent variable threat to validity may arise when measures give varying results, lack of sensitivity and representativeness and when changes happen after the measurement has been altered (Baldwin, 2018). For example, level of education measurement may improve over time.

Ethical Procedures

There are ethical procedures that need to be followed while conducting this study. Before beginning the study, I obtained permission from the Institutional Review Board (IRB; 11-17-20-0437843). It is important to note that the study does not need any permission to collect data from the NCI, simply because the data is publicly accessible. Additionally, I did not need permission from any respondents in the study, because this study is using pre-collected and de-identified data. Data obtained from the Internet to help with the research is acknowledged by me. Data was not amended or changed at any time during the study.

The data was stored using a password-protected file located inside the home office of personal computer. This ensures that the data remains protected, and the data will be deleted 7 years after the completion of the study, which is in alignment with her IRB's requirements.

Summary

In summary, in the above section two, the research design (descriptive, quantitative design and cross-sectional) has been discussed, the methodology and rationale of the study was also presented. This quantitative study will determine the effect of the socio-demographic factors of age, educational attainment, socioeconomic status, personal belief, and knowledge in relation to HPV, while considering the source where individuals obtain their information about this illness. This section has also provided an overview of the study's methodology, discussing the target population, the research design, the sampling procedures, data collection methods, and how the data will be

analyzed. The section then concluded with a discussion on the instrumentation and operationalization of constructs and how the variables will be measured, the threats of validity, and ethical procedures that I will follow. Various assumptions and procedures that govern the research methodology were also taken to consideration. The next section is that of Section three that will present the results of the study.

Section 3: Presentation of the Results and Findings

Introduction

Section 2 focused on research design and rationale, methodology, sampling and sampling procedures, data collection, and data analysis. Section 3 presents results and major findings of the study. The first component of this section describes the key sociodemographic characteristics of the respondents. The second component deals with the knowledge level of respondents on HPV. The third and fourth component provides findings from the logistic regression and chi-square test for independence, respectively.

Sociodemographic Characteristics of Respondents

Age of Respondents

The ages of respondents ranged from 18 to 95 years. This means that most of the respondents were mature enough to understand the questions posed to them and any explanation given to them. Figure 2 indicates that majority of the respondents, representing 33%, were between the 50 and 64 years. Almost one-fifth (19%) of the respondents were between the age group 35 and 49 years. Over one-third (36%) of the surveyed individuals were 65 years and above. It can also be deduced from Figure 2 that 73% of the respondents were within the age of 35 to 74 years.

Figure 2

Age Group of Respondents
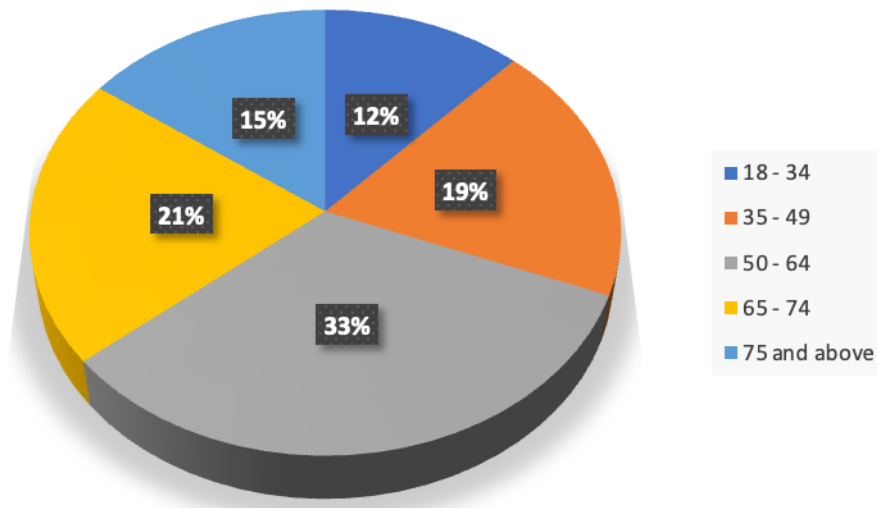
Educational Level of Respondents

The educational level of the respondents was generally quite high. Of the 3,504 respondents who participated in the survey, only 51 (1.5%) did not comment on their level of education. This indicates that the response rate for this question was very high, with a percentage of 98.5. A minority of the people surveyed (7.8%) had less than the high school level of education. Almost one-fifth (18%) of the respondents were high school graduates. About 30% of the respondents had some form of college diploma. Slightly more than one-quarter (26%) of the respondents had bachelor's degree. Some of the people surveyed had some form of postbaccalaureate degree (17.1%).

