

**Awareness, Knowledge and Attitudes about Human Papilloma Virus among Female
Tertiary Students in South Africa**

Admire Takuranenhamo Chikandiwa

A Mini-thesis Submitted in Partial Fulfilment of the Requirements of the Masters in Public
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Supervisor: Dr Brian Van Wyk

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ABSTRACT

Background: Human Papilloma Virus (HPV) is the etiological agent in cervical cancer. There is a high prevalence of HPV infection among South African (SA) women, and cervical cancer is the second most common cancer among them. Two HPV vaccines, Cervarix and Gardasil, have recently been licensed for use in SA and models show that vaccination may lead to about 70% decline in cervical cancer cases. However, there is a need to know how to effectively promote and deliver the vaccines to ensure optimal uptake and coverage. Little research has been done in SA to describe women's knowledge of HPV and cancer of the cervix. Moreover, the correlates and the predictors of women's interests in receiving the HPV vaccine have not been characterized. It is therefore necessary to have locally obtained data which would guide the formulation of policies on the introduction and propagation of HPV vaccination in SA.

Aim: The study aimed to describe the knowledge and awareness of HPV infection and vaccine of female university students and to determine the predictors of vaccine acceptability.

Methodology: A cross-sectional survey on a stratified sample of 150 female students was conducted. Self-administered questionnaires were used to gather information on the students' sexual behavior, awareness and knowledge about HPV infection and HPV vaccine and their health related beliefs.

Analysis: Means and frequencies were used for descriptive analysis. Logistic regression was used assess to determine the predictors of willingness to be vaccinated.

Results: The study found that 70% of the participants were sexually active. Awareness and knowledge on HPV/vaccine were poor; with only 22% being aware of HPV and that a HPV vaccine was available in South Africa. A greater proportion (80%) reported willingness to be vaccinated. Being aware of the existence of a pap smear, higher knowledge about HPV, higher perceived vaccine effectiveness and higher perceived severity of HPV infection were significantly associated with increased willingness to be vaccinated.

Recommendations: There is need for education about HPV and vaccination in South Africa. An effective vaccine marketing strategy should emphasise the effectiveness of the vaccine, susceptibility to contracting HPV and its severity. Lobbying should also be done for the reduction in the cost of the vaccine.

Declaration

I declare that **Awareness, Knowledge and Attitudes about Human Papilloma Virus among Female Tertiary Students in South Africa** is my own work that has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.

Admire Takuranenhamo Chikandiwa

September 2010



Signed..... 

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Definition of Terms

Human Papilloma Virus (HPV): HPV is a member of the papilloma virus family of viruses that is capable of infecting humans and establish productive infections only in the stratified epithelium of the skin or mucous membranes (Schiffman and Castle, 2003).

Cervical Intraepithelial Neoplasia (CIN): CIN, also known as cervical dysplasia, is the potentially premalignant (precancerous) transformation and abnormal growth (dysplasia) of squamous cells on the surface of the cervix. Even though most cases of CIN remain stable, or are eliminated by the host's immune system without intervention, a small percentage of cases progress to become cervical cancer if left untreated (Kumar, Abbas, Fausto and Mitchell, 2007).

CIN 1: Is the least risky type, represents only mild dysplasia or abnormal cell growth and is confined to the basal 1/3 of the epithelium. It corresponds to infection with HPV, and typically will be cleared by immune response in a year or so, though can take several years to clear (Kumar *et al.*, 2007).

CIN 2: Moderate dysplasia confined to the basal 2/3 of the epithelium (Kumar *et al.*, 2007).

CIN 3: Severe dysplasia that spans more than 2/3 of the epithelium, and may involve the full thickness. This lesion may sometimes also be referred to as cervical carcinoma in situ (CIS) (Kumar *et al.*, 2007).

Cervical Cancer: It is a disease in which the cells of the cervix become abnormal and start to grow uncontrollably, forming tumours (Kumar *et al.*, 2007).

Model: A model can be thought of as a theory that is constructed to explain, predict and master phenomena such as events, or behavior of animals or humans (Ford, 2009).

Low grade squamous intraepithelial lesion (LSIL or LGSIL): usually indicates mild dysplasia and generally corresponds to the histological classification of CIN 1 (Apgar, Zoschnick and Wright, 2003).

