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MATERNAL ATTITUDES AND FACTORS ASSOCIATED WITH THE HUMAN PAPILLOMAVIRUS (HPV) VACCINATION UPTAKE AMONG DAUGHTERS

by

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DECLARATION

University of the Witwatersrand, Johannesburg

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I, Lounette Graaff (Student number: 715589), declare that this Dissertation is my own, unaided work. It is being submitted for the Degree of MA Social and Psychological Research at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

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ABSTRACT

Introduction: The Human Papillomavirus (HPV) has been identified as the most prevalent causative agent of cervical cancer, especially among young, sexually active women. Regardless of the availability of the HPV vaccine, vaccine uptake among adolescents in South Africa and globally remain poor. Parental hesitancy has been cited as a major contributing factor towards the low vaccine uptake. Vaccine hesitancy among mothers of adolescent girls and policies to address this issue remains understudied in South Africa. Therefore, this study aimed to address a) the maternal socioeconomic and demographic factors; and b) maternal attitudes and beliefs that played a role in vaccine hesitancy among mothers of adolescent daughters (aged 10–19).

Methods: Data were gathered through an online survey. A link to the survey was posted on various social media platforms and advertised through the distribution of flyers in a suburb outside a big metropolitan area. The survey consisted of maternal socioeconomic-demographic questions; a general HPV knowledge scale; and the HPV Attitudes and Beliefs Scale (HABS). Data were analysed through descriptive statistics, Pearson's chi-square, and Binary Logistic Regression.

Results: Majority of mothers (n=198) were White, middle-aged, highly educated and came from high-middle income families. Vaccine uptake among girls was poor (32.2%). Daughters of mothers who were ever married were less likely to be vaccinated than those with mothers that were never married. Mothers from Catholic or Non-religious affiliations were more likely to vaccinate their daughters than Christian counterparts. Additionally, mothers who shared an income with their spouse were 76% less likely to have vaccinated their daughter. Overall level of knowledge of HPV among mothers was moderate to high. From the final regression, influence was the only predictor of vaccine uptake.

Conclusion: Maternal age, race, and other socio-economic factors did not play a significant role in adolescent vaccine uptake. The strongest predictor for vaccine uptake in this study were influence among friends, family, and healthcare providers, as well as whether the mother perceived the vaccine to be easily accessible. Further recommendation was made to include a mixed method study, initiatives that target parental consent and communication, programs that include healthcare provider influence, the effect of paternal influence and male responsibility, and addressing the source and messaging of the vaccine to address parental hesitancy.

Keywords: adolescent daughters, cervical cancer, Human Papillomavirus (HPV), maternal attitudes, vaccine hesitancy, vaccine uptake

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CHAPTER 1
INTRODUCTION

Over 275,000 women lose their lives to cervical cancer each year with more than 500,000 new diagnoses being reported annually on a global scale (Hopkins & Wood, 2013). Cervical cancer is the fourth most common cancer and the second biggest cause of cancer-related mortality in women worldwide (Angioli et al., 2016). In sub-Saharan Africa, cervical cancer is the second most common cancer among women between the ages of 15 and 44 and is the primary cause of female cancer-related deaths (Black & Richmond, 2018). In South Africa 12,983 women are annually diagnosed with cervical cancer (Bruni et al., 2018). The damaging effect thereof is seen widely across African countries due to the lack of accessible preventative cytological screening (Pap smears) and early detection, as well as the pervasiveness of associated risk factors for the disease (Cunningham, Davidson, & Aronson, 2013).

The Human Papillomavirus (HPV) is a double-stranded, nonenveloped DNA virus (Haupt & Sings, 2011) which belongs to the *papillomaviridae* family (Chaturvedi, 2010) and has been identified as the most prevalent causative agent of cervical cancer, especially among young, sexually active women (Angioli et al., 2016). The genetic makeup of the virus is circular in structure, approximately eight kilobytes in length, and is known to replicate itself within the nucleus of the host cell (Ryndock & Meyers, 2014). This DNA virus infects the mucosal or cutaneous cell tissues and can either cause benign neoplasms or cysts such as warts, or malignant tumours that are cancerous (Ryndock & Meyers, 2014). Over 190 different HPV strains exist, and the majority of infections do not require any treatment (Tathiah, Naidoo, & Moodley, 2015).

However, some strains of the virus have been found to infect the anogenital (cervix, vulva, vagina, penis, anus, rectum) and oropharyngeal tracts of men and women, and the high-risk subgroup of the virus is known to be carcinogenic (Hopkins & Wood, 2013). In addition, HPV has also been linked to non-melanoma skin cancers and other human cancers, making the infection a major cause of human carcinogenesis (Agorastos et al., 2015). Reportedly, 70–80% of all HPV-related cancers are found in the cervix and are solely caused by high-risk strains – HPV 16 and 18 (Angioli et al., 2016; Bruni et al., 2018; Haupt & Sings, 2011). These high-risk strains have been identified in 99.7% of cervical cancer laboratory cultures worldwide (Haupt

& Sings, 2011). Incidence rates of cervical cancer due to HPV are far greater than the prevalence of HPV noncervical cancers and may attributable to the unique carcinogenic susceptibility of the cervix compared to other anatomical parts (Chaturvedi, 2010). In addition, other strains of the virus, such as HPV types 6 and 11, cause "recurrent juvenile respiratory papillomatosis and genital warts" (Bruni et al., 2018, p. 31). Recurrent respiratory papillomatosis is often noted in children where vertical transmission occurs between mother and infant (Chaturvedi, 2011).

Cervical cancer is preventable through early detection and intervention. Treatment options are available. However, the management of cervical carcinomas and lesions are costly. Prevention remains the most viable option to protect women from cervical cancer mortality. Research suggests that immunisation programs are the most prominent and highly effective preventative strategies against the spread of infectious diseases (McKeever, Bloch, & Marrel, 2015). Vaccinations against HPV are considered a highly effective strategy in lowering the rates of cervical cancer mortality (Kahn, Zimet, Rosenthal, & Widdice, 2015). Hopkins and Wood (2013) suggest that a thorough HPV vaccination program could reduce deaths due to cervical cancer in women by up to 76% if efficacy and coverage is assumed to be close to 100%. Should coverage only reach 70%, this type of program will be able to prevent the deaths of three million women in the next 10 years if vaccination occurs in adolescents.

Clinical, biological, and epidemiological research provides significant evidence of the causal relationship between HPV and cervical cancer among sexually active women (Denny & Kuhn, 2017). Poor HPV vaccine uptake is not only limited to the South African context but continues to be a global health issue. Currently, two prophylactic vaccines are commercially available which target the high-risk HPV strains (Haupt & Sings, 2011). The vaccines were first introduced and licensed across many overseas countries in 2006 (Denny & Kuhn, 2017). The immune responses of Gardasil® (quadrivalent) and Cervarix® (bivalent) are reported to be the most effective when administered before an individual's sexual debut (Hoque, 2016). Subsequently, most health organisations recommend that the vaccine is administered to girls between the ages of 11 and 12 years, with a booster vaccine from age 13 to 18 (Ganczak, Owsianka, & Korzeń, 2018). The vaccination of this age group is supported by "high levels of immunological antibody response, the stabilization of titres at levels above those found in natural infection 3 years after immunization, the risk of acquiring HPV shortly after sexual initiation, and the success of age-based versus risk-based strategies" (Rosenthal et al., 2008, p. 240). Currently, Gardasil® and Cervarix® are registered vaccines in South Africa and have

been available within the private sector since 2008 (Ngcobo, Burnett, Cooper, & Wiysonge, 2019). According to the Public Health Association of South Africa (PHASA), the cost of a single dose of both the bivalent and quadrivalent vaccines in the private sector is around R650.

The safety and effectiveness of the two HPV vaccines (Gardasil and Cervarix) have been tested through rigorous medical trials to ensure that the protection against the virus persists for approximately nine years. Moreover, vaccinations during early childhood and infancy have shown multiple successful immunisation efforts worldwide. However, successful vaccine uptake among adolescents (aged 10–19) has remained poorly understood and has been identified as an important global health issue (Nanni, Meredith, Gati, Holm, Harmon, & Ginsberg, 2017). In April 2014, the South African Department of Health launched a national HPV vaccine campaign across four provinces (KwaZulu-Natal, North-West, Mpumalanga and Gauteng) within the public-school systems (Delany-Moretlwe et al., 2018). A bivalent vaccine against HPV 16 and 18 was introduced to grade four girl learners (≥ 9 years old) at no cost on a two-dose schedule with a six-month interim between doses. Delany-Moretlwe et al. (2018) reported that, of the estimated 353,000 girls that were vaccinated, 10 cases of mild to minor side effects were reported such as abdominal pain, nausea, fever, rash, and dizziness.

Despite the continued success rate and safety of administering the HPV vaccine within the private sector, uptake rates remain poor among most developing countries (Ngcobo et al., 2019). According to Ngcobo et al. (2019), the data from the South African vaccine campaign showed a decrease in the uptake among learners between the first dose and the second dose which decreased by 21.4% in 2014 and 26% in 2016. Poor HPV vaccine uptake has been associated with multiple factors, including but not limited to cost, availability, healthcare accessibility, vaccination opportunities, knowledge and awareness of HPV and the vaccine, and adolescent health priority (Ngcobo et al., 2019; Tathiah et al., 2015). Moreover, parental attitudes and hesitancy toward vaccine uptake may be an important factor towards understanding and addressing the lack of uptake which is a major public health concern. Therefore, this study aimed to investigate the maternal attitudes, as well as the associated factors related to the HPV vaccine uptake in South Africa.

1.1 Problem statement

In South Africa, over 7,700 women are diagnosed with cervical cancer on an annual basis and over 4,000 women lose their lives to HPV-related cervical cancer each year (Tathiah et al., 2015). Yet, there remains a persistent low rate of HPV vaccine uptake among the

recommended age group (adolescents) which is cause for concern given the public health problem it presents. Previous research has estimated that, with a 70% coverage rate, girls between the ages of 9 and 12 years will have a 43% reduced risk of developing cervical cancer in their lifetime if vaccinated against high-risk HPV (Moodley, Tathiah, Mubaiwa, & Denny, 2013). In South Africa, there was a limited uptake of the HPV vaccine between 2009 and 2014, especially within the private sector. Tathiah et al. (2015) report that only an estimated 50,000 individuals may have been vaccinated during this time.

The successful implementation of adolescent immunisation programmes has also proven to be challenging for most other countries around the world. Vaccine hesitancy and parental attitudes have been cited as some of the determinant factors for low vaccine uptake among adolescents. Research suggests that mothers are often considered as the "gatekeepers" or decision-makers with regards to vaccinating their children (Gross, Laz, Rahman, & Berenson, 2015). A study by Katz et al. (2013) found that the health care choices for adolescents living in a township in Johannesburg (South Africa) were made by mothers and grandmothers, with little to no involvement of a paternal figure. Therefore, understanding a mother's vaccine hesitancy is crucial for any nationwide immunisation program to be successful (Gilkey et al., 2014).

Because the current vaccines are not effective in women who have already been infected with HPV (Mbulawa et al., 2018), continuous cytological screening and early vaccination remains a major health priority among the government, policy makers and healthcare professionals. This study will contribute to the growing area of research pertaining to the association between maternal attitudes and socioeconomic and demographic factors with regards to the HPV vaccine uptake among adolescent daughters, which remains understudied in the private health sector of South Africa.

1.2 Rationale

The prevalence rate of female cervical cancer mortality in sub-Saharan Africa and southern Africa continues to be among the highest in the world, notwithstanding its preventability (Delany-Moretlwe et al., 2018). It is important to take into consideration parental attitudes and the factors associated with vaccine hesitancy as the recommended age for the HPV vaccine involves adolescents. One-quarter of the world's population comprises adolescents and the majority of adolescents live in low and middle-income countries (LMICs) such as those in southern Africa (Michelow & Firnhaber, 2016). Since the introduction and

licensing of the HPV vaccines in the US and other first world countries in 2006, Gardasil and Cervarix have been proven to be safe and highly immunogenic in adolescents and has provided strong direct and indirect protection against HPV (Gallagher, LaMontagne, & Watson-Jones, 2018). Yet the vaccine uptake among adolescents remains poor.

Before the vaccines were introduced in South Africa in 2009, Harries et al. (2009) suggested that the vaccine uptake in the country would depend on socio-economic and cultural truths, as well as the proposed vaccine agenda, local knowledge and attitudes towards the vaccine. Research has found that vaccine hesitancy among parental decision-makers is affected by multiple factors; however, it is unclear whether these findings can be generalised in the South African context as research remains limited (Ngcobo et al., 2019). In a comparative study by Francis and Katz (2012) with a sample of participants from a township in Johannesburg (South Africa) and rural Ohio Appalachia, it was found that, despite the differences in geographical location, race, ethnicity and culture, mothers shared many of the same concerns regarding the welfare of their daughters associated with HPV vaccination and cervical cancer prevention. In this study, both sample groups believed that the HPV vaccine should be provided by the government. The sample groups were predominantly receptive towards the HPV vaccine but were concerned about its safety and the early onset of sexual debut regarding their daughters. Both sample groups also believed that they needed more information on HPV and the vaccine in order to make an informed decision. Additionally, mothers were concerned about their daughters' vulnerability towards contracting HPV due to sexual assault/abuse, as gender-based violence remains prevalent especially in LMICs such as South Africa.

Maternal attitudes and factors associated with the HPV vaccine uptake among adolescents have been studied vastly on a global scale. However, vaccine hesitancy among mothers of adolescent girls and policies to address this issue remain understudied in South Africa (Ngcobo et al., 2019). Whilst studies in SA have focused on national immunisation efforts within the public-school system, minimal research has been done in the context of the private health sector where the vaccines are available and accessible through healthcare providers. Tathiah et al. (2015) recommend that the private health sector should aim to increase awareness and knowledge surrounding HPV, cervical cancer, and the vaccine especially among adolescents. Therefore, in order to have a better understanding of the reasons why mothers refuse or hesitate with regards to vaccinating their daughters, this study provides insight and possible healthcare strategies to address vaccine hesitancy among mothers, as well as recommendations for healthcare providers and future research.

In understanding what contributes to the vaccine hesitancy among mothers, various role-players within the public and private health sector can benefit from this study. These include the individuals involved in implementing successful immunisation programs in the South African context and it can aid the Department of Health in its efforts to increase the vaccine uptake within the country. By understanding vaccine hesitancy and its impact, appropriate policies can be adopted and modified to align with the needs of potential clients and stakeholders. Moreover, improving vaccine uptake among adolescent girls by addressing maternal hesitancy plays an important role in the prevention of HPV-related cervical cancer through herd immunity.

1.3 Aim and Objectives

Limited research exists regarding the barriers to the HPV vaccine uptake in South Africa, especially towards the factors associated with vaccine hesitancy among mothers (Ngcobo et al., 2019). This study aimed to address: a) the maternal socioeconomic and demographic factors; and b) maternal attitudes and beliefs that play a role in vaccine hesitancy among mothers of adolescent daughters towards the HPV vaccine through the results of a constructed survey. Subgroups are hereon referred to as groups within the sample belonging to certain demographics, socio-economic characteristics, levels of knowledge, and attitudes and beliefs.

This study intended to meet the following objectives:

- To establish the levels of vaccination uptake among adolescent daughters;
- To establish the distribution/spread of vaccination uptake across different subgroups;
- To assess the level of HPV knowledge among mothers; and
- To establish the maternal demographic, socioeconomic, knowledge, attitudes and belief factors associated with vaccination uptake among adolescent daughters.