Table 1

Level of Education of Respondents

Educational background	Frequency	Percent
Less than High School	275	7.8
High School Graduate	631	18
Some College	1,039	29.7
Bachelor's Degree	910	26
Post-Baccalaureate Degree	598	17.1
Missing Data	51	1.5
Total	3,504	100

In the case of the missing data, many of the numbers and variables missing did not affect the end results of the study because they were not considered significant to the total number. Compared to the available data, this missing data only comprised approximately 0.01% of the outcome and hence did not affect the general results especially because the numbers compounded to the original total of 3,504 people. This was arrived at by estimating the missing number from the available number which makes the results accurate.

From Figure 3, most of the respondents were married (48%), while 18% were single and had never married. Minorities of the surveyed individuals had either separated (2%) or were living as married couple (3%). Seventeen percent (17%) of the people who were surveyed were divorced, while 12% were widowed.

Figure 3

Marital Status of Resondents
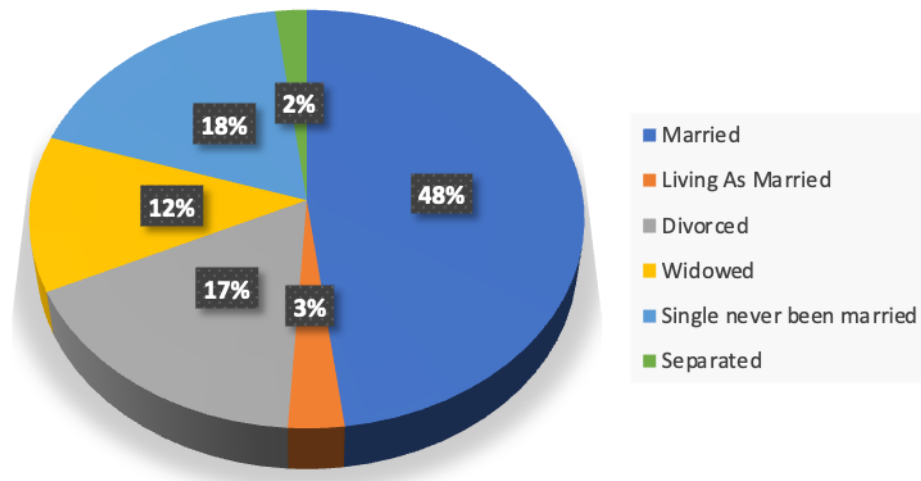
Primary Occupation of Respondents

The results from Table 2 show that of the 3,504 who participated in the survey, 1,696 individuals representing 48.3% were employed, while 115 individuals (accounting for 3.3%) were unemployed. A substantial percentage (31.8%) of the respondents were retired. The percentage of respondents who were homemakers, students, and disabled accounted for 4.6, 1.6 and 6.6%, respectively.

Table 2

Occupation of Respondents

Occupation	Frequency	Percent
Employed	1,696	48.3
Unemployed	115	3.3
Homemaker	161	4.6
Student	55	1.6
Retired	1,113	31.8
Disabled	233	6.6
Others	22	0.6
Missing Data	109	3.1
Total	3,504	100