High grade squamous intraepithelial lesion (HSIL or HGSIL): indicates moderate or severe Cervical Intraepithelial Neoplasia or carcinoma in situ and generally corresponds to the histological classification of CIN 2 or 3 (Apgar *et al.*, 2003).



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Chapter 1: Introduction

This study describes knowledge of female students about Human Papilloma Virus (HPV), cancer of the cervix (cervical cancer) and the predictors of HPV vaccine acceptability. The first section of this chapter provides brief profiles of the country and the university. It discusses the pathological background of HPV, its causal link with cancer of the cervix and current ways of managing cervical disease. This is followed by a description of the burden of HPV infection and cancer of the cervix at global, regional and national levels. The statement of the problem, rationale of the study, relevant research questions as well as the hypotheses that were tested, are presented and then followed by a brief chapter summary and layout of the rest of the mini-thesis.

1.1. South Africa

Health indicators in South Africa are poor, with the heavy burden of HIV/AIDS reversing earlier improvements in life expectancy and mortality. The under-five mortality rate was reported to be 67 per 1 000 in 2000 while HIV/AIDS was the single most important cause accounting for 57% of these deaths (WHO, 2006). The same report estimated the maternal mortality ratio to be 230 per 100 000 live births. In 2002, AIDS ranked 1st among the top ten causes of death, accounting for 52% of the causes with cerebrovascular diseases coming second (5%), and all the other causes accounting for less than 5% individually (WHO, 2002).

1.2. The Profile of the University

At the time of the study (2009), this university* was serving a total of over 8,500 students (University Registrar's office, 2009). The University has five faculties namely: Education, Law, Management & Commerce, Science & Agriculture and Social Sciences & Humanities. In terms of student enrolment in 2009, Faculty of Social Sciences & Humanities was the largest with 2397 students followed by the Faculties of Management & Commerce, Education, Science & Agriculture and Law which had 2080, 1901, 1394 and 776 students respectively (University Registrar's office, 2009).

* Following a discussion by the university's management at the time of data collection, it was agreed, for confidentiality reasons that throughout this thesis the researcher was not supposed to disclose the identity of the institution

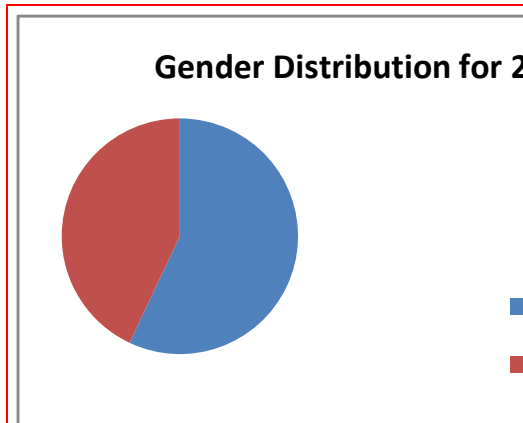


Fig. 1: Gender distribution of students (University Registrar's Office, 2009).

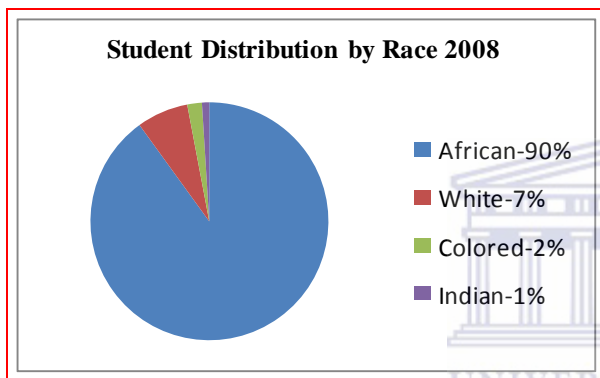


Fig. 2: Race distribution of students (University Registrar's Office, 2009).

The university enrolment, as shown in Fig. 2, is predominantly made up of African students. In 2008, the student distribution was 90% African, 7% white, 2% colored and Indian 1%. Fig. 1 shows that in the same year, the gender distribution was 57% women vs. 43% men. In 2008, undergraduate students (diploma, 3 or 4 year bachelors degrees) constituted the majority of the students as shown in figure 3.