1.4 Research questions

Given the important role of maternal decision making in adolescent HPV vaccine uptake, it is crucial for policy makers, governments and other initiatives to consider maternal attitudes and the associated factors thereof in order to develop successful vaccination efforts (Griffioen et al., 2012). Based on the objectives mentioned above, this study addressed the following research questions:

1. What are the levels of vaccination uptake among adolescent daughters in context of this study?
2. What is the distribution/spread of vaccination uptake among different subgroups?
3. What maternal socioeconomic and demographic factors are associated with vaccine uptake among adolescent daughters?
4. What is the level of HPV knowledge among mothers?
5. What maternal attitudes and beliefs are associated with vaccination uptake among adolescent daughters?

1.5 Acronyms

GACVS	Global Advisory Committee on Vaccine Safety
GAVI	Global Alliance for Vaccines and Immunization
HABS	HPV Attitude and Belief Scale
HPV	Human Papillomavirus
ICC	Invasive Cervical Cancer
LMICs	Low and Middle-Income Countries
PHASA	Public Health Association of South Africa
STI	Sexually Transmitted Infection
VACCS	Vaccine and Cervical Cancer Screen project
WHO	World Health Organisation

1.6 Terminology

- Adolescent – any person between 10 and 19 years old.
- Carcinogenic – having the potential to cause cancer.
- Co-infection – in virology, co-infection means when a person is infected by two or more simultaneous virus particles, e.g. having HPV and HIV.
- Herd Immunity – resistance to the spread of a contagious disease within a population that results if a sufficiently high proportion of individuals are immune to the disease, especially through vaccination.
- Pap smear – a sample of cells collected from the cervix for testing.
- Prophylactic – a medicine or course of action used to prevent disease.
- Serious adverse events – any adverse drug event (experience) occurring at any dose that can result in death, hospitalisation or any other serious events.

CHAPTER 2
LITERATURE REVIEW

2.1 The prevalence and prevention of HPV-cervical cancer

In the United States, approximately 6.2 million people contract HPV on an annual basis, making it the most common sexually transmitted infection (STI) among humans (Niccolai, Metha, & Hadler, 2011). HPV is known to enter through microabrasions on the epithelial layer of the anogenital tracts of humans and infecting the basal cell layer in which HPV-related diseases can manifest (Ryndock & Meyers, 2014). Predominantly, HPV transmission occurs through sexual contact between at least two individuals of which one party is already infected with the virus. HPV infected individuals are often asymptomatic, making it a dangerous virus among both sexually active men and women (Staggers et al., 2012). Young people around the world and in Africa are at a high risk of being infected by an STI (Mbulawa et al., 2018). HPV will affect approximately 50–80% of young, sexually active women worldwide during their lifetime (Angioli et al., 2016). In South Africa, a high prevalence rate of HPV has been reported among adolescents and young women (≤25 years old) residing predominantly in Gauteng, KwaZulu-Natal and the Western Cape Provinces (Mbulawa et al., 2018). In most developing countries, cervical cancer receives significantly fewer resources and attention due to other competing health and socio-environmental problems such as HIV, malaria, poor sanitation, and widespread poverty (Denny & Kuhn, 2017).

In South Africa, the reported rates of cervical cancer differ significantly among Black women (42.1%) and White women (14.5%) which is, in part, associated with socio-economic status, unequal access to health care and exposure to HPV and HIV infections (Botha & Dochez, 2012). Populations that are vulnerable to cervical cancer in South Africa include women of colour (Francis et al., 2010) who are disproportionately affected by cervical cancer. These disparities are a result of a number of factors that include past social inequalities during apartheid, access to screening and poverty. According to Denny and Kuhn (2017), 82.7% of cervical cancer was diagnosed in Black women and 9% in White women in 2011. Furthermore, Black adolescent girls (60%) are reportedly engaging in more sexual activity and 14% will reach their sexual debut before the age of 13 (Jeudin, Liveright, Del Carmen, & Perkins, 2014).

Although cervical cancer is rare among adolescents, the rate of abnormal Pap smears among young girls has increased due to the high prevalence rate of HPV (Benard et al., 2012).

According the Bruni et al. (2018), 100 annual cases of cervical cancer are found in girls between the ages of 15 and 18 in South Africa. Although the prevalence rate might be low for younger women, HPV-related cervical cancer rates increased to over 6,000 cases per year in 2018 for women between the ages of 40 and 64 (Figure 2.1). Yet, the HPV vaccine uptake in South Africa remains poor with an estimated 50,000 vaccinated individuals between 2009 and 2014 (Tathiah et al., 2015).

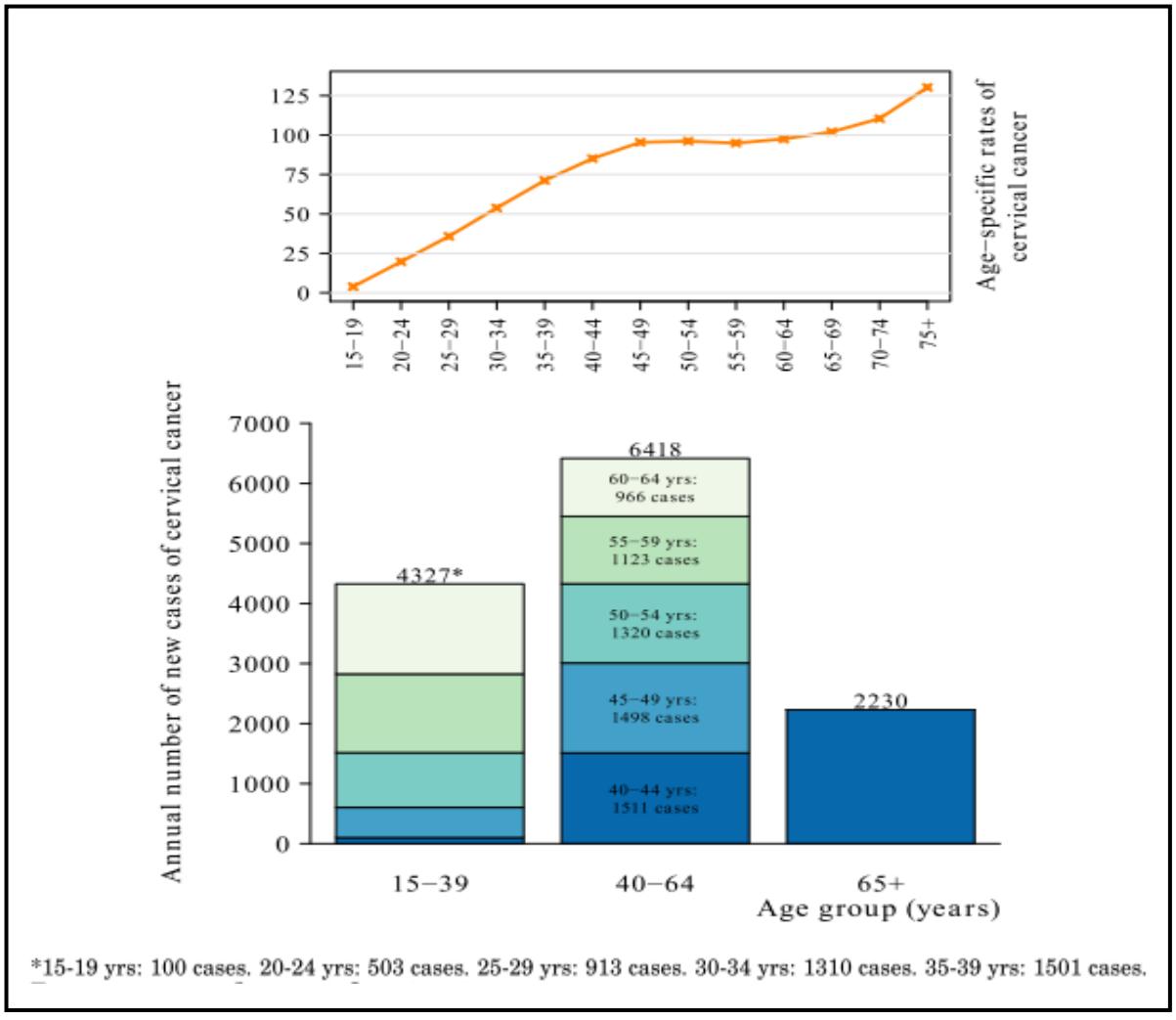

Figure 2.1. Annual number of cases and age-specific incidence rates of cervical cancer in South Africa *(Source: Bruni et al., 2018)*

Individuals infected with HPV might only present with lesions after an incubation period of one to eight months (Botha & Dochez, 2012). Therefore, once a diagnosis has been made, most cases of cervical cancer present late with a high incidence of mortality. Early

detection is therefore a vital part in the prevention of cervical cancer. Cervical cancer screening and prevention methods have been put into place in most developed countries; however, cytology screening programmes in LMICs have been unsuccessful and poorly managed (Denny & Kuhn, 2017). In addition, treatment opportunities for women with invasive cervical cancer (ICC) remain inadequate in southern Africa. Radiotherapy centres are in high demand, waiting lists for receiving treatment are long and only 20 gynaecological oncology professionals are registered within the country (Botha & Dochez, 2012). Moreover, oncology support in rural parts of South Africa remains particularly deficient.

In southern and sub-Saharan Africa, the HIV epidemic has also deflected the minimal resources away from other health priorities such as cancer screening. Studies in Ghana propose that only 12% of the female population undergo annual Pap smears (Coleman, Levison, & Sangi-Haghpeykar, 2011). Cost, inadequate knowledge, lack of awareness and judgement from others have been identified as possible barriers among these women. Moreover, the misguided beliefs of the vaccine – fear of pain and adverse effects – have been cited as possible uptake barriers in Tanzania, Botswana and Mozambique (Black & Richmond, 2018). In the private health sector of South Africa, continued routine Pap smears have resulted in a significant decline in cervical cancer diagnoses (Botha & Dochez, 2012). Moreover, LMICs, such as South Africa, have been provided with technical knowledge and financial support by the Global Alliance for Vaccines and Immunization (GAVI) to initiate HPV vaccine pilot studies (Michelow & Firnhaber, 2016). Many of these programs have targeted public school systems rather than clinics or communities. In 2000, the state launched the South African National Policy for cervical cancer prevention which offers women from the age of 30 free access to three routine Pap smears every 10 years. However, the coverage (13.6%) among the population has remained suboptimal (Hoque, 2016).

New technology to test for 14 HPV strains (DNA testing) is now available across 250 sites across South Africa (Denny & Kuhn, 2017). This procedure gives results within one hour and can be performed by a non-laboratory assistant which makes it accessible for women living in both rural and urban areas. However, prevention remains the most cost-effective and precautionary measure of cervical cancer. Progress has been made with immunisation efforts since June 2018 as eight countries across sub-Saharan Africa have undertaken national HPV immunisation programs as seen in the Table 2.1 below (Black & Richmond, 2018).

Table 2.1

National HPV Immunisation Programs across sub-Saharan Africa targeting adolescent girls

Country	Year of induction	Delivery platform	Estimated coverage
Botswana	2015	School-based (grades 5–7) and out-of-school girls aged 9–13	
Lesotho	2012	School-based	
Mauritius	2016	School-based (grade 5)	
Rwanda	2011	School-based (grade 6) and out-of-school girls	HPV3 98.7% (2014)
Senegal	2016	School-based	
Seychelles	2014	School-based (grade 6)	HPV1 77% HPV2 76% (2014)
South Africa	2014	School-based (grade 4)	HPV1 92% HPV2 72% (2014)
Uganda	2015	School-based (grade 4) and out-of-school girls aged 10	

HPV1= One dose; HPV2= Two doses; HPV3= Three doses

Despite global efforts, vaccine uptake among adolescents remains poorly understood and can largely be attributed to factors associated with parental acceptance or decision making (Griffioen et al., 2012). Reportedly, these factors have been identified to include knowledge surrounding HPV, personal or family history of STIs and cancer, belief systems, peer and family endorsements, healthcare provider recommendations, parent-child communication about sexual activity, exposure to the media and maternal perceptions of their daughter's vulnerability to HPV (Griffioen et al., 2012). In this chapter, the themes regarding HPV and the vaccine in South Africa, vaccine hesitancy among parents and the factors that contribute to vaccine hesitancy are discussed. This chapter also examines the theoretical and conceptual framework used in this study.

2.2 HPV and the vaccine in South Africa

High rates of HPV infections occur globally and have been labelled as the most prevalent STI to date. The risk of HPV infection is mainly attributable to STI co-infection, the number of past and present sexual partners, as well as the early onset of sexual debut (Mbulawa

et al., 2018). In South Africa, around 3,000 women lose their lives to cervical cancer each year (Denny, 2017). Cervical cancer rates (14 diagnoses per annum) remain low in young women between the ages of 20 and 24 (Benard et al., 2012). However, with the rise of HPV infections worldwide, rates of cervical cancer diagnoses are increasing. In a 2013–2014 study by Mbulawa et al. (2018), 298 women between the ages of 16 and 22 (who were not vaccinated) were recruited from disadvantaged communities in Cape Town and Soweto. From these participants, 66.7% (n=194) were already infected with HPV and 11.7% carried the high-risk HPV 16 strain which is known to be highly carcinogenic.

In addition, almost three million women, 15 years and older, are infected with HIV and are five times more likely to become co-infected with high-risk strains of HPV 16 and 18 (Katz et al., 2013). Research has also shown that having HPV increases the risk of becoming infected with HIV (Michelow & Firnhaber, 2016). Moreover, a study by Olesen et al. (2014) found that HPV infection among men in Sub Saharan Africa was highly prevalent (19.1%-100%), especially among men who were also HIV positive. Similar sexual risk-taking behaviour occurs between individuals who are HIV positive, adding to the spread of HPV through multiple concurrent sexual partnerships (Olsesen et al. 2014).With the high prevalence rate of HIV infection, which makes women more susceptible to cervical cancer, as well as the low levels of cervical screenings, cervical cancer rates in the country and across sub-Saharan Africa are expected to rise due to the lack of essential prevention efforts (Ngcobo et al., 2019). Therefore, without early intervention, cervical cancer is known to be the most common causative cancer-related morbidity among South African women.

Although cervical cancer among women are on the rise due to the prevalence of HPV infections, it is also important to note that HPV noncervical cancers, place a big burden on both women and men in our society. Chaturvedi (2010: p22) reported that approximately 97,215 cases of noncervical HPV related cancers are diagnosed worldwide of which "50,780 cancers are found among men (13,485 anal cancers, 26,775 oropharyngeal cancers, and 10,520 penile cancers) and 46,435 cancers among women (14,787 anal cancers, 6,048 oropharyngeal cancers, and 25,600 vaginal/vulvar cancers)." Noncervical cancer rates are found to be almost equal among men and women. However, research shows that oropharyngeal cancers are more prevalent in men (Chaturvedi, 2010). Therefore, men and young boys are just as affected by HPV and are not considered only as "carriers" of HPV.

Globally, three prophylactic HPV vaccines are available – Gardasil®, Gardasil-9 and Cervarix® (Mbulawa et al., 2018). Gardasil® protects against two low risk HPV types (6 and 11), which cause genital warts, and two high-risk types (16 and 18); Gardasil-9 protects against five more low-risk types (31, 33, 45, 52 and 58); and Cervarix® protects against HPV 16 and 18. Only Gardasil® and Cervarix® are registered in South Africa (Botha & Dochez, 2012). Both these vaccines are administered intramuscularly in a three-dose schedule and have been studied with large populations and have been found to be safe and effective (Botha & Dochez, 2012). Moreover, these vaccines do not contain viral DNA, biological agents or preservatives and are made up of L1 proteins that are non-carcinogenic and non-infectious (et alBotha & Dochez, 2012; Tathiah et al., 2015). These vaccines are intended to prevent disease and are not effective in individuals who have already contracted HPV (Mbulawa et al., 2018).