Figure 4

Annual Income of Respondents
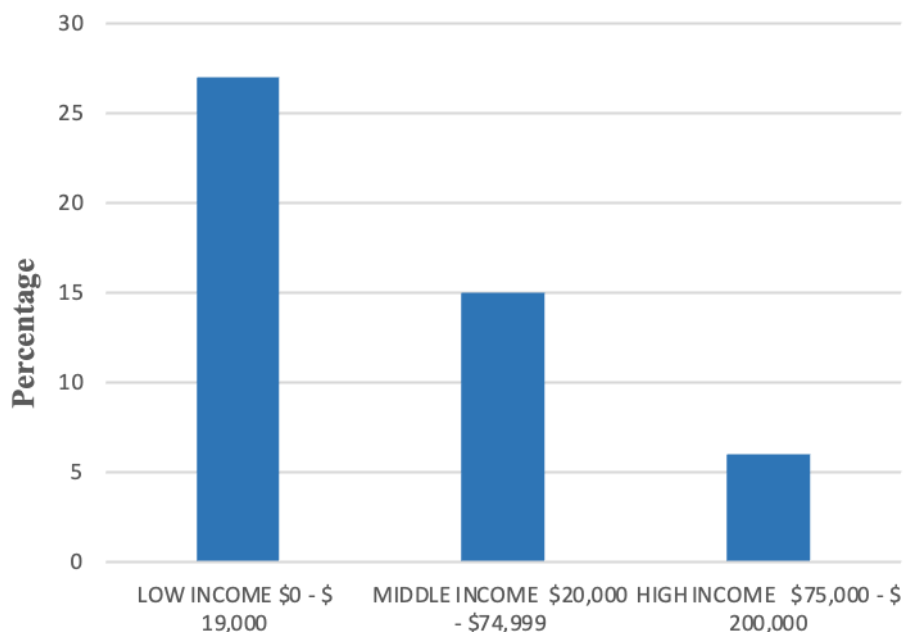
Figure 4 shows the annual income of the respondent. The results illustrate that about 15% of respondents fell within the middle-income status. It was also revealed that about 8% of the respondents were in the high-income level. Twenty-seven percent of the respondent were found in the lower-income bracket. In general, it would be said that most of the respondents have low-income status, and this may influence their ability to get HPV screening or have education on HPV. According to Grandahl et al. (2017), lower socioeconomic status delays people's ability to respond to HPV vaccine uptake to prevent HPV and its related cancer.

Figure 5

Respondent's Knowledge and Source of Knowledge on HPV

Respondent knowledge on HPV was measured using a nominal scale where "YES" was used to represent knowledge of HPV and "NO" was used to not having knowledge of HPV. Results from the data analysis indicate that majority of the respondent are aware of HPV and its related cancers accounting for about 58.5% of the total sample and 40.1% of the sample population is not aware of HPV. A greater percentage of the respondents being aware of HPV will help them to provide enough information and also pay attention to answering the questions posed to them.