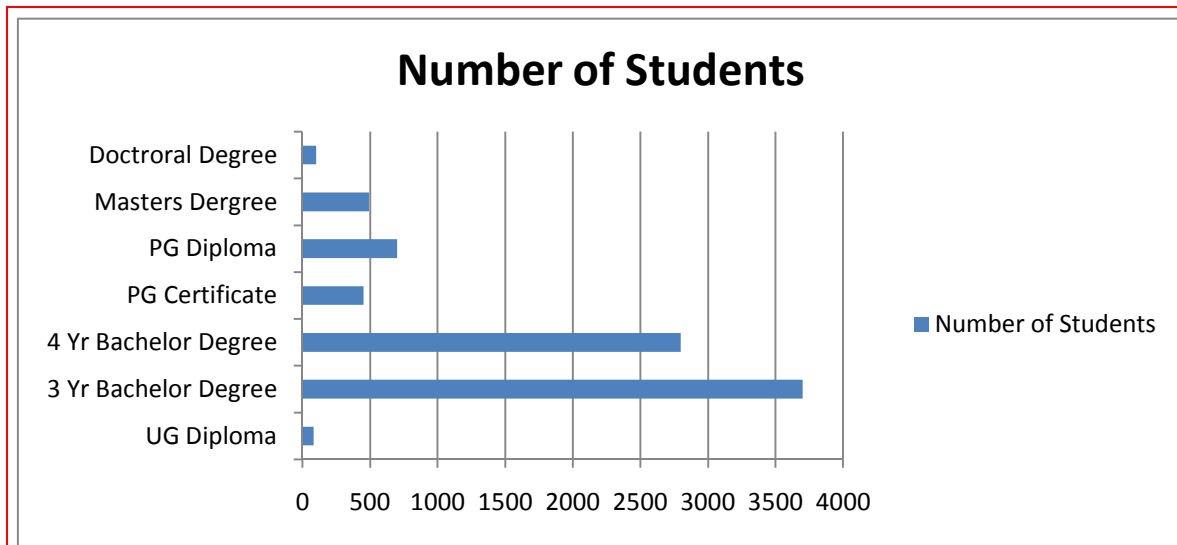


Fig. 3: Student distribution by qualification type (University Registrar’s Office, 2009).

1.3. Human Papilloma Virus



Pathological Background

Human Papilloma Virus (HPV) is a virus that is generally spread through skin-to-skin contact that occurs during sexual intercourse. However, in some cases, non-penetrative sexual contact can also lead to HPV infections (Winer, Lee, Hughes, Adam, Kiviat and Koutsky, 2003). There are over 30 strains of HPV that exist and infect the genital area (Daley, 1998; International Agency for Research on Cancer [IARC], 1995; Koutsky, 1997).

Genital HPV infections are categorized by their association with cervical cancer (Daley, 1998; IARC, 1995). Two HPV strains, types 6 and 11, categorized as low-risk types, can cause benign cervical cell changes and cause nearly all male and female genital wart infections. Human Papilloma Virus (HPV) is the etiological agent in cervical cancer and it has been shown to be a necessary but not a sufficient cause of cervical cancer (Munoz, Castellaque, Berrington, Gonzalez and Gissmann, 2006).

Approximately 20 HPV strains can cause cervical cancer in women (IARC, 1995). However, four are accountable for the majority of cases and known as high-risk types (IARC, 1995). The oncogenic or high risk types of HPV contain the E6 and E7 genes which code for the

tumour suppressor protein binding oncoproteins and are found in virtually all cases of invasive cervical cancer (Kirnbauer, 1996). Types 16 and 18 together, cause about 70% of cervical cancer, and Types 31 and 45 together cause another 15% (IARC, 1995; Hoover, Carfioli and Moench, 2000; Winer *et al.*, 2003). Over 99% of cervical cancer cases result from genital infection with human papillomavirus (WHO, 2005).