Since 2006, Gardasil® and Cervarix® have been extensively studied in clinical trials using the vaccine (active group) and placebos (inactive group), and no difference has been found in the adverse effects or complications between the two groups (Denny, 2017). No severe complications, onset of autoimmune or chronic diseases, or deaths were reported in these trials. Multiple studies have found that the protection from the vaccine is known to last for up to seven years in uninfected individuals (Hoque, 2016). Additionally, vaccination of young adult women and older women is recommended should it be "feasible, affordable, cost effective, and does not divert resources from vaccinating the primary target population or from effective cervical-cancer screening programmes" (Hoque, 2016, p. 568). In addition, both vaccines have been reported to be safe and effective for the vaccination of adolescent boys (Chaturvedi, 2010).

In 2014, the South African government successfully implemented an HPV vaccine rollout among public schools in the country. The target population in this project was girls from the ages of nine and over 1.2 million girls (90% coverage) have been fully vaccinated against HPV to date (Denny, 2017). However, there was a significant decrease in uptake among girls between the first dose in 2014 and the second dose (Ngcobo et al., 2019). As part of the program, Cervarix® was offered in two doses (six months apart) without any cost following written formal consent from parents (Attipoe-Dorcoo, Singh, & Moodley, 2018). In addition, research suggests that, with a 50% or more vaccination coverage, HPV infections should reduce by 68% through herd immunity and cross-protection (Newman et al., 2018). To date, global vaccination efforts have been focused on female adolescents. Denny (2017) suggests that the devastating impact of the virus and the current public health problem rests among girls and

that, once resources in the country become available, future vaccination efforts in South Africa should include boys. It is also suggested that the vaccination of girls will ensure that herd immunity is provided to boys (Sherman & Nailer, 2018). However, the HPV vaccine uptake among adolescents remains suboptimal and vaccination efforts should include both adolescent girls and boys to optimise immunity against HPV as the disease is a shared burden among both genders.

2.3 Vaccine confidence and hesitancy

From a parental perspective, confidence in vaccines is a key factor in the successful uptake and implementation of adolescent vaccines (Gilkey et al., 2014). However, when it comes to children, many parents believe that the negative effects of vaccines outweigh the benefits. Vaccine hesitancy can be defined as the refusal or delayed acceptance of a vaccine, despite its availability (Ngcobo et al., 2019). Vaccine hesitancy has been identified as the prevailing attitude among individuals that not only affects the person who is refused the vaccine, but also society due to the lack of herd immunity (Patel & Berenson, 2013). Moreover, vaccine hesitancy is influenced by "confidence, complacency, convenience, risk calculation and collective responsibility" (Ngcobo et al., 2019, p. 14). The Vaccine and Cervical Cancer Screen (VACCS) project, conducted in Gauteng and the Western Cape Provinces, showed that parental acceptance and consent plays an important role in vaccine uptake among adolescents (Botha et al., 2015).

Research indicates that HPV vaccine hesitancy among decision-makers is higher when compared to other childhood/adolescent vaccines (Ngcobo et al., 2019). According to Black and Richmond (2018), HPV vaccines are highly effective in the prevention of precancerous vicissitudes of the cervix if administered before an individual's sexual debut. However, recent studies have shown that the HPV vaccine uptake levels among adolescent girls remain inadequate, mainly due to the unwillingness of parents and a lack of healthcare provider recommendations for the vaccine (Kahn et al., 2015). Many parents rely on healthcare professionals' recommendations as a reliable and trusted source of information (Hoque, 2016). Therefore, research has shown that parents are unwilling or less likely to vaccinate their children against HPV if inadequate information about the vaccine is provided (Shapiro et al., 2018). Knowledge about HPV and the vaccine among healthcare decision-makers, such as mothers of adolescents, plays an important role in vaccine uptake. Parents who do not know enough about HPV or the vaccine are less likely to vaccinate their children (Shapiro et al.,

2018). Additionally, when parents remain unaware about the effects of certain preventable diseases and the impact they can have on their children's lives, the more fearful they are about the risks they believe are associated with the vaccine (Patel & Berenson, 2013). Therefore, research suggests that parents who are more knowledgeable about the severity of HPV and cervical cancer-related morbidity would be more willing to vaccinate their daughters.

Furthermore, vaccine confidence may decrease due to beliefs that the vaccine can cause harm, is costly and is not easily accessible. In the United States, 30% of parents reported that they were unwilling to vaccinate their daughters against HPV due to concerns about safety and efficacy (Gilkey et al., 2014). Studies have reported localised side-effects occurring at the site of injection such as redness, swelling and pain (Botha & Dochez, 2012). More adverse systemic effects include fatigue, fever, dizziness, nausea, myalgia and headache. After more than 175 million HPV vaccines were administered globally, the World Health Organization (WHO) reviewed safety data and found no Serious Adverse Events (SAEs) that could be linked to the vaccine (Burnett, 2014). In addition, the Global Advisory Committee on Vaccine Safety (GACVS) has stated that anaphylaxis is a SAE that may occur in 1.7 cases per million doses and fainting among individuals has been found to be caused by injection anxiety or fear. The GACVS (WHO, 2017, p. 7) reported that no causal relationship exists between "complex regional pain syndrome (CRPS), postural orthostatic tachycardia syndrome (POTS), premature ovarian insufficiency, primary ovarian failure, and venous thromboembolism" and the HPV vaccine. No other SAEs have been identified and the HPV vaccines have been reported to be safe (WHO, 2017). Furthermore, the vaccine can be safely administered together with other child and adolescent vaccines (Botha & Dochez, 2012).

In addition to safety and risk, social stigma exists around HPV and adolescent vaccination due to its identification as a sexually transmitted disease. Parental concerns exist pertaining to the belief that the vaccine will increase sexual risk-taking and an early onset of sexual activity among young girls (Ko et al., 2019). This is based on the premise that adolescents will gain a false sense of invincibility and subsequently engage in more sexual risk-taking behaviour (Forster, Wardle, Stephenson, & Waller, 2010). In South Africa, the response to the HPV vaccine among parents reflected hesitancy with regards to risky sexual behaviour and having multiple sexual partners among adolescents as previously noted with condom distribution and other sexual health initiatives implemented in the school systems (Delany-Moretlwe et al., 2018). Parents are concerned that the vaccine promotes unsafe sexual activity. To date, research has found no association between increased sexual risk-taking behaviour and

adolescents who have been vaccinated against HPV in private practice (Cook, Venkataramani, Kim, Tamimi, & Holmes, 2018).

Other social influences in parental decision making toward the HPV vaccine include family, friends, and social media (Shapiro et al., 2018). Furthermore, vaccine hesitancy can also be attributable to maternal socio-economic and demographic variables, level of knowledge on HPV and the vaccine, as well as attitudes and beliefs. It is also important to note that additional factors, beyond the barriers mentioned here, exist. Rendle and Leskinen (2017) highlight the importance of sexual risk, novelty of the HPV vaccine and safety linked to time and substantial evidence. Although some of these factors are not explicitly measured in this study, participants provided responses to an open-ended question which provides further understanding towards the factors that influence maternal attitudes in relation to vaccine confidence and hesitancy. These themes will be further discussed in Chapter 5.

2.4 Contributing factors toward adolescent HPV vaccine hesitancy

2.4.1 Demographic and socio-economic variables of mothers

On an intrapersonal level, the decision whether to take up a vaccine as a mother of an adolescent girl, relies on the "attitudes, beliefs, knowledge, subjective norms, socio-demographics, as well as cultural and religious aspects" of the individual making the decision (Grandahl et al., 2018, p. 11). Previous research regarding socio-economic and demographic variables and the relationship between vaccine uptake have been inconsistent. Although very few studies have identified the role of maternal age and vaccine uptake, Agorastos et al. (2015) found that women between 30 and 49 years old were more likely to vaccinate their daughters. However, the researchers found that maternal age was more strongly associated with personal vaccination (themselves) rather than the decision to vaccinate their children.

Women from a low SES (living below the poverty level) have a higher incidence rate of HPV infection and ICC diagnoses (Jeudin et al., 2014). Therefore, these mothers, with a personal history of HPV and/or cervical cancer, might be more inclined to vaccinate their daughters. Additionally, in their South African study, Jeudin et al. (2014) found that Black mothers (70%) more strongly supported the HPV vaccine than other races. But, despite the higher acceptance rate from Coloured women for the vaccine, actual uptake on a global scale remains moderate to poor. This could be in part due to lower vaccine series completion rates

among Coloured adolescents, resulting in the same level of uptake as other racial and SES groups (Jeudin et al., 2014).

In addition to maternal race, SES and level of education have also been inconsistent when associated with vaccine uptake or acceptance (Agorastos et al., 2015). Research has found that parents from a lower socio-economic standing (income and level of education) were less likely to vaccinate their children (Grandahl et al., 2018). A study by Ganczack et al. (2018) found that parents who were employed were more likely to vaccinate their children. A higher SES could place parents in a better financial and social standing in accepting and obtaining the vaccine for their children. Reportedly, unvaccinated children tend to come from high-income families where the mother is a college graduate (Rosenthal et al., 2008). Previous research has found an inconsistent relationship between parental education and vaccine uptake, where a higher level of education is related to vaccine hesitancy or refusal (Borena, Luckner-Hornischerb, Katzgraberb, & Von Laer, 2016). A reason for this could be that well-educated parents tend to undertake their own research and access internet sites that contain conflicting, inaccurate, and anti-vax information. Another reason could also be that well-educated parents might not see HPV as an immediate threat to their children.

Furthermore, religion, culture and moral values of parents have been associated with vaccine uptake (Fogel & Ebadi, 2011). Fogel and Ebadi (2011) report that parents affiliated with Catholicism were more likely to vaccinate their children, but those who attended religious services on a regular basis were more inclined to refuse the vaccine for their children. Moreover, parents who practised a more conservative religion were more concerned about the possibility that the vaccine could lead to risky sexual behaviour among young children. In the United States, parents from religious groups report that the HPV vaccine – which is known to prevent sexually transmitted infection – undermines the teaching of abstinence-based sex education and moral codes (Botha & Dochez, 2012). Other studies in the United States, Canada, United Kingdom, Sweden, Indonesia, and Brazil have found inconsistent results between religious beliefs and vaccine uptake/decline due to the differences in religious perspectives (Grandahl et al., 2018).

2.4.2 Maternal knowledge

Knowledge and healthcare provider recommendations play an important role in vaccine hesitancy and acceptance among parents. Knowledge and adequate awareness of health issues play an active role in the decision-making processes of individuals regarding their own healthcare and that of others (Waller, Ostini, Marlow, Zimet, & McCaffery, 2013). Previous research conducted in sub-Saharan Africa has found that women have limited access to cytological screening and lack knowledge regarding issues around HPV and cervical cancer (Coleman et al., 2011). A study by Francis et al. (2010), on a sample of Black South African women living in poor socio-economic environments, found that the participants were unfamiliar with HPV, cervical cancer and the vaccine. They reported a lack of access to Pap smears and the various barriers thereof, but most were willing to vaccinate their children if recommended by their healthcare providers. Parents with lower levels of knowledge regarding vaccines and vaccine preventable diseases are more likely to depend on healthcare provider recommendations on whether to vaccinate their children (Patel & Berenson, 2013). Additionally, a previous study in Botswana found that women from low income families had limited knowledge regarding cervical cancer and cytological screening. Francis et al. (2010) report that 40% of this study's sample had never had a Pap smear in their lifetime. Moreover, Allen et al. (2009) found that parents of adolescent daughters (9–17 years), who vaccinated their daughters, were more knowledgeable about HPV and the vaccine compared to parents who chose not to.

Delany-Moretlwe et al. (2018) mention that the level of knowledge regarding cervical cancer and related female mortality is low in South Africa. The researchers therefore believe that, because of this, parents will be more hesitant or reluctant towards taking up the vaccine for their girl children and might deem the HPV vaccine as an unnecessary precaution, especially if they believe that their daughters are not at risk of becoming infected with this STI (Grandahl et al., 2018). Therefore, the success of any vaccine rollout or program is dependent on educating recipients, decision-makers, as well as those involved in the process (Botha et al., 2015). In their study, Botha et al. (2015) found that parents who attended the information session of the VACCS project had a higher level of acceptance and consented to having their children partake in the vaccination roll-out. This highlights the importance of providing clear and credible information to parents in these initiatives.

2.4.3 Maternal attitudes and beliefs

Furthermore, research has shown that there is an association between vaccine uptake and parental attitudes and beliefs. According to Perez et al. (2016, p. 626), the attitudes and beliefs that predict HPV vaccine uptake are:

> *…benefits of HPV vaccination, HPV vaccine efficacy, perceived severity of and susceptibility towards HPV and HPV-associated diseases, HPV vaccine safety, beliefs that HPV vaccination might influence sexual behaviour, beliefs about cost, physicians' recommendation, influence of significant others and peers, religious and cultural attitudes, and age-related concerns*.

Parental attitudes and beliefs that are positive are important predictors of adolescent vaccine uptake (Grandahl et al., 2018). A study by Perez et al. (2016) showed that parents with moderately positive attitudes, compared to parents who scored low on the HPV Attitude and Beliefs Scale (HABS), were six times more likely to have vaccinated their children. Moreover, this study found that parents, who had positive attitudes toward HPV vaccination, were more likely to allow their daughters to receive the vaccine. Negative attitudes were considered to be a predictor of vaccine refusal and hesitancy. Parents who believe that the HPV vaccine is beneficial and works efficiently (protects rather than harms) are also more likely to vaccinate their children (Grandahl et al., 2018).

A systematic review of vaccine acceptance across Africa by Cunningham et al. (2014), found that between 41% and 78% of parents believed that their daughters were at risk of contracting HPV. Parents believed that the severity of HPV-related diseases was high and therefore the effectiveness and benefits of the vaccine were met with a positive attitude. Barriers to the vaccine include cost, safety, dosage, side effects, a lack of information, accessibility, fear, and the promotion of sexual risk-taking behaviours among adolescents. The studies suggested that these concerns were significantly associated with vaccine refusal. Parents reported that the vaccine should be free or at a minimal cost. Parents said that they would feel more positive toward the vaccine's safety if the recommended dosage schedule was lower. Currently, the vaccine is offered on a two-three dose schedule.

Parents also suggested that more awareness should be created around the fact that HPV causes cervical cancer rather than it being a sexually transmitted disease. Although HPV is transmitted predominantly through sexual activity, more evidence suggests that nonsexual transmission of HPV (albeit low risk) is possible. According to Ryndock and Meyers (2014)

the virus is stable and resistant towards most common disinfectants which contain alcohol and glutaraldehyde. In other words, the virus can spread through contact with inoculated surfaces and prevention efforts should not solely be directed towards highlighting HPV as a STI, but rather the risk of transmission and what disease burden the infection may carry. Furthermore, the most common barrier to acceptance is regarded as the accessibility of the HPV vaccine. A study by DiAngi et al. (2011) found that mothers were more accepting of the vaccine if it was easy to obtain and if they had access to a medical health professional or clinic. Moreover, healthcare provider recommendations and favourable attitudes of friends and family towards the HPV vaccine was reported to be an important determinant in adolescent vaccine acceptance among parents (Cunningham et al., 2014). Although mothers are known to be the primary caregivers and decision-makers with regards to health care in the family, little is known about the influence of fathers or spouses in vaccine uptake (Berenson et al., 2014).