Knowledge of HPV
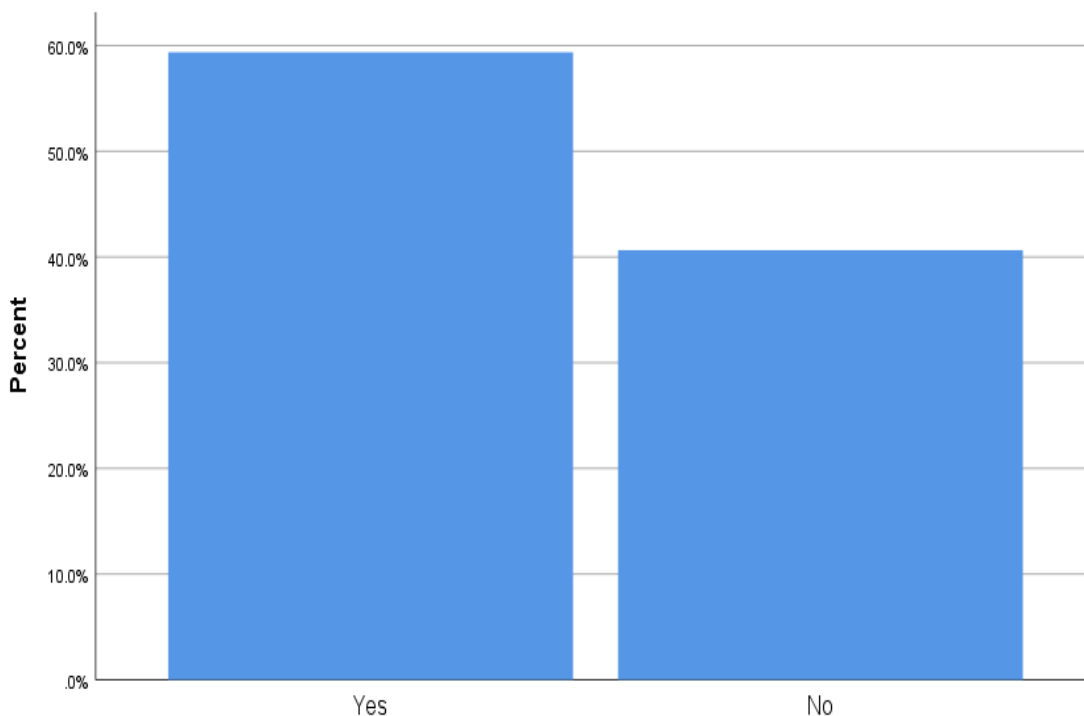
Table 3

Source of Information about HPV

Source	Frequency	Percent
Books, Brochures and Pamphlets	425	12.12
Family/Friend/Co-worker	89	2.54
Doctor/Health Care Provider	640	18.26
Cancer Organization	11	0.31
Internet	2,164	61.75
Library/Magazines/Newspapers	33	0.94
Telephone Information	20	0.57
Missing data	122	3.52
Total	3,504	100

As outlined in Table 3, of the 3,504 people who participated in the survey, Approximately, half of the respondents representing 62% indicated that internet was their source of information on HPV. Additionally, 18% of the respondent also had their information on HPV from doctor/health care provider. Furthermore, 12% of the respondent gain information on HPV through books/brochures/pamphlets. However, 4% of the respondents did not indicate their source of information on HPV. Respondent refusal to indicate their source of information on HPV maybe attributed to privacy.

Logistic Regression

In research projects, model building involves fitting statistical and data analysis models to express the relationship between the variables in the data. In this case, a binary

logistic regression model was fitted to model the knowledge of HPV depending on age, educational level, socioeconomic factors, personal belief about HPV and the related concepts. The dependent variable in this research project was a categorical variable with the categories and thus a logistic regression model was the most appropriate (see Allison, 2012).

Source of Information

I conducted logistic regression analysis to investigate the relationship between knowledge of HPV and related cancers and the source of information of respondents. It was found that books, brochures and pamphlets, family/friend/coworker, healthcare providers, and internet were significant and a positive predictors respectfully; Books, Brochures and Pamphlets $OR = 2.312$, 95% CI [1.56 – 3.87], $p < .005$; Family/Friend/Coworker, $OR = 2.432$, 95% CI [1.34 – 3.65], $p < .007$; Health Care Provider, $OR = 3.631$, 95% CI [1.72 – 6.83], $p < .003$; Internet, $OR = 4.345$, 95% CI [1.54 – 8.62], $p < .001$. The estimated OR for books, brochures and pamphlets was 2.312, 95% CI [1.56 – 3.87] as shown in Table 4.

Table 4

Source of Information

Predictors	B	S.E.	Wald	Sig.	Odds Ratio	95% C.I. for Odds Ratio
Constant	-4.310	2.012	2.345	.064	.003	
Books, brochures & pamphlets	.654	.231	6.23	.005	2.312	1.56 - 3.87*
Family/friend/coworker	2.478	1.425	3.54	.007	2.432	1.34 - 3.65*
Health care provider	2.764	1.325	4.68	.003	3.631	1.72 -6.83*
Cancer organization	1.320	1.012	2.01	.076	1.031	.10- 1.25
Internet	3.721	1.896	8.65	.001	4.345	1.54- 8.62*
(Scale/reference)					0	

n= 3,*504, p>* 0.05, CI= Confidence Interval, * = statistically significant

Personal Beliefs

Logistic regression analysis was conducted to investigate the relationship between knowledge of HPV and related cancers and personal beliefs of respondents. It was found that trust in HPV vaccination, health concern, and risk factors were significant and positive predictors respectfully; Trust in HPV vaccination, B = (2.681), *SE* = 1.432, Wald = 3.51, *p* <.004; Health Concern, B= (3.412), *SE*= 1.821, Wald = 4.78, *p* < .006; Risk Factors, B= (2.631), *SE* = 1.542, Wald = 4.78, *p* < .006. The estimated odd ratio for risk factors was 2.791, 95% CI [1.85 – 4.12] as shown in Table 5.