Table 1: Papillomavirus types involved in different human cancers (WHO, 2005)

Type of Cancer	Papillomavirus types involved	Percentage HPV Positive
Cervical	16, 18, 31, 33, 35, 39, 45, 51, 58, 59, 66	>95
Vulval	16, 18	>50
Penile	16, 18	>50
Vaginal	16, 18	>50
Anal	16, 18	>70
Oral Cavity	16, 18, 31	~25
Nail bed	16	~75



Infection with high-risk HPV is also associated with the growth of other malignancies (table 1) including oral, vulva, penile and anal cancers (Castle, Schiffman, Bratti, Hildesheim, Herrero and Hutchinson, 2004; Gilson and Lowy, 2004). Frisch found that about 90% of anal cancers among women, 58% among heterosexual men, and 100% among homosexual men were positive for high-risk HPV DNA (Frisch, 2002).

The association of HPV of the genitals with non-genital cancers (i.e. head, neck and esophageal cancers) has been less well established, but studies do support the possibility (Herrero, Castellsague, Pawlita, Lissowska, Kee and Balaram, 2003).

Most individuals become infected during the first few years of initiating sexual activity, thus, it is common among adolescents or those in their early twenties (Berkow, Beers and Fletcher, 1997; IARC, 1995; Harries, Moodley, Barone, Mall and Sinanovic, 2008). Most of the HPV

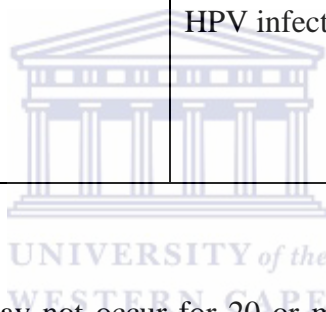
infections are asymptomatic. It has been shown that the median duration of the new infection is normally eight months; about 70% of new infections clear up within one year and 91% clear within two years (Franco, Villa, Sobrinho, Prado, Rousseau and Desy, 1999; Molano, Ven den Plummer, Weiderpass, Posso and Arslan, 2003). HPV cervical infection results in cervical morphological lesions ranging from normalcy (cytologically normal women) to different stages of precancerous lesions (CIN-1, CIN-2, CIN-3/CIS) and invasive cervical cancer.

1.4. The development of cervical cancer

Human papillomavirus (HPV) infection has been established as the necessary, but not solely sufficient, cause of cervical cancer (Walboomers, 1999). The vast majority of women infected with an oncogenic HPV type never develop cervical cancer, which suggests that additional factors acting in conjunction with HPV influence the risk of disease development. Rates of HPV infection spontaneously resolving on its own or progressing to cervical cancer without treatment vary for low-grade and high-grade cervical cell abnormalities. Low-grade cervical cell abnormalities typically resolve spontaneously (60%) and rarely progress to cancer (1%). However, without treatment, high-grade cervical cell abnormalities spontaneously resolve much less often (30-40%) and progress to cancer without treatment much more often (12%) (Ostor, 1993).

Table 2: Progression from HPV infection to cancer (Alliance for Cervical Cancer Prevention, 2003).

HPV Infection	Mild Cervical Dysplasia	Severe Dysplasia	Cervical Cancer
<p>Infection is extremely common among women of reproductive age.</p> <p>Most cases remain stable or become undetectable. A small percentage of cases lead to abnormal cell changes (within months/years of Infection).</p>	<p>These abnormal cell changes are usually temporary and disappear over time.</p> <p>Some cases, however, progress to severe dysplasia.</p>	<p>The precursor to cervical cancer, severe dysplasia is far less common than mild dysplasia.</p> <p>Severe dysplasia can progress from mild dysplasia or, in some cases, directly from HPV infection.</p>	<p>Invasive cancer develops over many years and is most common among women in their 50s and 60s.</p>



Progression to cervical cancer may not occur for 20 or more years after the first infection with HPV occurs, while genital warts normally appear one to six months later (IARC, 1995; Koutsky, 1997). Co-factors such as parity, use of oral contraceptives, tobacco smoking, immune suppression particularly related to human immunodeficiency virus (HIV), infection with other sexually transmitted diseases, and poor nutrition have been associated to various extents with the development of invasive cervical cancer.