2.5 Theoretical Framework

The attitudes and beliefs that predict the HPV vaccine uptake are based on theoretical concepts that include behavioural theories such as the Health Belief Model (Perez et al., 2016). The Health Belief Model (HBM) was developed in the 1950s by social psychologists (Champion & Skinner, 2008). The HBM consists of constructs that predict behaviour to prevent, screen or control symptoms of illness and disease. These constructs include: susceptibility and severity; benefits and barriers to behaviour; cues to action; and self-efficacy which was recently included in the model. According to Champion and Skinner (2008, p. 47), the HBM can be understood in the following way:

> *If individuals regard themselves as susceptible to a condition, believe that the condition has potentially serious consequences, believe that a course of action available to them would be beneficial in reducing either their susceptibility to or severity of the condition, and believe the anticipated benefits of taking action outweigh the barriers to (or costs of) action, they are likely to take action that they believe will reduce their risks.*

In addition to the above-mentioned constructs, knowledge, and socio-demographic variables (modifying variables) may influence an individual's perception and this may indirectly or directly affect the outcome behaviour (Grandahl et al., 2018). The HBM (Figure 2.2) has been widely used in research that includes health behaviours such as vaccine uptake and the attitudes and factors associated with it (Reiter, Brewer, Gottlieb, McRee, & Smith,

2009). Reiter et al. (2009) used three of the HBM constructs – cues to action, perceived susceptibility and perceived barriers – and found that parental attitudes and beliefs did not differ between racial groups or urban/rural groups but had a significant correlation with vaccine uptake. Today, the HBM is predominantly used by health educators to assist in designing health interventions that promote prevention (He, 2015). However, limited research exists regarding the constructs of the HBM and its role in the HPV vaccine uptake among women (Guvenc, Seven, & Akyuz, 2016). For an individual to take up a vaccine (for themselves or others), the benefits of their health behaviour should outweigh the barriers (Grandahl et al., 2018).

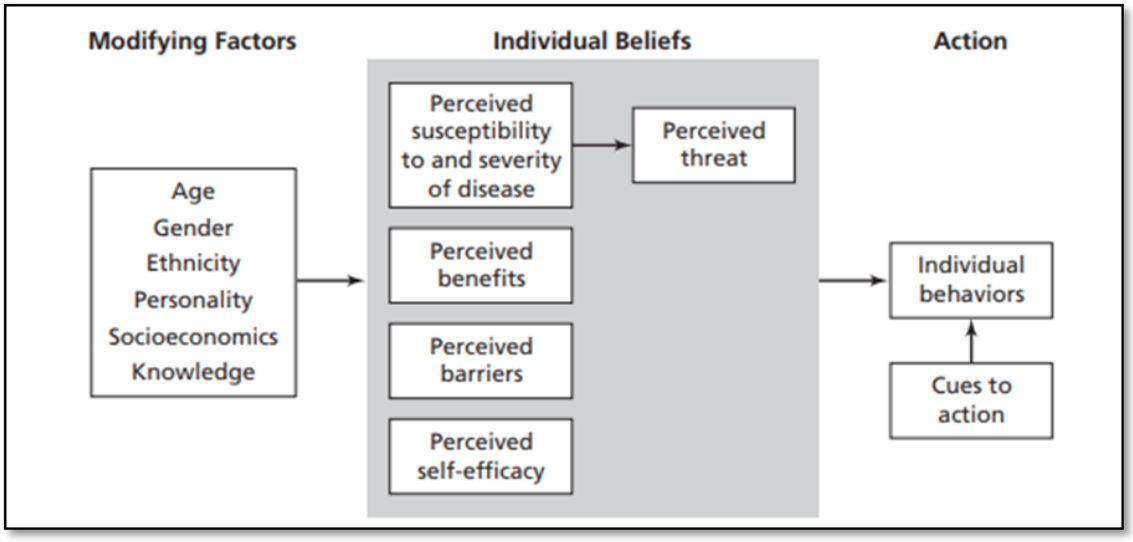

Figure 2.2. Health Belief Model
(Source: Champion & Skinner, 2008)

2.6 Conceptual Framework

The HBM identifies constructs that lead to a health behaviour outcome but is limited in defining the relationships between and among these variables (Champion & Skinner, 2008). Moreover, the HBM does not specifically address important social, interpersonal, and contextual factors. Therefore, the HBM is also limited in its individuality and thus a scale, such as the HPV Attitude and Beliefs Scale (HABS) by Perez et al. (2016), aims to account for more individual constructs that could potentially influence parental decision-making towards HPV vaccine uptake. The conceptual model of this study therefore accounts for individual factors by assessing maternal socio-economic and demographic factors as an independent variable. This study therefore tested the association between maternal attitudes (HABS) and socio-economic and demographic factors as independent variables with vaccine uptake (DV). Lastly,

this study aimed to measure whether the level of knowledge influences the relationship between maternal demographic and socio-economic characteristics and maternal attitudes and beliefs, and vaccine uptake. The level of knowledge is presumed to act as a modifying variable as suggested in the Figure 2.3 below.

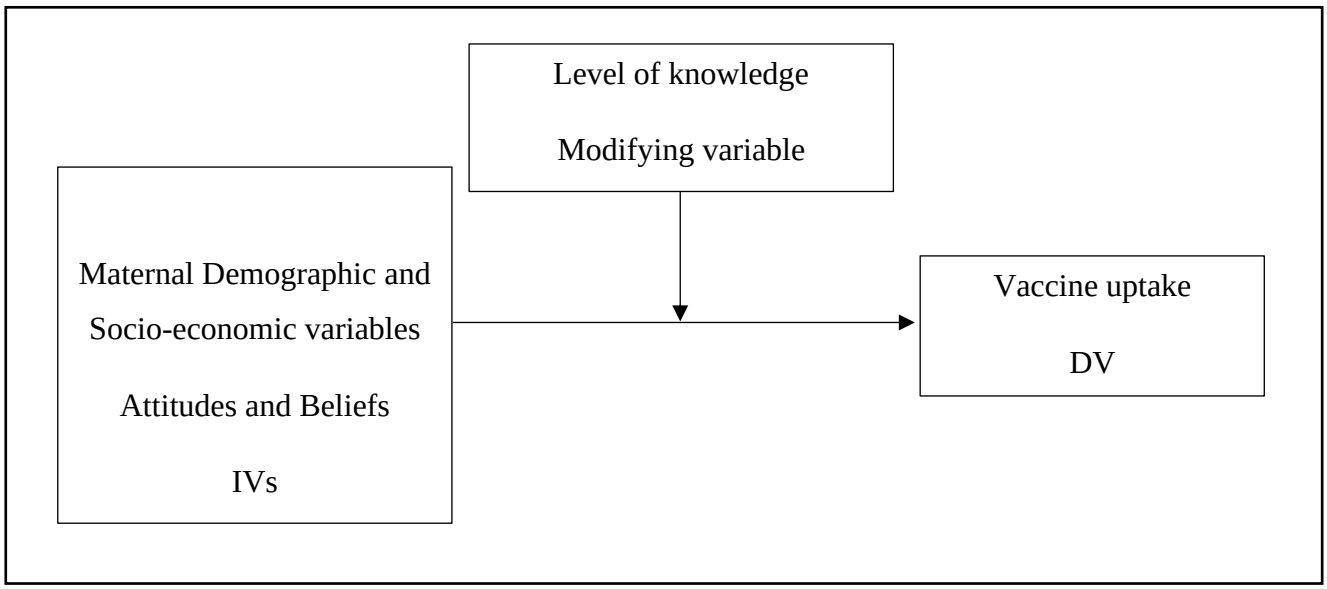

Figure 2.3. Conceptual framework of the relationship between maternal attitudes and beliefs, socio-economic variables (IVs) and vaccine uptake (DV) with the effect of modifying variables (maternal knowledge)

Based on the HBM and the conceptual framework of this study, the following hypotheses will be tested:

Socio-economic and demographic variables

- H1: There is an association between maternal religious affiliation and vaccine uptake.
- H1: There is an association between annual household income (SES) and vaccine uptake.
- H1: There is an association between the mother's education level and vaccine uptake.
- H1: There is an association between a mother's marital status and vaccine uptake.

Knowledge

- H1: Adolescent girls with mothers having lower levels of knowledge are less likely to have been vaccinated for HPV.

Attitudes and Beliefs

- H1: Adolescent girls with mothers who generally hold a positive attitude towards the vaccine are more likely to be vaccinated.

2.7 Conclusion

The Health Belief Model (HBM) has been widely used in behavioural studies regarding the HPV vaccine and public health concerns. A gap in research exists in using the HPV Attitudes and Belief Scale (HABS) among other populations such as the parents of females (Perez et al., 2016). Furthermore, minimal research exists regarding the population of mothers of adolescent girls, especially within a South African context. According to literature above, various factors play a role with regards to vaccine hesitancy and the low prevalence rate of the HPV vaccine uptake among adolescent girls. Understanding parental vaccine hesitancy and confidence is essential in promoting immunisation programs and addressing the public health issues around the high prevalence of HPV infection and cervical cancer. Currently, the HPV vaccine remains costly, is available only within the private sector and uptake continues to be voluntary.

It is therefore important for decision-makers to understand the link between HPV and cervical cancer, as well as the severity thereof, to make well-informed decisions about the vaccine and whether to give their daughters and sons the vaccine. Further research by Ngcobo et al. (2019) has been recommended regarding the current HPV vaccination coverage and factors associated with HPV vaccination hesitancy and low uptake in South Africa. Therefore, this study aimed to contribute to the research that exists regarding the maternal attitudes and associated factors that play a role in the HPV vaccine uptake among adolescent girls. Due the fact that HPV vaccination programs target adolescents, it is vital to address parental hesitancy and acceptance to ensure optimal uptake (Shapiro et al., 2018).

CHAPTER 3
METHODS

3.1 Sample

The various rates of cervical cancer among women in different countries reflect their age, race, area, and socio-economic status (Denny & Kuhn, 2017). According to Denny and Kuhn (2017), almost one million Pap smears were conducted across South Africa in 2013 and 2014. Table 3.1 below shows that the province of Gauteng had the second most screening cases (n=156,851) after KwaZulu-Natal. Therefore, the context of this study focused on mothers of adolescent girls (10–19 years old) living in urban Gauteng. The sample was screened to include mothers of adolescent girls and therefore non-probability, purposive sampling was used. It was calculated that approximately 270 participants were needed for this study. The sample size for the study was calculated within a 90% confidence interval and if the prevalence (P) of the HPV vaccine is at 20% with 0.04 degrees of freedom:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Table 3.1

Number of cervical smears performed across provinces in SA between 2013 and 2014

Province	Cases (n)	Low-grade lesions (%)	High-grade lesions (%)
Eastern Cape	70 377	5.1	3.8
Free State	52 107	7.2	2.0
Gauteng	156 851	18.7	7.0
KwaZulu-Natal	181 705	14.3	7.7
Limpopo	82 085	6.7	3.1
Mpumalanga	55 116	3.4	6.9
North West	64 270	5.9	3.6
Northern Cape	12 522	2.1	6.2
Western Cape	128 411	8.6	3.8

3.2 Procedure

Five private gynaecological practices from a suburb outside a metropolitan city were approached and the researcher requested access in the form of a letter to place hard copies of flyers (Appendix B) in the practice. These flyers contained information regarding the study and invited mothers of adolescent daughters to participate. The link to the survey, hosted by *Survey Monkey*, was included on the flyer as well as the contact details of the researcher and supervisor. Participants were able to access the online survey from the link provided on the flyer from any smart device, e.g. computer or mobile phone. This was done by typing the link manually into the web browser's URL or scanning the QR code provided. Additionally, participants were encouraged to contact the researcher via email to request the link. Only 14 participants responded to the survey through the flyers. Therefore, the survey link and invitation to participate were further posted on social media platforms to gain access to more participants. A further 340 responses were gathered through social media platforms such as Facebook and Instagram. The use of social media across populations of people have increased globally over the last few years, and it has been used as an effective recruitment strategy that allows access to hard-to-reach populations and is also deemed cost-effective (Topolovec-Vranic & Natarajan, 2016). It is important to note that this style of recruitment can affect the quality of data through participant accountability (lower levels of completion rates) as well as missing responses (Guillory et al., 2018).

Once participants opened the link, they were given a brief introduction to the study as part of participant information (Appendix C). Participants were then asked to "accept/decline" to partake in the study which was considered informed consent. Participants were made aware that the survey was voluntary and that they could exit at any time. They were also notified that they would need to complete the survey in one session and that exiting will save and submit the results, but incomplete data was not used in the study. They were also made aware that their identities would remain anonymous and that they allowed their data to be used by the researcher. Participants were given the contact details of both the researcher and supervisor should they wish to discuss any uncertainty. The survey (Appendix D) prompted participants to firstly answer a control question: "Do you have an adolescent daughter?" Participants who did not answer yes to the above question, were taken to the last page of the survey and thanked for their time and efforts. Participants were then asked whether their daughters had been fully vaccinated (DV). Full vaccination was described in the survey to include at least two doses of the HPV vaccine. If participants answered "no" to the above question, they were asked if they

were willing to vaccinate in the future (yes/no), as well as an open-ended question as to why/why not. Furthermore, the survey included a set of socio-economic and demographic questions and a subsequent test battery with a total of 62 items. The online survey took participants approximately 15 minutes to complete.

3.3 Instrumentation

According to the literature, vaccine hesitancy is a layered phenomenon. The chosen measures were narrowed down (as per the guidance of the HBM) to cover two aspects: parent-specific factors (such as socio-economic-demographics and general knowledge) and vaccine-specific factors (attitudes and beliefs). Following the control and DV question, the survey further consisted of three sections. Part one covered basic socio-economic-demographic information; part two investigated mothers' knowledge about HPV; and part three explored the maternal attitudes and beliefs about HPV and adolescent HPV vaccination. The survey was constructed and each subtest (the demographic/socio-economic questions, the General HPV knowledge questionnaire and the HABS questionnaire) was obtained through an open access database.

3.3.1 Demographics and socio-economic factors

The response format for all demographic and socio-economic variables was provided in categories. Participants were firstly asked to indicate their age with regards to categories: younger than 18, 18–24, 25–34, 35–44, 45–55, older than 55. Age categories were coded as 18–24=1, 25–44=2 and 45 and older=3. Mothers who were younger than 18 were removed as this indicated that they did not have an adolescent daughter or that they might have indicated the daughter's age instead of their own. Participants where then asked about their gender identity: female, male or other (in order to control for mothers). Male participant responses were removed from the data set as this did not align with the context of the study. Participants were asked what race they identified with and were give the categories: Black (1), White (2), Indian (3), Coloured (4) and Other (5).

Marital status of the mother was categorised as married, divorced, separated, widowed, single or never married. Marital status was then categorised as Ever Married (1) and Never Married (2) in the final data set. Religious affiliation included a wide set of religious beliefs and offered participants to choose other if their affiliation was not mentioned. Participants were also asked to indicate the number of adolescent children residing in their care and household

(zero to more than four, more than four was coded 5). Number of children were divided into two categories in the final dataset: Less than two children (1) and more than two (2). Level of education was categorised as less than High School, Matric, Certificate/Diploma, Bachelor's degree, Honours degree, Master's degree and PhD. In the final dataset, level of education was categorised as Less than tertiary education (1), and Tertiary education (2).