Table 5

Personal Beliefs

Predictors	B	*SE*	Wald	Sig.	*OR*	95% C.I. for Odds Ratio
Constant	-2.348	1.453	1.02	.016	.027	
HPV prevention	.625	.65	1.78	.058	2.031	.012- 1.31
Trust in HPV vaccination	2.681	1.432	3.51	.004	2.781	1.32 – 4.58*
Health concern	3.412	1.821	4.78	.006	3.214	1.75 - 4.21*
Risk factors	2.631	1.542	2.65	.003	2.791	1.85 - 4.12*

Note n= 3,504. P> 0.05, CI= Confidence Interval, * = statistically significant

Education Attainment

Logistic regression analysis was conducted to investigate the relationship between knowledge of HPV and related cancers and education attainment of respondents. It was found that some college and bachelor's degree were significant and positive predictors respectfully; Some College, B = (3.985), *SE* = 1.785, Wald = 4.78, p <.008; Bachelor's degree, B= (3.853), *SE*= 1.321, Wald = 2.13, p < .006. The estimated odd ratio for some college was 3.21, 95% CI (1.45 – 5.76) as shown in Table 6.

Table 6

Education Attainment

Predictors	B	*SE*	Wald	Sig.	*OR*	95% C.I. for Odds Ratio
Constant	-3.421	2.146	2.216	.085	.007	
Less than high school	.561	.345	2.03	.076	1.14	.002- 1.45
High school graduate	1.765	1.312	2.52	.085	1.76	1.45 – 1.62
Some college	3.985	1.785	4.78	.008	3.21	1.45 – 5.76*
Bachelor's degree	3.853	1.321	2.13	.006	1.79	2.79 – 6.34*
Postbaccalaureate degree	1.231	.651	2.48	.094	1.52	.004 – 1.36

n= 3,504. *p*> 0.05, CI= Confidence Interval, * = statistically significant

Socioeconomic Status

Logistic regression analysis was conducted to investigate the relationship between knowledge of HPV and related cancers and socio-economic status of respondents. It was found that employed, unemployed, homemaker and retired were significant and positive predictors respectfully; Employed B = (3.951), *SE* = 1.682, Wald = 4.52, *p* <.001; Unemployed, B= (3.241), *SE*= 1.52, Wald = 3.21, *p* < .004; Homemaker, B = (3.721), *SE* = 1.64, Wald = 3.21, *p* < .007; Retired, B = (3.685), *SE* = 1.982, Wald = 4.631, *p* < .005. The estimated *OR* for some employed was 3.12, 95% CI (1.79 – 5.86) as shown in Table 7.

Table 7

Socioeconomic Status

Predictors	B	*SE*	Wald	Sig.	*OR*	95% C.I. for Odds Ratio
Constant	-4.451	2.781	3.621	.002	2.89	
Employed	3.951	1.682	4.52	.001	3.12	1.79 – 5.86*
Unemployed	3.241	1.52	3.21	.004	3.01	1.42 – 4.63*
Homemaker	3.721	1.64	4.51	.007	3.45	1.32 – 4.08*
Student	2.481	1.03	1.78	.094	1.21	.031 – 1.14
Retired	3.685	1.982	4.631	.005	3.20	1.65 - 6.82*

n= 3,504. P> 0.05, CI= Confidence Interval, * = statistically significant

Table 8

Descriptive Statistics for the Logistic Regression Model

	Model Summary		
Step	-2 Log likelihood	Cox & Snell r^2	Nagelkerke r^2
1	81.96	.375	.604

The table above represents the model summary of a logistic regression fitted with all the explanatory variables. The model was statistically significant with a corresponding r^2 score of 0.604. This indicates that the model was able to account for about 60.4% of the variance occurring in the HPV awareness as explained by the explanatory variables. All the variables were statistically significant.

Table 9

Model Significance

Hosmer-Lemeshow Test			
Step	Chi-Square	*Df*	Sig.
1	17.865	8	.022

The Hosmer-Lemeshow test presented in Table 9 gives the statistical accuracy of the model. The chi-square significant level of 0.022 was observed. Indicating the model was statistically significant. The validity of the model can also be accessed using the coefficients of the explanatory variables. This coefficient gives the effects variable has on the entire model. In other words, they represent the expected change to the dependent variable when the explanatory variable is changing with one unit.