1.5. Risk factors for progression to cancer

A systematic review of eight case-control studies on invasive cervical cancer and two studies on carcinoma *in situ* (CIS) from four continents suggest that, compared to women who had never given birth, those with three or four full-term pregnancies had 2.6 times the risk of developing cervical cancer; women with seven or more births had 3.8 times the risk (Muñoz, Franceschi, and Bosetti, 2002). Other studies confirmed this positive correlation between high parity and cervical cancer (Brinton, Reeves and Brenes, 1989; Thomas, Qin and

Kuypers, 2001; Castellsague and Munoz, 2003). The physiologic reason for the association is unclear, but possibilities include hormonal factors related to pregnancy or cervical trauma.

Evidence from research proposes that there is a potential long-term relationship between prolonged use of oral contraceptives and development of cervical cancer. Analysis of data pooled from ten case-control studies of patients with invasive cervical cancer or CIS suggest that long-term use of oral contraceptives could increase the risk of cervical cancer by up to four-fold in women with HPV infection (Moreno, Bosch and Munoz, 2002). Similar findings have been confirmed by other studies (Smith, Green, Berrington, Appleby, Peto and Plummer, 2003; Castellsague and Munoz, 2003).

Smoking also appears to be strongly associated with the development of precancerous cervical lesions and cancer (Hildesheim, Herrero and Castle, 2001; Castellsague and Munoz, 2003). It is among the most consistently identified environmental factors likely to influence the risk of cervical cancer. Studies show at least a two-fold risk for current smokers compared to non-smokers (Hildesheim *et al.*, 2001; Szarewski and Cuzick, 1998; Castellsague, Bosch and Munoz, 2002).

Women infected with HIV are more readily infected with high risk HPV types and are more likely to develop precancerous lesions (and develop them more rapidly) than HIV-negative women in the same age category (De Sanjose and Palefsky, 2002; Clarke and Chetty, 2002; Gaffikin, Ahmed, and Chen, 2003). Studies done in Africa confirmed the same findings (Parkin, Wabinga, Namboozee and Wabwire-Mangen, 1999; Sitas, Bezwoda and Levin, 1997).

Women who are co-infected with HPV and other sexually transmitted agents, such as *Chlamydia trachomatis* or herpes simplex virus-2 (HSV-2), are more likely to develop cervical cancer than those who are not co-infected. One pooled analysis of seven case-control studies examining the effect of HSV-2 infection in the etiology of invasive cervical cancer found that among HPV DNA-positive women, HSV-2 was associated with about a three-fold increased risk of developing cervical cancer after adjustment for potential confounders (Smith, Herrero and Bosetti, 2002).

Low socio-economic status (SES) is recognized as a risk factor for many health problems, including cervical cancer, particularly in low-resource settings (Dos Santos and Beral, 1997). Women with low SES often have limited income, restricted access to health care services,

poor nutrition and a low level of awareness about health issues and preventive behavior. All of these factors can make them more vulnerable to illness and preventable diseases such as cervical cancer.

1.6. Prevention/Management of cervical disease

Such an in-depth knowledge about the natural history of the disease (cervical cancer) means that several ways to prevent the disease can be found. The precancerous changes in cervical tissue can linger for years, but if they are identified and successfully treated early, the lesions will not develop into cervical cancer (IARC, 1995). Thus, cancer of the cervix is a highly preventable disease which has primary and secondary levels of prevention (WHO, 2005).

Primary prevention is supportive of efforts to increase public knowledge and the ability of individuals to make healthy lifestyle choices as well as creating environments that assist individuals in making healthy choices (Kaufman, Adam, Icenogle and Reeves, 1997). For instance, women should stop smoking or preferably never start smoking, use barrier methods during intercourse to prevent the spread of the HPV and other sexually transmitted diseases, postpone sexual activity to older age and decrease parity. Secondary prevention on the other hand, aims at early detection (screening) and treatment of precursors by the use of regular pap smears (Alliance for Cervical Cancer Prevention, 2003).

Table 3: Current ways of managing cervical disease (Alliance for Cervical Cancer Prevention, 2003).

HPV Infection	Mild Cervical Dysplasia	Severe Dysplasia	Cervical Cancer
There is no treatment to eliminate HPV.	Mild dysplasia generally should be monitored rather than treated since most lesions do not progress to cancer.	Severe dysplasia should be treated, as a significant proportion of cases progress to cancer.	Treatment of invasive cancer is hospital-based, expensive, and often not effective.