According to the World Bank, South Africa has been categorised as an upper-middle income country (Botha & Dochez, 2012). Household annual income was divided into categories of less than R200,000, R200,000–R349,999, R350,000–R499,999, R500,000–R749,999, R750,000–R999,999, R1,000,000–R1,499,999, R1,500,000 and above. This variable was used to measure socio-economic status (SES). According to an article in *Business Tech*, 62.3% of households fall within the lowest income bracket of under R86,000 per annum. Middle income households (26.4%) earned between R86,001 and R1,480,000 per annum while 1.2% of households earned R1,480,000–R2,360,000 and more. Therefore, participants who earned less than R200,000 and between R200,000 and R499,999 per annum, were classified as Low-Middle SES (coded 1). Those who earned R500,000 per annum and upwards were classified as High-Middle SES (coded 2). Furthermore, participants were also asked who the bread winner in the family was (myself=1, my partner/spouse=2, other/both=3) and their current employment status (employed=1; unemployed=2).

3.3.2 General HPV Knowledge

Participants were asked to respond to a 16-item questionnaire to assess their general knowledge of HPV, including transmission, consequences, and risk factors (Waller et al., 2013). Participants received a (1) for correct answers and a (0) for incorrect and uncertain (I don't know) answers. The Cronbach alpha values in the original study for the 16 items were 0.849 (n=1473). The self-response format included "true", "false" and "I do not know" options. Total scores of correct answers ranged between 0 and 16 where higher scores indicate a stronger/higher level of knowledge with regards to HPV. Participant scores were divided into high scorers, moderate, and low scorers. Those who responded to less than 50% of the 16 questions correctly were categorised as having a low level of knowledge (1), moderate knowledge (2) was calculated as a score between 50–68% and those who scored 70% and more, were categorised as high knowledge scorers (3).

3.3.3 HPV Health Attitudes and Beliefs Scale (HABS)

The concepts of the HABS are framed by the theoretical framework of the HBM (Perez et al., 2016). The original scale consists of 46 items and was adapted to suit the context of this study. According to the online survey, items were divided into nine subscales to measure: Benefits of HPV vaccination (Benefits) – items 34-43, Threat of HPV-infection and HPV-associated diseases (Threat) – items 44–46, Social influence (Influence) – items 47–54, Harms – items 55–60, Risk – items 61–63, Affordability – items 64–66, Communication – items 67–71, Accessibility – items 72–75, General vaccination attitudes (General Attitudes) – items 76–79. High scores on most of the subscales are indicative of positive attitudes (agree to strongly agree) and beliefs toward HPV vaccination. Negative attitudes indicated participants who scored statements from strongly disagree and disagree. Neutral attitudes were categorised in scores of somewhat disagree, neutral and somewhat agree. High scores of the subscales of harms, affordability, and communication reflect negative beliefs and attitudes toward the HPV vaccine. Therefore, these items were reversed scored as well. In addition, items 72, 73, 78 and 79 were reversed scored due to high scores indicating a negative attitude towards the vaccine. Participants were asked to respond in a Likert format from strongly disagree (1), neutral (4), to strongly agree (7). The reliability of the scale had a Cronbach alpha of 0.847.

3.4 Data Analysis

All data management and statistical analyses in this study were performed by using IBM SPSS (version 25.0). The characteristics of the sample were given in frequency and percentages. Vaccine uptake levels among different subgroups were measured using cross tabulations and Pearson's Chi-square tests. Potential associations between socio-economic, demographic factors, HPV knowledge and attitudes/beliefs in relation to vaccine uptake were analysed through odds ratios at a 95% confidence interval. Bivariate logistic regression was used against the outcome to assess the strength of each variable's association with vaccine uptake. The first regression analysis examined the relationship between the demographic, socio-economic, knowledge and attitude variables, each separately with vaccine uptake (Model 0). The second regression measured the association between maternal demographics and socio-economic variables and knowledge with vaccine uptake (Model 1). The regression in Model 2 measured the association between maternal demographics/socio-economic variables and maternal attitudes with vaccine uptake and the final model accounted for all IVs with vaccine uptake.

3.5 Ethical Considerations

The health practitioner of each sample site was requested to grant the researcher permission to recruit patients from the practice. Before individuals chose to participate in the study, they were prompted to accept/deny the conditions pertaining to the study before beginning the survey (Appendix C). This information was used as an introductory page when the survey was accessed online. Participants were made aware that partaking in the study was completely voluntary. They were also made aware that they could withdraw from the study at any time without consequence. All data collected are kept confidential and safely stored on a password protected laptop. Raw data were only accessible to the researcher and supervisor. Participants were also informed that the study results would be made available to them on request and contact details of the researcher were provided.

Before commencing with this research study, an application for ethical clearance was made through the Wits Human Research Ethics Committee (HREC) medical division and approved (M190679- Appendix A). In addition, the nature of this study was deemed low risk as the questions asked prompted information about people's knowledge, attitudes and beliefs. This also included biographical information and some potentially sensitive questions surrounding HPV, vaccination and healthcare of participants' adolescent daughter(s). Participants of this study were not deemed to be a vulnerable group; however, should they experience any discomfort during or after the survey, participants were allowed to exit the survey at any time and were informed about the free psychological services offered by Lifeline Pretoria and Johannesburg . Contact details of these services were provided in the Participant Information Sheet (Appendix C).

CHAPTER 4
RESULTS

The results of this study are reported below. Firstly, the socio-economic and demographic characteristics of the sample have been presented through descriptive statistics such as frequencies, percentages, and visual representation (pie charts). This not only includes maternal demographics, but also maternal knowledge and attitudes and beliefs. Secondly, vaccine uptake among the sample's demographics, SES, and level of knowledge was represented through cross tabulations and Pearson's Chi-square with a significance level of $p<0.05$. Lastly, all demographic, socio-economic, knowledge and attitude variables were tested separately in assessing their relationship with vaccine uptake through Binary Logistic Regression.

4.1 Socio-economic and demographic characteristics of the sample

In this section, descriptive statistics and frequencies were used to describe the sample of this study, as well as to assess the level of knowledge among participants and overall attitudes of mothers of daughters. Out of 354 people who responded to the survey, only 246 indicated "yes" to having one or more adolescent daughter between the ages of 10 and 19 years. From the 246 respondents, 198 responses were used for further analysis. The majority of mothers (43.2%) were between the ages of 35 and 44 years. Of the 198 participants, the majority of participants identified as White (68.8%) followed by Black (17.6%), Coloured (8%), and Indian (4.5%). Only one person reported as "other". Racial distribution is represented in Figure 4.1 below.

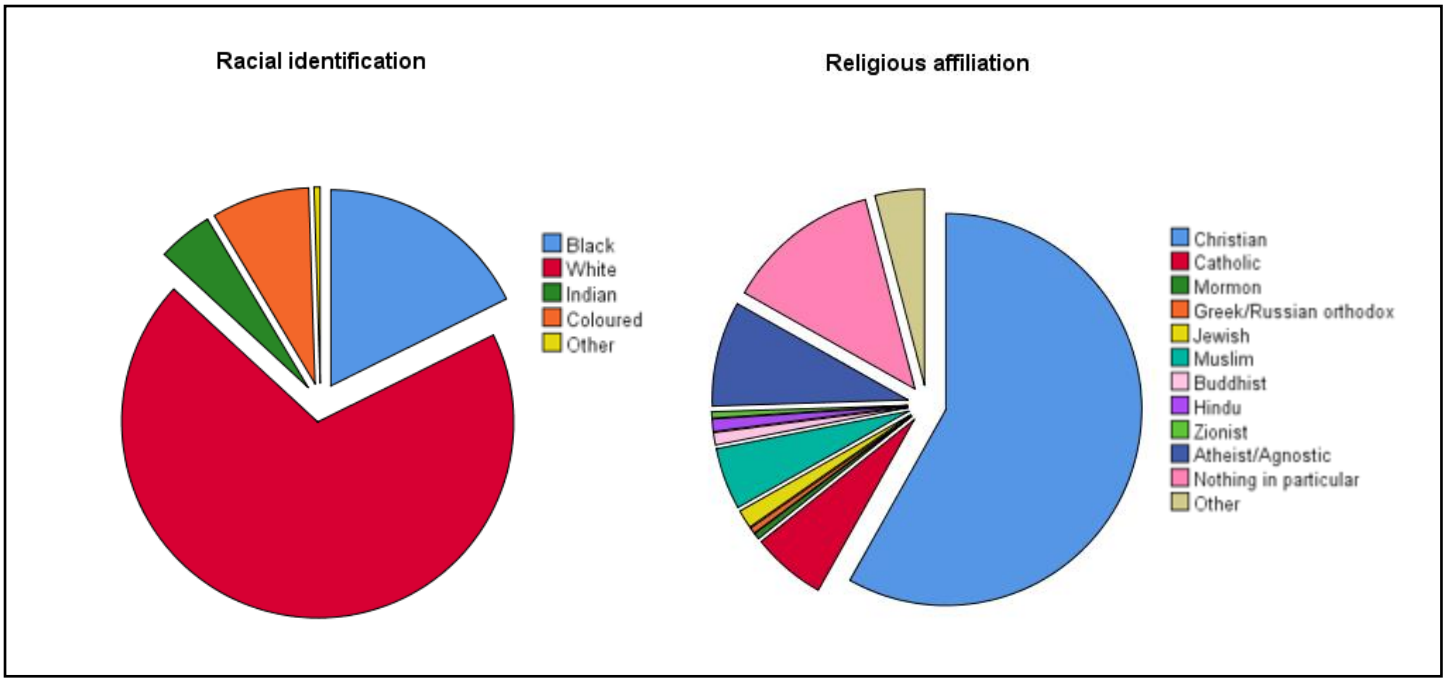

Figure 4.1. Distribution of spread (percentages) across race and religious affiliation of the sample

With regards to religious affiliation, most mothers (64.8%) identified as Christian, followed by those who associated with Nothing in particular (12.6%), Atheist/Agnostic (8.5%), Catholic (6%), Muslim (5%), Other (4%), and Jewish (1.5%). Only 1% of the sample identified as Buddhist and Hindu respectively, while 0.5% of the sample affiliated with Greek/Russian orthodox, Zionist and Mormon, respectively. The graphical representation of religious affiliation can be seen in Figure 4.1 above. Furthermore, most mothers (71.9%) reported having two or more children staying in their home and under their care. Among the mothers of adolescent daughters, 85.9% were ever married and only 13.6% reported that they were never married. In addition, 88.4% of mothers held a tertiary qualification while 10.6% of mothers had an education level of matric or lower. Both marital status and level of education is represented in Figure 4.2. The main source of income for participants was divided into three categories: “myself” (35.7%), “my spouse/partner” (43.2%) and “other” which generally referred to both parties as a source of income for these participants (20.6%). Most mothers reported that they were employed (86.9%). Approximately 42.7% of participants belonged to the low to middle income group of households, while 54.8% fell under the high to middle income group. Moreover, vaccine uptake among adolescent daughters was low. Of the mothers included in this study, 65.3% had daughters who were not vaccinated, while 32.2% of daughters had taken up the vaccine (Figure 4.3). Demographics not represented in the pie charts, are included as frequencies and percentages in Table 4.1.

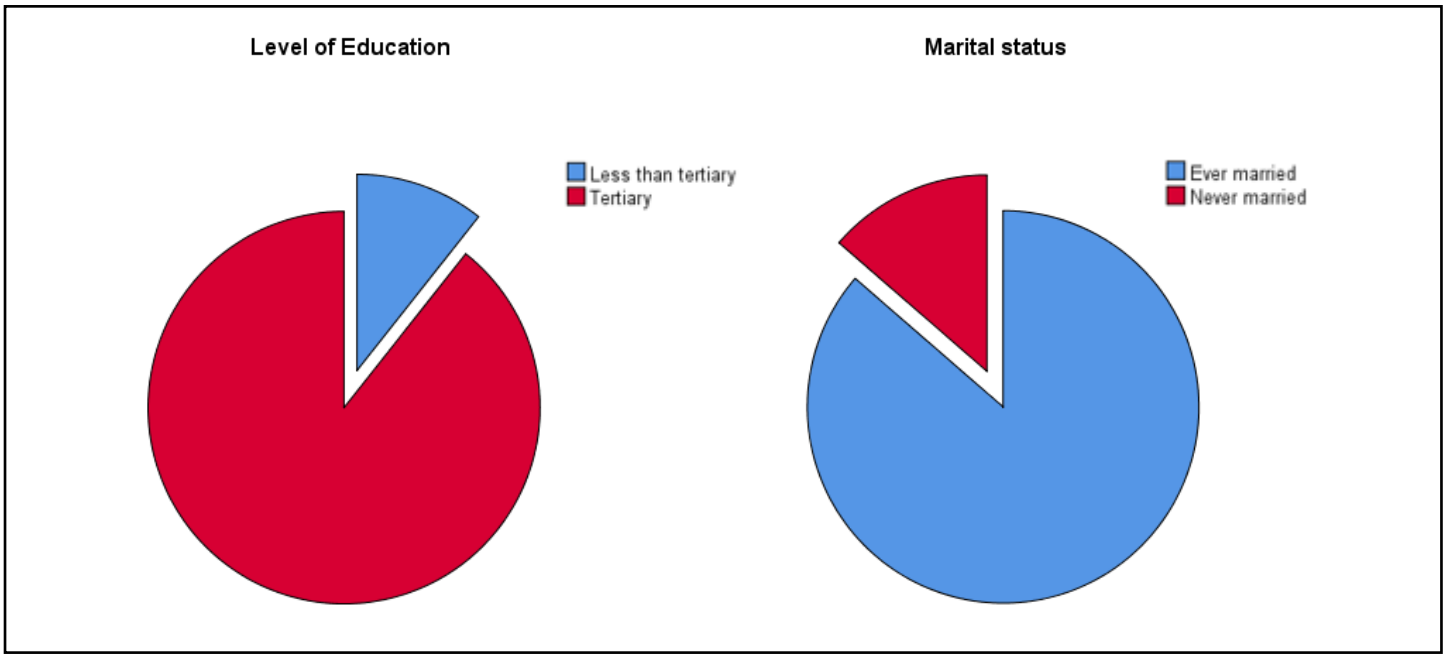

Figure 4.2. Distribution of spread (percentages) across level of education and marital status of the sample