Binary logistic regression was used to determine the best predictors of respondent knowledge of HPV and related cancers. The independent variable (knowledge of HPV and its related cancers) had a dichotomous response. The dummy variable was coded as 0 = No and 1 = Yes. The odds of an event occurring is the probability that the event will occur divided by the probability that the event will not occur (Acquah, 2013). Following Greene (2008), the probability y = 1 occurring varies according to the values of the explanatory variables.

Table 10

Binary Logistic Regression

<table>
<thead>
<tr><th colspan="4">Model Summary</th></tr>
<tr><th>Step 1</th><th>-2 Log likehood</th><th>Cox & Snell R
Square</th><th>Nagekerke R
Square</th></tr>
</thead>
<tbody>
<tr><td>1</td><td>81.96</td><td>0.375</td><td>0.604</td></tr>
</tbody>
</table>

Table 11

Binary Logistic Regression Continuation

Predictors	B	S.E.	Wald	Sig.	Odds Ratio	95% C.I. for Odds Ratio
Constant	-5.542	3.313	2.798	.094	.004	
Age	.787	.294	7.16	.007	2.196	1.23- 3.91*
Educational Attainment	3.994	1.860	4.61	.032	.018	.00 - .17
Socio-Economic Status	3.995	1.636	5.96	.015	54.30	2.20-134.5*
Personal Beliefs	2.899	1.327	2.06	.047	1.38	.10- 18.66
Source of Information	1.176	.423	7.73	.005	3.242	1.42- 7.43*

n= 3,504. P> 0.05, CI= Confidence Interval, * = statistically significant

A logistic regression analysis was conducted to investigate the relation between knowledge of HPV and related cancers and demographic characteristics (age, personal belief, educational attainment, socio-economic status, source of information) of respondents. The predictor variables were tested to verify if there were no violation of the linearity of the logit.

Age, in the logistic regression analysis was found to contribute to the model. It was found to be significant and a positive predictor; B = (.787), SE = .294, Wald = 7.16,

$p < .007$. The estimated odd ratio was 2.196, 95% CI (1.23 – 3.91) for every one unit increase of age. This implies respondents are more likely to have knowledge of HPV and related cancers as their age increases. However, this result goes contrary to Burger et al., (2017) who found that HPV can occur at any age at one's life.

Educational attainment was also found to be significant and a positive predictor; B = (3.944), SE = 1.860, Wald = 4.61, $p < .032$. The estimated odd ratio was .018, 95% CI (.00 - .17) for every one unit increase of educational attainment. This implies that respondents are more likely to have less knowledge of HPV and related cancers as their educational level goes up. The inverse association of education attainment and knowledge of HPV and related cancer could be attributed to respondent ignorant about HPV, although they have attained college education. However, this result contradicts a study done by Thompson et al. (2020) who found that over 70% of their respondents were highly educated and have knowledge of HPV and related cancers.

Socio-economic status was found to be significant and a positive predictor; B = (3.995), SE = 1.636, Wald = 5.96, $p < .015$. The estimated odd ratio was 54.30, 95% CI (2.20 -134.5) for every one unit increase of socio-economic status. The respondents are more likely to have knowledge of HPV and related cancers when they have better socio-economic status.

Personal belief was found to be significant and a positive predictor; B = (2.899), SE = 1.327, Wald = 2.06, $p < .047$. The estimated odd ratio was 1.38, 95% CI (.10 – 18.66) for every one unit increase of personal belief. This implies that respondents' personal belief is more likely to influence their knowledge of HPV and related cancers.

Hodge et al (2014) found that culture belief hinders the spread of the HPV and related cancer in Africa, Middle East, and Asia.

Source of information was also found to be significant and a positive predictor; B = 1.176, SE = .423, Wald = 7.73, $p < .005$. The estimated odd ratio was 3.242, 95% CI (1.42 – 7.43) for every one unit increase of source of information. This implies that access to HPV information improves respondents' knowledge of HPV and related cancers. Also, this indicates that respondents are more likely to be informed about HPV and related cancers when they have source of information through the media. This result goes to support a study conducted by Hodge et al. (2014) that television-based sensitization, learning institutions, and the internet were identified as the most preferred sources of information on HPV and its related cancer.