Traditional cervical cancer screening is based upon microscopic examination of cervical cells for abnormalities (Alliance for Cervical Cancer Prevention, 2003). Introduced in the 1950s, the Papanicolaou smear test, which involves scraping cells from the cervix, staining and examining them under a microscope, is one of the most successful cancer screening tools ever developed. With varying estimates of sensitivity and specificity, the test is not perfect. Yet between 1955 and 1992, deaths from cervical cancer in the US dropped by 74% as a direct result of the use of the Pap test in routine gynecological screening (Kaufman *et al.*, 1997).

Most screening policies follow a triage system for detection, treatment, and follow-up of cervical abnormalities (Kaufman *et al.*, 1997). Conservative triage schemes are based upon the assumption that most mild cervical abnormalities spontaneously regress to normal. Such schemes are, therefore, typically cautious about rushing into expensive treatments. In the UK for example, recommended policy states that women with a smear report indicating a 'mild' abnormality (LSIL: CIN1) should return for a second smear test in 6 months. If an abnormality appears again, immediate colposcopy is indicated. If the smear is negative and is followed by a second negative smear in 6 months time, she may return to a schedule of routine screening (Jenkins, Sherlaw-Johnson and Gallivan, 1996).

More aggressive triage schemes are based upon the principal that 'it's better to be safe than sorry' (Kaufman *et al.*, 1997). The National Cancer Institute of the United States recommends that a woman with a mildly abnormal smear test should be re-screened in 3 months, rather than 6. A second abnormal reading indicates that immediate colposcopy is warranted. If the follow up test is normal, she should be re-screened every 6 months. After at least three consecutively negative smears, she may then return to a routine schedule of annual tests (Kaufman *et al.*, 1997).

The South African cervical cancer-screening policy and the programme implemented since 2001 attempts to reduce the incidence of cervical cancer by 70% (Department of Health, 2003). Three free smears per lifetime are recommended for the program, commencing after the age of 30 and with a 10-year interval between each smear.

Treatment of Cervical Intraepithelial Neoplasia (CIN) and invasive cervical cancer becomes progressively more complex and costly as severity of the lesion increases (WHO, 2005). CIN

can generally be treated by various methods of excision, but invasive cancer usually requires radiation, chemotherapy, or surgery (including cryosurgery, laser surgery, or hysterectomy). These higher levels of treatment are frequently uncomfortable for the patient and may involve many side effects. All women diagnosed and treated for CIN (1, 2, or 3) can expect to survive for at least 5 years. 80–90% of those diagnosed with stage I invasive cancer will survive for at least 5 years. Far fewer will survive after treatment for higher stages of invasive cancer; 50–65% for stage II, 25–35% for stage III, and 0–15% for stage IV (Wolstenholme and Whynes, 1998). Though industrialized countries have greatly reduced deaths from cervical cancer through screening programmes that allow early detection and treatment, these programmes are expensive and difficult to implement in low-income countries such as those in Africa (WHO, 2005). It is these costs of treatment that may be avoided by introducing vaccination programmes. Thus, vaccines against HPV infections have the potential to be a more practical and cost-effective way to reduce the incidence of cervical cancer (WHO, 2005).

1.7. Burden of HPV infection

Worldwide, about 10% of women in the general population are estimated to harbor cervical HPV infection at any given time (WHO, 2007), whilst 70% and 80% of women with low grade lesions and high grade lesions respectively test positively for HPV DNA (WHO, 2007). The same report shows that about 87% of all cervical cancers world wide tested positive for HPV DNA. Human Papillomavirus (HPV) infection is one of the most common types of sexually transmitted infections in the United States (Koutsky, 1997). The highest rates of HPV infection are found in adults aged 18-28 years (Koutsky, 1997). Research demonstrates that 10% to 39% of sexually active young women, especially those of college age (18-24 years), are infected with high risk HPV at any point in time (Winer *et al.*, 2003).

South African women have a higher prevalence of HPV infection, with the highest rates of infection being found among the young sexually active adults under the age of 25 (Allan *et al.*, 2001). HPV type 16 (high risk) is the most dominant type found in South Africa (Williamson, Passmore, Marais and Rybicki, 2002). About 15.5% of women in the general population are estimated to harbor cervical HPV infection at any given time, and 63.0% of invasive cervical cancers in South Africa are attributed to HPV types 16 and 18 (WHO, 2007).