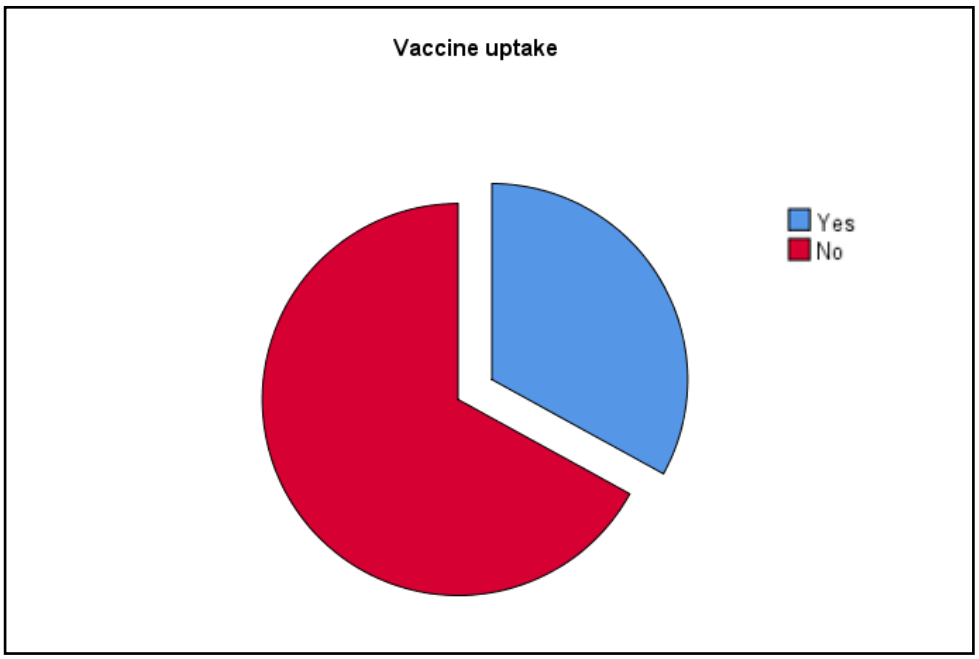

Figure 4.3. Level of vaccine uptake (percentages) among the sample

Table 4.1
Maternal demographic and socio-economic characteristics

Variable	Category	Frequency	Percentage
Age	18–34 years old	23	11.6
	35–44 years old	86	43.2
	45< years old	72	36.2
Number of Children	Less than two	53	26.6
	Two and more	143	71.9
Bread Winner	Me	71	35.7
	Spouse/Partner	86	43.2
	Both	41	20.6
Employment Status	Employed	173	86.9
	Unemployed	25	12.6
Socio-economic Status	Low-Middle Income	85	42.7
	High-Middle Income	109	54.8

Frequencies and percentages of maternal knowledge and attitudes and beliefs are presented in Table 4.2. Mothers had an overall moderate (28.6%) to high (48.7%) level of knowledge regarding HPV. The majority of mothers had a positive attitude (31.2%) towards the benefits of the vaccine, while 13.6% believed that it was not beneficial. Mothers had a positive attitude (50.3%) towards the threat that HPV imposed and 31.2% felt that, without the vaccine, their daughter(s) might be at risk for HPV-related diseases. The highest proportion of mothers had a positive (26.1%) and neutral (20.6%) attitude toward the harm that the HPV vaccine carried. Just over a third of mothers had a more neutral attitude (36.7%) toward the effect that influence from friends and family had on vaccine uptake. The largest proportion of mothers had a positive attitude (53.3%) toward the communication with their daughter(s). Mothers were unsure (50.8%) whether the vaccine was affordable, and the highest proportions felt neutral (33.2%) and positive (32.7%) towards the accessibility of the vaccine. Moreover, a large proportion of mothers had a positive attitude (45.7%) toward the HPV vaccine in general.

Table 4.2

Frequency table of maternal knowledge and HPV attitudes and beliefs

Variable	Category	Frequency	Percentage
Level of knowledge	Low	44	22.1
	Moderate	57	28.6
	High	97	48.7
Benefits	Negative attitude	27	13.6
	Neutral	36	18.1
	Positive attitude	62	31.2
Threat	Negative attitude	5	2.5
	Neutral	32	16.1
	Positive attitude	100	50.3
Influence	Negative attitude	6	3.0
	Neutral	73	36.7
	Positive attitude	30	15.1
Harms (-)	Negative attitude	37	18.6
	Neutral	41	20.6
	Positive attitude	52	26.1
Risk	Negative attitude	33	16.6
	Neutral	46	23.1
	Positive attitude	62	31.2
Affordability (-)	Negative attitude	25	12.6
	Neutral	101	50.8
	Positive attitude	14	7.0
Communication (-)	Negative attitude	3	1.5
	Neutral	27	13.6
	Positive attitude	106	53.3
Accessibility	Negative attitude	1	0.5
	Neutral	66	33.2
	Positive attitude	67	32.7
General Attitudes	Negative attitude	25	12.6
	Neutral	29	14.6
	Positive attitude	91	45.7

4.2 Vaccine uptake among subgroups

To show the distribution of vaccine uptake among categories of the demographic and socio-economic variables, the data were analysed through cross tabulations and Pearson's Chi-square in which significance was set at $p<0.05$. The distribution of vaccine uptake across the demographic variables and socio-economic variables is represented in Table 4.3. The only significant association was between vaccine uptake and marital status ($p=0.047$). Mothers who were ever married (90%) reported that they did not vaccinate their daughters, whilst mothers who were never married (20.3%) had vaccinated their daughters against HPV. No other significant differences of vaccine uptake were found across maternal demographic and socio-economic variables.

Distribution of vaccine uptake across knowledge subgroups and maternal attitudes and beliefs subgroups were also analysed through Pearson's Chi-square test as seen in Table 4.4. There were no significant differences between knowledge subgroups and vaccine uptake. However, eight of the nine HABS subscales had significant differences in vaccine uptake across their categories. Mothers who had positive attitudes (87.8%) toward the benefits of the vaccine had vaccinated their daughter(s). The majority of mothers, who had positive attitudes (91.3%) in their belief toward HPV as a threat to the wellbeing of their daughter(s) and those having a positive attitude of their daughters' risk (73.8%) for HPV-related diseases, vaccinated their daughter(s). The greatest proportion of mothers who believed the vaccine to be harmful did not vaccinate their daughter(s) (49.2%) while most mothers who were positive that the vaccine was not harmful, did vaccinate their daughter(s) (74.4%). Almost half of mothers, who had a more positive attitude toward the influence of friends and family, had vaccinated their daughter(s) (48.5%). The majority of mothers, who had a positive attitude toward the accessibility of the vaccine, indicated that they had vaccinated their daughter(s) (79.1%). Furthermore, most mothers had vaccinated daughters if they had a positive general attitude (92%) towards the HPV vaccine.

Table 4.3
Vaccine uptake across maternal demographic and socio-economic subgroups

Variable	Category	Vaccine uptake	No vaccine uptake	p-value
Age	18–34 years old	17.9	9.8	0.319
	35–44 years old	44.6	48.4	
	45< years old	37.5	41.8	
Race	White	64.1	72.3	0.269
	Black	18.8	16.2	
	Coloured	12.5	6.2	
	Indian	3.1	5.4	
	Other	1.6	0.0	
Relationship Status	Ever married	79.7	90.0	0.047
	Never married	20.3	10.0	
Religion	Christian	53.1	60.2	0.176
	Catholic	10.9	3.9	
	Mormon	0.0	0.8	
	Greek/Russian orthodox	0.0	0.8	
	Jewish	1.6	1.6	
	Muslim	3.1	6.3	
	Buddhist	1.6	0.8	
	Hindu	1.6	0.8	
	Zionist	1.6	0.0	
	Atheist/Agnostic	15.6	5.5	
	Nothing in particular	9.4	14.8	
	Other	1.6	4.7	
Number of Children	Less than two	31.7	24.0	0.256
	Two and more	68.3	76.0	
Education	Less than tertiary	15.9	7.7	0.080
	Tertiary	84.1	92.3	
	Spouse/Partner	40.6	45.4	
	Both	18.8	20.0	
Employment Status	Employed	85.9	88.5	0.616
	Unemployed	14.1	11.5	
Socio-economic Status	Low-Middle Income	46.8	42.2	0.550
	High-Middle Income	53.2	57.8	

Table 4.4

Vaccine uptake among maternal knowledge and attitudes and beliefs subgroups

Variable	Category	Vaccine uptake	No vaccine uptake	p-value
Level of knowledge	Low	15.6	26.2	
	Moderate	37.5	23.8	0.162
	High	46.9	50.0	
Benefits	Negative attitude	0.0	32.9	
	Neutral	12.2	38.8	0.000
	Positive attitude	87.8	29.3	
Threat	Negative attitude	2.2	4.5	
	Neutral	6.5	32.6	0.010
	Positive attitude	91.3	62.9	
Influence	Negative attitude	0.0	8.1	
	Neutral	51.5	74.3	0.011
	Positive attitude	48.5	17.6	
Harms (-)	Negative attitude	2.3	42.9	
	Neutral	23.3	35.7	0.000
	Positive attitude	74.4	21.4	
Risk	Negative attitude	0.0	34.4	
	Neutral	26.6	35.4	0.000
	Positive attitude	73.8	30.2	
Affordability (-)	Negative attitude	15.9	18.1	
	Neutral	59.1	78.7	0.002
	Positive attitude	25.0	3.2	
Communication (-)	Negative attitude	2.4	2.2	
	Neutral	19.0	19.6	0.880
	Positive attitude	78.6	78.3	
Accessibility	Negative attitude	0.0	1.1	
	Neutral	20.9	62.9	0.000
	Positive attitude	79.1	36.0	
General Attitudes	Negative attitude	0.0	27.2	
	Neutral	8.0	27.2	0.000
	Positive attitude	92.0	45.7	

In Model 0 of the binary logistic regression (Table 4.5), all demographic, socio-economic, knowledge and attitude variables were tested separately in assessing their relationship with vaccine uptake. Two maternal demographic variables were statistically significantly associated with vaccine uptake (Model 0- Model 2). Daughters of mothers who were Catholic (3.41) or Atheist/Agnostic (3.33) were three times more likely to have been vaccinated than daughters from mothers who were affiliated with Christianity. When maternal knowledge was controlled for in Model 1, the significance and magnitude of the association between Catholicism (4.08) and vaccine uptake increased, while the significance and magnitude of association between Atheism/Agnosticism (2.19) and vaccine uptake decreased. Furthermore, daughters from mothers who relied on a combined source of income (both parties contributed/or received income from another source) had a 76% less likelihood of being vaccinated compared to daughters from mothers who were reliant on themselves as the main source of income (Model 2).

Maternal levels of knowledge in the baseline model were found to be significantly associated with vaccine uptake amongst daughters. Daughters who had mothers with a moderate level of knowledge of HPV were almost three times more likely (2.63) to have been vaccinated. With the addition of demographic and socio-economic variables (Model 1), daughters of women who had a moderate and high level of knowledge of HPV had a higher likelihood of being vaccinated. However, in the final model, there was no statistical significance between high levels of knowledge and vaccine uptake, but the significant association between moderate levels of knowledge increased in magnitude (14.14). Therefore, daughters who had mothers with moderate levels of knowledge around HPV and the vaccine, were more likely to have been vaccinated compared to daughters from mothers who had low levels of knowledge (Model 3). Regarding the attitudes and beliefs results, from the HABS, eight attitudes were found to be significantly associated with vaccine uptake in the baseline models (Table 4.5). Daughters were twice as more likely (2.71) to have been vaccinated if their mothers held a more positive attitude towards benefits of the HPV vaccine. Daughters were more likely (1.95) to have been vaccinated if they had mothers who held a more positive attitude toward preventing the threats that HPV imposes on their wellbeing. Daughters were more likely (2.75) to have been vaccinated if they had mothers who held a more positive attitude toward the vaccine because of the influence from friends and family.

Table 4.5

Binary Logistic Regression Models of vaccine uptake among different subgroups

Variable	Category	Model 0	Model 1	Model 2	Model 3
Age	18–34 years old	1	1	1	1
	35–44 years old	0.628	0.494	2.371	4.001
	45< years old	0.628	0.444	3.662	6.008
Race	Black	1	1	1	1
	White	1.218	1.407	0.877	1.263
	Indian	0.835	0.819	0.043	0.035
	Coloured	3.094	4.213	1.857	0.404
Relationship Status	Ever married	0.891	0.603	0.679	0.490
	Never married	1	1	1	1
Religion	Christian	1	1	1	1
	Catholic	3.412*	4.083**	1.121	1.755
	Mormon	0.000	0.000	0.000	0.000
	Greek/Russian orthodox	0.000	0.000	0.000	0.000
	Jewish	3.511	2.805	1.513	1.155
	Muslim	0.651	1.016	21.734	71.409
	Buddhist	2.250	2.149	4.386	5.156
	Hindu	5.101	4.652	0.000	0.000
	Atheist/Agnostic	3.330**	2.194*	2.678	3.499
	Nothing in particular	0.682	0.736	1.239	2.638
	Other	0.000	0.000	0.000	0.000
Number of Children	Less than two	1	1	1	1
	Two and more	0.804	0.844	0.443	0.549
Education	Less than tertiary	1	1	1	1
	Tertiary	0.636	0.500	0.572	0.235
Bread Winner	Me	1	1	1	1
	Spouse/Partner	0.757	0.813	1.065	0.813
	Both	0.570	0.654	0.242*	0.352
Employment Status	Employed	1.343	1.309	3.066	4.005
	Unemployed	1	1	1	1
Socio-economic Status	Low-Middle Income	1	1	1	1
	High-Middle Income	1.332	1.317	0.317	0.430
Level of knowledge	Low	1	1		1
	Moderate	2.632**	7.058**		14.137**
	High	1.569	3.423*		2.073
Benefits		2.717***		0.777	0.947
Threat		1.953***		1.282	1.549
Influence		2.752***		2.275**	2.480**
Harms (-)		2.116***		1.625	1.659
Risk		2.063***		1.212	1.244
Affordability (-)		1.278**		1.413	1.557
Communication (-)		0.963		0.589	0.583
Accessibility		2.330***		2.235**	1.924
General Attitudes		2.733***		1.753	1.579

Statistical significance: p<0.1* p<0.05** p<0.001***

Moreover, daughters were more likely (2.12) to have been vaccinated if they had mothers who held a more positive attitude toward the belief that the HPV vaccine was not harmful. Daughters were also twice as likely (2.06) to have been vaccinated if they had mothers who held a positive attitude toward the belief that they (the daughters) were at risk of contracting HPV-related diseases. Daughters were also more likely to have been vaccinated if they had mothers who held a more positive attitude toward the affordability (1.28) and accessibility (2.33) of the vaccine. Lastly, daughters were more likely (2.73) to have been vaccinated if they had mothers who held a general positive attitude towards the HPV vaccine. Accessibility and influence were significantly associated with vaccine uptake in Model 2. Daughters from mothers who held a positive attitude towards the accessibility (2.24) and influence (2.28) of the vaccine, were twice as likely to have been vaccinated. In the final model, only the association between attitudes of influence and vaccine uptake remained statistically significant. The significance and magnitude of this relationship decreased slightly. Furthermore, the direction of this relationship remained positive.

CHAPTER 5
DISCUSSION

5.1 Levels of vaccination uptake among subgroups

This study found that vaccination uptake among adolescent daughters was low (32.2%). Since the vaccine was introduced in the South African public-school system in 2014, vaccination uptake levels have been moderate to poor, especially between scheduled doses (Ngcobo et al., 2019). Low levels of the HPV vaccine uptake have also been found to be consistent on a global scale. In a recent meta-analysis, studies conducted in 15 different countries (n=840,838) reported an average vaccine uptake of 41.5% (Newman et al., 2018). Reasons behind the poor uptake levels are multifactorial and parental hesitancy remains crucial in addressing and understanding the uptake levels of adolescent vaccination.

In this study, 198 mothers of adolescent daughters participated in a survey regarding HPV and the vaccine. The majority of participants were between the ages of 35 and 44 years, were predominantly White, married, and affiliated with Christianity. The demographic results of this study, especially according to racial distribution, is not a true demographic representation of South Africa. A study by Guillory et al. (2018), found that most participants recruited through social media platforms (i.e. Facebook and Instagram), and who completed an online survey, were predominantly White, Non-Hispanic individuals. Although social media usage among racial groups were deemed to be similar, the authors suggest that people of colour had more access to cell phone usage than at-home broadband internet to complete a lengthy survey which made participation more challenging. Similarly, the Facebook advertisements used to promote the survey of the current study showed more online engagement (clicks, comments, likes) from people of colour (1121/1142), but far less participation in the survey.