Generally, it can be said that the predictor variables have a positive and significant relationship with respondents' knowledge of HPV and related cancers. Education on these variables will help respondents to be more informed about HPV and related cancers.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

Section 3 presented the results and major findings of this study which include the socio-demographic characteristics of the respondents, the regression model, and the interpretation of the results. This quantitative cross-sectional study was designed to determine the factors that predict the likelihood of having knowledge of HPV and related cancers and use of data from the NINTS 2018 Survey in United States. In this study, age, educational attainment, socioeconomic status, and source of information were used as the independent variables.

Interpretation of Findings

In this section I discuss the results of the study in relation to literature review on knowledge of HPV and related cancers in the United States. The data from the survey was obtained from a sample of the U.S. population, and thus the analysis results depict the analogy of HPV awareness in the United States. Results from the data analysis indicate that majority (58.5%) of the U.S. population is not aware of the HPV and related cancers. This number triggers the assumption that the community is not yet aware of HPV and this call for HPV awareness from the health ministries and the government. Controlling and combating the HPV begins with the public awareness of the infection, how it manifests, treatment if there is and the control measures. These measures cannot be achieved if respondents are not aware of HPV.

The study showed that access to HPV information improves respondents' knowledge of HPV and related cancers. Sources of information about health exist in

several forms, and medium, among these forms are, the internet, hospitals/clinics, library, and magazines. Studies have shown that television-based sensitization, learning institutions, and the internet were identified as the most preferred sources of information on HPV and its related cancer (Hodge et al., 2014). Since the internet and healthcare facility is the major source of information concerning health, the United States should mainly focus on these two areas

According to Thomas (2019), communication channels are crucial factors in all phases in health care operations. Whether it is a clinical accurately communicating patient's data with another facility, or a group of doctors, nurses, specialist, patients, and public members at large discussing how to self-diagnose various kinds of diseases and their possible treatment. Societies with powerful communication strategies can augment their patient's health, while those that do not have effective protocols in place can negatively impact patients' well-being. The government, health organizations, health care professionals, and health providing institutions need to recognize the significance of information transmission in the health sector (Yoshida , 2016).

When contemplating the extent of information in health care, patient immunity is one of the prime justifications to formulate a practical communication configuration in anybody concerned with public health. The government should invest more on the internet through the ministry of information and technology to disseminate HPV and related cancers and even about other diseases that endanger human existence.

Online health information can increase patients' proficiency of competence with, and engagement in health decision-making strategies (Sun et al., 2022). With detailed

online publications, patients now find answers for additional or forgotten questions, as well as the opportunity to explore sensitive or embarrassing questions in the convenience and privacy of their own homes (Diette & Rand, 2007). Similarly, through emerging time-constrained websites including blogs, patients can share their health and illness familiarities; they can offer outstanding insights and deliberations from the lived experiences of their distinct health aliments anytime from anywhere. This type of information might help patients become informed about their illness and reduce feelings of loneliness and solitude. This becomes especially advantageous for those patients who are immobile and homebound because of debilitating illness.

Health communication is a remarkable niche in healthcare which allows experts to use communication system to orient and influence the public's judgments to upgrade health (Walter et al., 2017). Effective health communication needs to be tailored for the audience and situation. Research into health communication strives to refine communication policies to teach people how to improve health or health communication to avoid specific health risks. Academically, health communication is a discipline profession within communication studies.

Limitations

The limitations in this study include nature of study design as cross-sectional study since it can establish response, selection biases, and recall. End results were based on a self-reported aim to commence and complete knowledge on HPV and related cancers. The sample size I used limited the population of the study findings to only study participants. Also, the research suffered some weaknesses in the dataset being analyzed,

such as effective education on HPV to help eliminate the misconception of the disease (see Stagger et al., 2012) and economic factors were likely to have influenced the validity and reliability. The study involved structured questionnaires with closed ended questions concerning knowledge of HPV, which caused respondents to have limited options of responses based on the selection made by the questionnaire developers. There were numbers missing that should have been used in the study in certain areas as reflected in the tables labeled level of education of the respondents and occupation of respondents. This missing information, however insignificant to the results of the study, would have instilled more confidence in the result had it been available for study. In measuring respondent knowledge about HPV, the emphasis was placed on whether respondents have heard anything about HPV or not. Details or the content of HPV and its related cancers were not considered as far as respondent knowledge was concerned.