1.8. Burden of Cervical Cancer

Cervical cancer has a major impact on the lives of women worldwide, particularly those in developing countries. According to the latest global estimates, 493,000 new cases of cervical cancer occur each year among women, with about 273,000 women dying of the disease annually (Tables 4 and 5). The disease represents a major health inequity as 83% of new cases (409 000) are in developing countries where screening programs are not well established or effective (Parkin, Whelan and Ferlay, 2002; WHO, 2005). In most of these countries, cervical cancer is the leading cause of cancer deaths among women. Central and South America, the Caribbean, sub-Saharan Africa, parts of Oceania, and parts of Asia have the highest incidence rates of over 30 per 100,000 women. These rates compare with no more than 10 per 100,000 women in North America and Europe (Parkin *et al.*, 2002).



Table 4: Incidence of cervical cancer in South Africa, Southern Africa and the World (Parkin *et al.*, 2002)

Indicator	South Africa	Southern Africa	World
Crude Incidence Rate*	30.2	30.2	16
Age-standardized Incidence Rate*	37.5	38.2	16.2
Cumulative Risk (Age period 0-64yrs)	2.8	2.8	1.3
Standardized Incidence Ratio (SIR)	226	229	100
Annual number of new cases	6742	7698	493243

* Rates are per 100 000 women

Table 5: Mortality of cervical cancer in South Africa, Southern Africa and the World (Parkin *et al.*, 2002).

Indicator	South Africa	Southern Africa	World
Crude Mortality Rate*	16.5	17.5	19
Age-standardized Mortality Rate*	21	22.6	9
Cumulative Risk (Age period 0-64yrs)	1.6	1.7	0.7
Standardized Mortality Ratio (SMR)	234	252	100
Annual number of deaths	3682	4455	273505

* Rates are per 100 000 women

Cervical cancer is the most common cancer in women in sub-Saharan Africa (Parkin, Ferlay and Hamdi-Cherif, 2003). An estimated 57,000 cases of cervical cancer occurred in the year 2000, comprising 22.2% of all cancers in women, equivalent to an age-standardized incidence rate of 31 per 100,000 (Parkin *et al.*, 2003). About 60–75% of women in sub-Saharan Africa who develop cervical cancer live in rural areas, and mortality is very high (Parkin *et al.*, 2003). Many of the women who develop cervical cancer are untreated, mostly due to lack of access (financial and geographical) to health care.

The age-specific incidence rate in black African populations in Harare was 55.0 per 100,000 (Chokunonga, Levy and Bassett, 2002). Nonetheless, the true incidence of cervical cancer in many African countries is unknown as there is gross under-reporting (Anorlu, 2008). Only a few countries have functional cancer registries, and record-keeping is minimal or non-existent. Some of the figures quoted in the literature are hospital-based, which represents a small fraction of women dying from cervical cancer, as most women cannot access hospital care and die at home. Women in sub-Saharan Africa lose more years to cervical cancer than to any other type of cancer (Anorlu, 2008). Unfortunately, it affects them at a time of life when they are critical to the social and economic stability of their families.

Cervical cancer ranks as the most frequent cancer in the South African women between the ages of 15 and 44 (Parkin *et al.*, 2002). South Africa has a population of 16.48 million women from 15 years and older, who are at risk of developing cervical cancer. In 2002, it was the leading cancer among South African women, with crude incidence and Age-standardized incidence rates of 30.2 and 37.5 per 100 000 women respectively (Parkin *et al.*, 2002). In the same year, a total of more than 6700 new cases were reported (Tables 4 and 5).

Cancer of the cervix has, since the beginning of the National Cancer Registry in 1986 in South Africa, been the leading cancer in black women (Mqoqi, Kellet, Sitas and Musa, 2004). In 2002, it was reported that black females had highest ASIR of 35 per 100 000 and 1 in 25 women was at risk of developing cervical cancer (Parkin *et al.*, 2002). The second highest rate of 26.4 per 100 000 in 1999 was recorded among colored women who comprised on average 7.5% of all cervical cancer cases reported, whilst Asian women had the lowest cervix cancer incidence rates of 11 per 100 000 (Parkin *et al.*, 2002). It is therefore worth noting that the lifetime risk of developing cervical cancer in black South African females was twice that of Asian females and 2.4 times that of colored and white females combined (South African Department of Health, 2003).