Additionally, most mothers were well educated and held tertiary qualifications. This means that mothers should have had good knowledge of health matters, including knowledge of vaccines and other forms of prevention diseases. The study showed that this was evident as the majority of mothers had moderate to high levels of HPV knowledge (77.3%). Most participants were also from high to middle socio-economic backgrounds as a majority were employed and earned over R500,000 per annum. In addition, participants had access to a smart device in order to partake in the survey, albeit that participation might have been discouraged if participants were only able to access the survey through their phones.

Although, most demographic and socio-economic characteristics of the sample did not display significant differences across subgroups, relationship status was found to be significantly correlated with vaccine uptake (Table 4.3). More mothers who were ever married (90%) reported having daughters that were not vaccinated. In comparison, more mothers who were never married (20.3%) had daughters that were vaccinated. Furthermore, results from the regression model (Model 2) showed that mothers who shared their source of income (both) were less likely to have daughters who were vaccinated than mothers who relied mainly on themselves as the main source of income. Moreover, attitudes regarding influence and accessibility were also significantly associated with vaccine uptake in Model 2.

Therefore, additional crosstabulations between relationship status and certain demographic variables were tested. Significant correlations were found with regards to education, knowledge, SES, and source of income (breadwinner). Mothers who were married were more educated (88.6%), had a moderate level of HPV knowledge (91.2%), and came from a high to middle SES background (94.5%). However, mothers who were married relied more on their spouse (48.5%) as the main source of income, whereas single mothers (70.4%) reported to be the sole breadwinners. In literature, maternal level of education and SES and its association with vaccine uptake, have been found to be inconsistent across studies (Agorastos et al., 2015). Grandahl et al. (2018) reported that parents from a lower socio-economic standing (income and level of education) were less likely to have vaccinated their children, while parents who were employed were more likely to take up the vaccine for their children (Ganczack et al., 2018). Moreover, mothers who have a higher level of education may have better access to health information and therefore a higher level of knowledge of HPV (Ganczak et al., 2018). One can therefore reason that parents from a higher socio-economic background would not only be in a better position to obtain and afford the vaccine but would also be well educated around the risk and harms surrounding HPV and the benefits of the vaccine.

Opposingly, other studies have reported that children who were not vaccinated were more likely to come from high-income families where the mother is a college graduate (Rosenthal et al., 2008). Agorastos et al. (2015) found that marital status might not play a significant role in vaccine uptake; however, mothers of 13-year-old boys who were never married were more likely to vaccinate their sons than mothers who were ever married. These contrasting findings can be explained by the fact that regardless of a mother's education, level of knowledge and SES, influence plays a major role in shaping the decision of vaccination uptake, especially among women who are married. This is evident in that influence was found

to be a strong predictor of vaccine uptake. A qualitative study by Ko et al. (2019) showed that, although mothers were the main decision-makers of the family, they tended to consult their partner(s) regarding their child's healthcare and wellbeing. Although mothers are the primary healthcare decision-makers, spouses (or the lack thereof) could play an important role in the decision whether to vaccinate their children or not. Berenson et al. (2014) reported that non-Black, non-Hispanic fathers were more likely to influence the mother's decision on adolescent vaccination. Moreover, HPV vaccine uptake among adolescents were lower when mothers consulted their spouses (Berenson et al., 2014). In addition, one can also argue that mothers who are single are void of this influence as decision-makers and present more self-autonomy, especially if they are the sole providers (breadwinners) of the family and have access to the vaccine. Mothers who are married may choose not to vaccinate their daughters not only because of shared decision-making and spousal influence, but also due to shared finances or spouses/partners being the sole provider for the family. Source of income can therefore influence who has more say in the decision-making processes.

Results from the binary logistic regression also showed that religious affiliation played a significant role in vaccine uptake. Mothers who were Catholic or Atheists/Agnostic were more likely to have daughters that were vaccinated when compared to their Christian counterparts. The results of this study are similar to the findings of Fogel and Ebadi (2011) who found that parents who practiced Catholicism were more likely to vaccinate their children. Parents who were Christian were less likely to have their daughters take up the HPV vaccine as they were concerned that it might introduce sexual activity and act as a permission to engage sexually (Fogel & Ebadi, 2011). Whilst more conservative religions did not accept the vaccine for their children, especially with regards to the fear of increased risky sexual behaviour, non-religious parents (Atheists/Agnostic) were more likely to accept the vaccine. Moreover, Catholics, followed by non-religious groups, were reported to have the highest prevalence of HPV vaccine uptake among daughters younger than 13 (Fogel & Ebadi, 2011).

5.2 Maternal levels of knowledge

In this study, maternal levels of knowledge were found to be predominantly moderate (28.6%) to high (48.7%). While other studies conducted in sub-Saharan Africa indicated that levels of HPV knowledge were low among women (Perlman et al., 2014), this study's results are indicative of a sample that was predominantly White, highly educated and that came from high-middle income families. From an international perspective, studies have found that

knowledge and awareness regarding HPV and the vaccine was high among mothers living in the USA compared to those in Australia and the UK (Marlow et al., 2013). Although knowledge was not significantly associated with vaccine uptake, levels of knowledge were associated with vaccine uptake throughout the regression models (Table 4.5). Daughters who had mothers with a moderate level of knowledge regarding HPV were more likely to be vaccinated than those with mothers with low levels of knowledge. When demographic and socio-economic variables were controlled (Model 1), moderate and high levels of maternal knowledge were significantly and positively associated with vaccine uptake. Having a moderate level of knowledge regarding HPV and the vaccine was a positively strong predictor for vaccine uptake.

Although majority of mothers in this sample were married, well educated, but chose not vaccinate their daughters, previous qualitative studies conducted in South Africa have consistently found that caregivers (predominantly mothers) who had restricted knowledge concerning cervical cancer and HPV were still willing to vaccinate their children (Katz et al., 2013). In this study, most mothers who were unmarried had daughters who were vaccinated regardless of their maternal SES, level of knowledge, and education. Although the HPV knowledge level of mothers was moderate to high, well-educated mothers could still be opting out of vaccinating their children because of spousal influence and shared financial responsibility as previously discussed.

5.3 Maternal attitudes and beliefs associated with vaccine uptake

This study has shown that positive maternal attitudes and beliefs play an important role in adolescent vaccine uptake. Mothers who have positive attitudes are more likely to vaccinate their daughters than those who hold negative views toward the vaccine. Negative attitudes and beliefs have been linked to vaccine hesitancy and refusal in previous studies (Perez et al. 2016). Maternal attitudes in this study were measured across nine subscales: Benefits, Threat, Influence, Harms, Risk, Affordability, Communication, Accessibility and General Attitudes. The results of this study indicate that maternal attitudes toward vaccinating adolescent daughters against HPV were moderately positive; however, vaccine uptake was reportedly low (32.3%). Moreover, the majority of participants reported that they were not willing to vaccinate their daughters in the future (41.2%).

The results of the actual uptake levels and willingness to vaccinate compared to the overall positive maternal attitudes toward the HPV vaccine, seem mismatched and rather

confusing. In their study, Ganczak et al. (2018) found similar incongruencies between low levels of vaccine uptake and parents' willingness to vaccinate. They further explained that "social responsibility bias" among the sample could have played a role in their study. In addition, several participants were excluded in the inferential analysis of the 46 items included in the HPV Attitude and Belief Scale (HABS) as a number of items were recorded as missing data. Participants opting out of completing the questionnaire and subsequent HABS section could have been as a result of survey fatigue. Table 4.5 shows that communication was the only subscale that was not significantly associated with vaccine uptake in the entire regression and this is similar to what Sherman and Nailer (2018) found among their study sample. From the univariate analysis (Model 0), eight of the nine subscales were significantly associated with vaccine uptake among adolescent daughters.

Therefore, mothers who believed that the vaccine was effective in preventing HPV, that HPV was a serious threat to their daughters, that friends, family and healthcare providers favoured vaccination, that the vaccine was safe, that their daughters were at risk of contracting HPV and its related disease burden, that the vaccine was affordable and easily accessible, and that vaccinating children was a good idea in general, were significantly more likely to have vaccinated their daughters. From the final regression analysis model, a positive attitude towards influence was the only HABS subscale predictor of vaccine uptake. Influence regarding vaccine uptake remained significant regardless of the mother's level of knowledge and socio-economic and demographic characteristics (co-variates). Therefore influence, especially healthcare provider recommendations and spousal input, plays a crucial role in the decision-making processes of parents when it comes to adolescent vaccines. Healthcare provider recommendations have been cited as the greatest contributing factor toward vaccine uptake among parents in 20 different studies (Newman et al., 2018). Mothers seek reassurance from physicians that the vaccine is not only effective in preventing HPV and cervical cancer but that it is also safe. Parents' trust in healthcare professionals and their knowledge regarding HPV and the vaccine is important to consider when implementing effective vaccine communication strategies between physicians, parents and adolescents. Moreover, the results of this study show that accessibility of the vaccine was more of a concern for mothers than affordability (Model 2). It is therefore important that decision-makers know where and how to access the vaccine in South Africa.

5.3.1 Influence

This study shows that a mother's decision to vaccinate her daughter(s), was strongly predicted by influence, e.g., "I feel that healthcare providers believe vaccinating my daughter against HPV is a good idea". Healthcare provider recommendations significantly increase the likelihood that parents would vaccinate their children. In a study by Jeudin et al. (2014), the likelihood of vaccination uptake was increased 18-fold through healthcare provider recommendations. Healthcare providers are seen as the most trusted and influential source of vaccine uptake knowledge among parents and a healthcare professional's knowledge and attitude can have a major impact on the decision-making processes of parents regarding whether to vaccinate their children (Hoque, 2016). This is evident in Extract 1 below which was gathered from the open-ended survey question: "Are you likely to vaccinate your daughter in the future? Why? Why not?"

Extract 1

She'll go for her gynae check-ups which should be good enough? If the gynae suggests vaccination, we'll do that.

Decided to do it after consultation with a gynae.

Doctor advised me to vaccinate.

Trusted medical professionals have advised that it is effective and safe.

Meanwhile, vaccine hesitancy and suboptimal HPV vaccine uptake among adolescents could be due to the lack of healthcare providers' recommendations or their negative attitudes towards HPV vaccination as seen in Extract 2. Contradictory opinions between healthcare providers can lead to uncertainty and the resultant hesitancy among decision-makers. It is therefore important that healthcare professionals give accurate information regarding the HPV vaccine and base their recommendations on facts rather than personal opinions. Should the healthcare provider advise against the vaccine, then the claim should be scientifically substantiated. A study by Shapiro et al. (2018) found that healthcare provider recommendations played an important role in vaccine uptake among parents who were not only accepting of the HPV vaccine, but also for those who were uncertain or hesitant.

Extract 2

I did some research as my daughter has had all her other vaccines however, I was sceptical about this particular one. After a chat with my GP, he also had his reservations, so I opted out of it.

Medical advice from gynae not to.

Additional influences toward vaccine uptake may include the attitudes and beliefs of partners, friends, family and online social networks and the media. Very little is known about the effect of spousal influence on vaccination, however a study by Berenson et al., (2014) showed that when fathers or partners were consulted in the decision-making process, HPV vaccine uptake among adolescents declined. Moreover, little is known about the perspectives of fathers on HPV vaccination. Reportedly, men have a lower level of knowledge regarding HPV infection and were less likely to report vaccination in their sons (Berenson et al., 2014). Due to a lack of understanding on how HPV is transmitted, fathers may be blind to the severe consequences of infection among both female and male adolescents. It is therefore crucial to consult both parents when it comes to education efforts regarding vaccine uptake.

Furthermore, inaccurate information and sensationalised media reports contribute to vaccine hesitancy and refusal among decision-makers. In developed countries, health information is predominantly gathered through internet searches (Attipoe-Dorcoo et al., 2018). In general, vaccines, as a technology, are widely accepted in South Africa (Delany-Moretlwe et al., 2018). One study reportedly found that 28% of online articles regarding HPV and the vaccine held a negative tone and contained inaccurate information (Attipoe-Dorcoo et al., 2018). In addition, a study based in the United States found that 50% of 200 media articles were not necessarily 'in favour' of the HPV vaccine and repeatedly lacked accurate and comprehensive information about the vaccine, HPV, and cervical cancer (Attipoe-Dorcoo et al., 2018). Mothers in this study raised concerns regarding the harmful side-effects they believe are caused by the vaccine and have subsequently refused to vaccinate their daughters as seen in Extract 3.

Extract 3

Far too many adverse effects globally … Terrible reading about all the damaged kids, girls and boys. Even in South Africa, there has been severely injured kids due to this terrible vaccine …

My daughter investigated the HPV vaccine for her matric research task and her findings did not create confidence in the vaccine. Too many side effects.

I do not know enough about the vaccine, and have heard bad stories about it …

The absolute risk of contracting cervical cancer from HPV infection does not justify the risks associated with the HPV vaccine, even less when taking into account the success of Pap smear tests. Recent multiple scientific evidence regarding the toxicity of Aluminium adjuvant seals the deal.

They are a toxic concoction of chemicals fast tracked by the CDC and FDA and never undergone proper testing. They have killed and maimed more kids than any others. Also there is no point to this vaccine – pseudo science made for the minions to fear yet another disease that the magical vaccine industry can save them from …

In their analysis, Attipoe-Dorcoo et al. (2018) found that the majority of online media reports following the national HPV vaccine roll-out reported on the effectiveness of the vaccine, but rarely mentioned (36%) the safety and side effects of the vaccine. A lack of reporting this information may influence the acceptance of the vaccine among decision-makers. Burnett (2014) further explains that allegations made regarding the SAEs of the vaccine originate from the Vaccine Adverse Events Reporting System (VAERS) in the USA. This database is overly sensitive to adverse effects and does not account for specificity. Moreover, any individual can report an adverse event/side effect without any substantial evidence which makes the database vulnerable to false claims and inaccurate reporting. Furthermore, the HPV vaccines do not contain any viral DNA or carcinogenic matter (Botha & Dochez, 2012; Tathiah et al., 2015;). Mothers also mentioned that the vaccine is not a necessary preventative measure because their daughters would still need to go for annual Pap smears. This can be a costly measure for individuals, especially when gynaecological visits are not covered by private

medical care. In addition, cervical cancer screening, as a preliminary preventative measure for HPV, is less effective for younger women (Benard et al., 2012). A few mothers in this study also stated that they do not know enough about the virus or the vaccine. This could be an important gap to bridge with accurate information and recommendations from a trusted healthcare provider.

5.3.2 Accessibility

Findings from this study showed that mothers who found the vaccine to be easily accessible (e.g. "I feel that the process of getting the HPV vaccine for my daughter would be easy") were more accepting towards giving their daughters the vaccine. A study by DiAngi et al. (2011) found that mothers living in Botswana accessed the vaccine, firstly through public clinics (42%) and secondly, through gynaecological practices (39%). However, 74% of mothers were willing to vaccinate their daughters if it became available at their daughters' schools. Nevertheless, in other studies, distance from clinics or medical professionals did not deter women from taking up the vaccine for their daughters (Cunningham et al., 2014). Based on the demographic and socio-economic characteristics of this sample, accessibility was not a barrier to vaccine uptake. However, a few mothers raised concerns regarding the affordability of the vaccine as seen in Extract 4 below.

Extract 4

Very expensive. Girls not sexually active.

Vaccination is needed against cervical cancer, but the cost is prohibitive.

The last time I inquired from my gynaecologist as to how much the vaccination costs, I found out that it was beyond my means thus making it a luxury as opposed to an immediate need. Basically, I found it inaccessible.