Implications for Professional Practice and Social Change

During the study, data of the impact of knowledge of HPV-related cancer and barriers to information were analyzed. The findings of the study can inform the development of future interventions in encouraging/educating individuals on knowledge of HPV.

Professional Practice

The findings from this research can support stakeholders/healthcare providers in developing intervention programs that address specific needs in the provision and dissemination of HPV and HPV vaccination information. This medium may ensure better targeting of interventions and provide a solution where everyone benefits for all parties

involved, based on evidence. The research community and various stakeholders in public health would also be able to use the findings to ensure their interventions are sensitive to the needs of their targeted population and even improve vaccine uptake. In a similar study, Townsend et al. (2018) suggested the following to the government and other concerned health associations:

- Strengthen audience knowledge and awareness of a health issue about HPV and other related infections like cervical cancer.

- Impact attitudes and behaviors towards a health through publications on different communications platforms.

- Exemplify healthy portfolios.

- Demonstrate the advantages of behavior changes to public health results.

- Advocate a position on a health issue and policy.

- Improve demand or support for health services.

- Dispute against misunderstandings about health.

Another increasingly significant application of health communication has been in reaching students in the college community. The National College Health Assessment (year) has computed that 92.5% of college students reported being in "good, very good, or excellent health", nevertheless college students seem to battle more serious health problems like cancer-related diseases in comparison to other age groups and audiences. Professionals in health communication are energetically striving for new ways to reach this at-risk audience to extend public health standards in the college setting and encourage a healthier lifestyle (Ware & Davis, 1983). Health communication campaigns

are arguably the most used and helpful strategy for communicating public health information, especially in endorsing disease prevention (e.g., cancer, HIV/AIDS).

Positive Social Change

The knowledge of HPV vaccine is still one of the primary reasons for the gap in understanding HPV because most of the vaccines rolled out in different countries offer inadequate information to the targeted group, which is below the expectations (Vermandere et al., 2014). Most of these adverts about HPV are not always available on influential communication platforms such as internet and magazines, hence performing their intended purpose poorly. There is a need for experimenters to explore the efficiency of the available communication channels and develop one that will have greater coverage of the intended audience after doing a comprehensive data analysis.

Anderson et al. (2010) found that there is stigma correlated with exploring behavior in youths as copulation is heeded as a taboo in some communities. The youth fear that they will be perceived as immoral if they engage their parents with such topics, which can arouse antagonistic consequences. Future scholars should look for good communication platforms that will bridge this gap and stimulate the free flow of information about HPV and related cancers.

<div align="center">

Conclusion

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Based on the findings, this study concluded that the internet is one of the media that can be used to disseminate information on HPV and related cancers to the respondents. Although majority of the respondents were educated or have had college education, there was an inverse association of HPV and related cancer and educational

attainment, that is as respondents' level of education goes up their knowledge of HPV decreases. This result was attributed to the respondents ignorant about HPV although they have attained a reasonable level of education. Personal belief was also found to influence respondents' knowledge of HPV and related cancers. For instant, Hodge et al. (2014) found that culture belief hinders the spread of the HPV and related cancer in Africa, Middle East, and Asia.

Recommendations for Social Change

This study suggested that education on the predictor variables will help respondents and society at large to be more informed about HPV and related cancers. Additionally, the education on explanatory variables will bring about positive change such as applying ideas, action to promote worth and development of individuals. Successful implementation of educational programs that will contribute to social change and affect the lives of respondents in the community is highly needed. This will also improve their morale and provide an opportunity for them to contribute to the community development.

Furthermore, the use of television platforms, learning institutions, and the internet can be a good medium to disseminate HPV and related cancers information to the general public. These platforms provide first-hand information to the populace on the need to be aware of HPV. Moreover, the internet can share information from health care providers to a larger audience. With the current modern technology usage, social media platforms such as Facebook, Twitter, and YouTube can connect an audience with other members on the platforms to share ideas by posting and commenting about HPV.

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