5.4 Limitations

This study aimed to contribute to the growing area of research pertaining to the association between maternal attitudes and socioeconomic and demographic factors with

regards to the HPV vaccine uptake among adolescent daughters, which remains specifically understudied in the private health sector of South Africa. This study partly consisted of participants recruited from medical facilities who have access to private health care, although majority of responses were came from social media. Because only 14 participants from private medical facilities partook in the survey, it is unclear as to what percentage of participants accessing the survey through social media had access to private medical care. Moreover, the demographic and socio-economic characteristics of the sample indicated that the survey reached individuals from high-middle SES who had access to the use of a smart device in order to take part in the survey. However, it cannot be assumed that participants from social media platforms accessed private medical facilities only. This study is therefore limited as to what it can contribute to the context of the broader population of South Africa and findings cannot be generalised. The study sample might also not be fully representative of the greater South African population and it remains unclear as to how perception and attitudes of mothers might differ when the HPV vaccine is accessible to them through private health care.

When using an online survey, potential response bias from self-reported measures needs to be considered. The number of survey items may also have been perceived as too high which could lead to participant fatigue. This was evident in the missing data of the last scale (HABS) for a number of participants. Social bias could also account for participants being positive towards the HPV vaccine, yet the percentage of adolescent uptake was poor. Additionally, a quantitative study might not capture individual and contextual factors that underlie this layered health problem. It is recommended that a mixed methods study be applied to better assess this complex and morally sensitive phenomenon of adolescent HPV vaccination. The use of online social platforms showed that individuals who deemed themselves as “anti-vax”, did not want to participate in this kind of study as it was presumed to be an agenda to promote HPV vaccination. It appears that there is a lot of mistrust from society regarding research on HPV and the vaccine. Noticeably, there are also limited credible resources that account for the risk and SAEs that have been reported following immunisation with the HPV vaccine and this might also account why this is lacking in media reports. Despite this, some of the findings in this study are in line with previous research with regards to positive maternal attitudes in general, levels of HPV knowledge, demographics/socio-economic variables, as well as the inconsistencies found among them.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The Human Papillomavirus is a causative agent of various human cancers. HPV is known to be the only preventative STI through vaccination that ultimately prevents cervical cancer of which 70% and higher is linked to high-risk HPV strains 16 and 18. Globally and locally, many women lose their lives to cervical cancer especially with the increasing prevalence of HPV. The World Health Organisation (WHO) and other healthcare organisations recommend that the vaccine be given to adolescents (10–19 years old) before the age of sexual debut to ensure the most effective immunisation of these individuals. The HPV vaccine has been shown to reduce the prevalence of HPV infections in adolescents and subsequently decreases the cervical cancer rates among young vaccinated women (Jeudin et al., 2014). Since the national HPV vaccine roll-out among young girls in the public-school system in 2014, adolescent vaccine uptake remains suboptimal in South Africa. Maternal acceptance has been cited as an understudied, yet fundamental, factor to consider in the effective implementation of vaccination efforts, especially when considering childhood and adolescent vaccines. Therefore, this study aimed to understand the maternal factors and attitudes that affect vaccine uptake among adolescent daughters.

This study shows that maternal age, race, and other socio-economic factors do not play a significant role in adolescent vaccine uptake. This is consistent with other findings and could be related to the complex and diverse nature of demographical and socio-economic characteristics of mothers across the world. In addition, the sample of this study was limited to individuals from a higher SES that had access to a smart-device and social media in order to partake in this study. Religious affiliation, source of income, and marital status showed significant results regarding vaccine uptake. Mothers who were Catholic or non-religious were more likely to vaccinate their daughters as oppose to mothers who were Christian. Mothers who were married were less likely to vaccinate their daughters due to the influence of spouses as well as shared income. The study also aimed to gather data from mothers who had access to private healthcare and have visited a gynaecological practice recently (through flyers), but only 14 participants responded through this method. However, a study by Francis and Katz (2013) showed that, despite a mother's geographical location, socio-economic standing and

demographical characteristics, mothers shared the same concerns regarding the welfare of their daughters which included the prevention of HPV-related disease and the vaccine.

A positive attitude toward the HPV vaccine was positively correlated and associated with vaccine uptake. Mothers who held a more positive view towards the HPV vaccine were more likely to have vaccinated their daughters. Communication (e.g. “I feel that it is hard to talk to my daughter about her sexual health”) was not associated with vaccine uptake. The strongest predictors for vaccine uptake, regardless of a mother’s level of knowledge and socio-economic and demographic characteristics, were the influence of friends, family and healthcare providers. In the extracts, mothers reported that healthcare provider recommendations played an important role in the decision to vaccinate their daughters. The opposite is also true. A lack of recommendations or uncertainty regarding the vaccine from healthcare professionals influenced mothers to not vaccinate their daughters.

Furthermore, there was a concern regarding the SAEs and side-effects related to the HPV vaccine that increased vaccine hesitancy among mothers. These claims by mothers were mainly substantiated by media reports, VAERS and hearsay. To date, no serious adverse events have been linked to the immunisation from the HPV vaccine although longitudinal studies regarding the efficacy and adverse events of the vaccine could be beneficial in addressing parental concerns. Accessibility was also significantly associated with vaccine uptake. Mothers, who felt that the vaccine was easily accessible, were more likely to vaccinate their daughters. Considering the SES of the sample, accessibility was not seen as a barrier to vaccination. However, mothers raised concerns regarding the high cost of the vaccine that forms part of a two to three dose schedule and this could be further influenced by the who provides the main source of income for the family. In conclusion, it remains important to understand and address the barriers that play a role in vaccine hesitancy among parents, especially when children and adolescents are the target population to receive a vaccine. It is crucial for future vaccination programs to consider parental hesitancy and address concerns in order to effectively increase vaccine uptake among adolescents.

6.2 Recommendations

The high prevalence rate of HPV infections and subsequent life-threatening ailments, such as HPV-related cancers, show that prevention strategies play a key role in addressing the public health issues that HPV imposes. Since the vaccines’ availability in South Africa in 2009, low levels of adolescent vaccine uptake from parents for more than a decade indicate the

importance of addressing parental vaccine hesitancy and producing supportive programmes to effectively accelerate vaccine uptake (Newman et al., 2018). The demographic characteristics of this sample was predominantly White, middle-aged mothers from high-middle income families. Further research is recommended to target mothers of colour as HPV prevalence and subsequent HPV-related diseases are more commonly found in these vulnerable populations due to their different socio-economic status and unequal access to healthcare. Moreover, racial disparities also exist with regards to vaccine completion, making Black adolescent girls more vulnerable to contracting HPV at an earlier sexual debut compared to other racial groups (Jeudin et al., 2014). South Africa has a high prevalence rate of HIV infected individuals who are five times more likely to become co-infected with high-risk strains – such as HPV 16 and 18. It is therefore recommended that additional research be conducted among a higher-risk sample to identify reasons for vaccine incompletion and to develop initiatives that will address these concerns (Jeudin et al., 2014).

Current HPV vaccination efforts have been focused on the immunisation of girls. However, research suggests that including boys in vaccination efforts will reduce transmission rates and contribute towards the prevention of HPV disease burdens (Agorastos et al., 2015). It is also important to note that HPV is attributable to a substantial rise in noncervical cancers in men which include penile, anal, and head and neck -cancers (Olesen et al., 2014). Therefore, future vaccination efforts should aim to include the coverage of both girls and boys to effectively reduce HPV infections and subsequent health risks present in both genders. Additionally, research reports that conservative religions could be a possible barrier to vaccine uptake due to the belief that the vaccine might increase sexual risk-taking behaviour. This is evident that most of the sample (Christians) had daughters who were not vaccinated. Kahn et al. (2015) suggests that knowledge interventions about the facts and fallacies of HPV and the vaccine could create opportunities between parents, adolescents, and healthcare providers to develop accurate risk perceptions.

Furthermore, it is recommended that individuals who address society and parents be well informed about the data that exists regarding HPV, the HPV vaccine and its association with cervical cancer. Healthcare provider recommendations have been cited as a crucial factor of vaccine acceptance. Vaccination efforts should be focused on providing parents with information opportunities to discuss HPV risks and the vaccine in the presence of a medical healthcare professional. It is imperative, due to the influence and shared role that fathers may have in the decision-making process, that educational efforts around HPV and the vaccine also

include male responsibility. There is also a need to further examine the role of fathers in adolescent vaccination. Moreover, vaccination agendas against HPV should highlight the main preventative action as not only the fight against cervical cancer in women, but also highlighting other HPV-related cancers among both men and women. Furthermore, it is important to note that non-sexual transmission of HPV is rare, but plausible. Therefore, rather than promoting the vaccine as a STI preventative measure, it should be communicated that HPV infection is a causative agent of cancer among humans. This message might deter the belief that the vaccine increases sexual risk-taking behaviour and 'promiscuity' among adolescents, especially when targeting parents who are religiously conservative.

Considering the accessibility and costs of the vaccine, school vaccination programs remain preferable. A study by Tathiah et al. (2015) reported that vaccine uptake would increase if there was extensive communication between all stakeholders (e.g. healthcare providers, Departments of Health and Education, school bodies and parents) especially when it came to addressing parental consent and concerns, community engagement, the role of the media in creating awareness and spreading accurate information, and lastly to include the leadership of members in the public, community and private health sectors. It remains important to address the efficacy and safety of the vaccine even if it is freely provided. Further research is recommended to explore vaccination barriers among different sample populations in South Africa as well as to explore the attitudes of mothers regarding the vaccination of their adolescent sons to gauge whether future male vaccination efforts will be feasible for herd immunity.

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APPENDIX A: Ethical Clearance

School of Human and Community Development

Private Bag 3, Wits 2050

Johannesburg, South Africa

Tel: 27 (0)11 717 4524/5 Fax: 27 (0)11 717 4556

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Ms L Graaff

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M190678

NAME: (Principal Investigator)	Ms L Graaff
DEPARTMENT:	School of Human and Community Development Department of Psychology University
PROJECT TITLE:	Maternal attitudes and factors associated with the Human Papillomavirus (HPV) vaccine uptake among adolescent daughters
DATE CONSIDERED:	2019/06/28
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr S Mkwananzi
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2019/11/06

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report.** When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **June** and will therefore reports and re-certification will be due early in the month of **June** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

APPENDIX B: Recruitment Flyer

School of Human and Community Development

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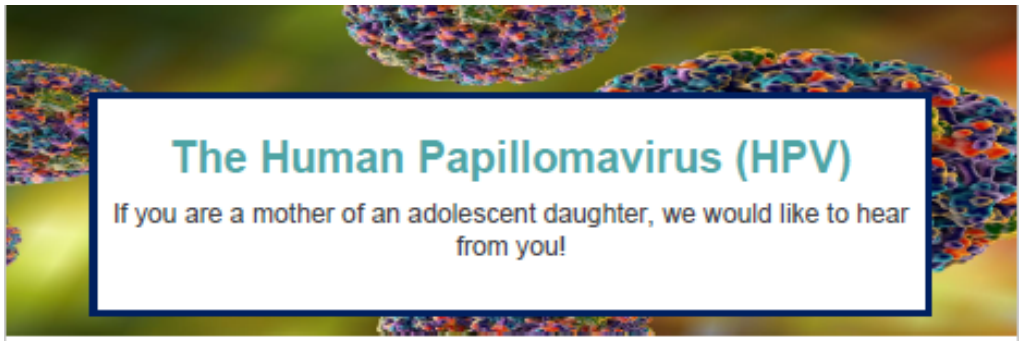
Tel: 27 (0)11 717 4524/5 Fax: 27 (0)11 717 4556



The Human Papillomavirus (HPV)

If you are a mother of an adolescent daughter, we would like to hear from you!

Adolescent HPV Vaccinations

HPV is known to be a highly infectious sexually transmitted virus. It has also been identified as the most prominent cause of cervical cancer, especially among young sexually active women.

This Research Study aims to explore and understand a mother's attitude and perceptions towards the HPV vaccine and their adolescent daughters. This study will contribute to the little research that exists surrounding this topic as well as to provide better insight regarding healthcare strategies and recommendations for healthcare providers and the general public.

How to participate

- Participation is completely voluntary
- Complete an online survey from any smart device
- This will take approximately 25 minutes of your time
- Participation is anonymous and confidential

Please access the survey from the following link:

https://www.surveymonkey.com/survey-hpvmaternalattitudes

OR email your interest to participate to lounette.graaff@gmail.com

Any questions?

Please contact us:

Lounette Els (Student Psychologist)
lounette.graaff@gmail.com
066 257 5160

Dr. Sibusiso Mkwananzi (Supervisor)
sibusiso.mkwananzi@wits.ac.za

WITS UNIVERSITY

University of the Witwatersrand

APPENDIX C: Participation Information Sheet

School of Human and Community Development

Private Bag 3, Wits 2050

Johannesburg, South Africa

Tel: 27 (0)11 717 4524/5 Fax: 27 (0)11 717 4556

Good Day,

My name is Lounette Graaff and as part of the fulfilment of a MA Social and Psychological degree at the University of the Witwatersrand, I am conducting a research study in the form of a dissertation paper. My research topic is: *Maternal attitudes and factors associated with the Human Papillomavirus (HPV) vaccination uptake among daughters.*

The Human Papillomavirus (HPV) is known to be a highly infectious sexually transmitted virus. It has also been identified as the most prevalent causative agent of cervical cancer, especially among young sexually active women. This study will aim to contribute to the little research that exists surrounding this topic as well as to provide better insight regarding healthcare strategies and recommendations for healthcare providers and future research.

Participation in this study will involve completing an online survey/questionnaire that will take approximately 25 minutes of your time. The data gathered from the survey will be kept safe on the researcher's laptop and will only be accessible to my supervisor and myself to ensure confidentiality. No form of personal identity will be used in any of the data collected or final paper. Please note that participation is completely voluntary. You can withdraw from this study at any time without any repercussions. Please note, that you can only complete the survey at one time and cannot return to it.

There is no anticipated risk from participating in this study. However, the focus of this research includes not only your opinion but also questions of a personal nature and issues concerning the welfare of your child. Should you feel uncomfortable with any of the questions, you are welcome to leave them unanswered. In addition, should you feel that you require support after completing this survey you can seek assistance from Lifeline, which provides confidential

counselling services available at no cost to all sectors of the community regardless of race, religion or social standing. You can contact Lifeline Pretoria or Johannesburg at the following numbers:

Lifeline Pretoria

Services and contact numbers:

- Telephone counselling service / crisis line – 012-804-3619 or 0861-322-322
- Face to Face counselling (by appointment) – 012-804-1853

Lifeline Johannesburg

Services and contact numbers:

- Telephone counselling service- 0861-322-322
- Face to Face counselling (by appointment) – 011-728-1347
- WhatsApp Counselling- 065-989-9238

After the study is completed, I will be happy to share the results with you if requested. To do so, contact me and I will add you to a mailing list to send the results once it has been approved. Should you choose to participate in this study, kindly answer the question below to continue to the survey questions.

Should you have any further questions or concerns, please feel free to contact me or my supervisor on the details which appear below.

Warm regards,

Lounette Graaff | Student Psychologist (PS0147729)

Tel: 066 257 5160

E-mail: lounette.graaff@gmail.com

Supervisor:

Dr. Sibusiso Mkwananzi

E-mail: sibusiso.mkwananzi@wits.ac.za

Question: Do you consent to participate in this online survey?

YES NO

APPENDIX D: Online Survey

School of Human and Community Development

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