The cancer of the cervix in colored and white women combined, constituted the second highest proportion (14%) to that in black women, with the lowest ASIR of 15.91 per 100 000. Asians had the least number of female cancer cases and had the second highest ASIR of 19 per 100 000 (South African Department of Health, 2003).

1.9. Factors associated with high prevalence of cervical cancer in Southern Africa

Socio-cultural factors

The necessary cause of cervical cancer, Human papillomavirus (HPV), is endemic in Africa. Furthermore, many of the factors that increase both HPV acquisition and promote the oncogenic effect of the virus are also widespread in the continent. These include: early marriages, polygamous marriages and high parity. Polygamy is accepted in many societies in sub-Saharan Africa. In some cultures, very young girls (usually virgins), are given out to marriage to much older men, most of whom have already more than one wife (Bayo, Bosch and de Sanjose, 2002; Chaouki, Bosch and Munoz, 1998). This may increase the likelihood of a girl catching HPV infection at first intercourse with her husband. Polygamy is reported to increase the risk of cervical cancer two-fold and the risk increases with increasing number of wives (Bayo *et al.*, 2002).

Socio-economic factors

Worldwide, women of low socio-economic status have a greater risk of cervical cancer. Cervical cancer is often referred to as a disease of poverty-stricken women (Denny, 2005). Poverty is endemic in sub-Saharan Africa. A recent study in Mali in West Africa showed that within a population widely infected with HPV, poor social conditions, high parity and poor hygienic conditions were the main co-factors for cervical cancer (Bayo *et al.*, 2002). Poverty, in its many ramifications, is also a very important barrier to the prevention and treatment of this disease.

Biological factors

Poor nutritional status and infections, e.g. malaria, HIV and TB, are ravaging sub-Saharan Africa and have made many people immuno-compromised (United Nations, 2008). Moreover, sub-Saharan Africa harbors about 70% of the world's population of people living with HIV and AIDS (United Nations, 2008). Several studies have demonstrated the association of HIV with HPV. A recently published study from Tanzania showed prevalence of HIV-1 was much higher among the cervical cancer patients (21.0%) than among the controls (11.6%) (Kahesa, Mwaiselage and Wabinga, 2008). The study reported that HIV-1

was a significant risk factor for cancer of the cervix (OR=2.9, 95% CI=1.4–5.9). It also showed that the mean ages of the HIV-1 positive and negative women with cervical cancer were 44.3 and 54 years respectively and this was a statistically significant finding ($p=0.0001$). Studies done in Zimbabwe and South Africa also suggested the association between HIV and cervical cancer (Chirenje, 2005; Moodley and Kleinschmidt, 2001).

Recent studies have linked sexually transmitted infections (STIs) other than HPV, to cervical cancer (Hawes and Kiviat, 2002; Smith *et al.*, 2002). These infections excite chronic inflammatory response which causes the generation of free radicals, which play an important role in the generation and progression of cancers (Hawes and Kiviat, 2002). Unfortunately, many women who get these infections receive incomplete treatment, because they cannot access (financially or geographically) good health care, thereby making chronic and persistent infections very common.

1.10. HPV vaccine

Since it became evident that HPV has a role in the genesis of cervical cancer, vaccines against HPV infections have been developed, and a massive push for vaccination is underway world-wide (Wong, 2008; WHO, 2006). This includes the two new prophylactic HPV vaccines namely: a bivalent vaccine targeting HPV16 and 18 (Cervarix; GlaxoSmithKline) and a quadrivalent vaccine targeting HPV 16, 18, 6 and 11 (Gardasil; Merck, Sharpe and Dohme). The vaccines are designed to enhance the immune response and increase the duration of protection against cancer-causing virus types.

Preliminary results show that the quadrivalent vaccine is efficacious in preventing the infections and diseases caused by the types of HPV covered by the vaccine and is well tolerated (Centre of Disease Control [CDC], 2007). The bivalent vaccine has also been shown to be efficacious and well tolerated in women over 26 years of age (Schwarz and Dubin, 2007; Schwarz, Spaczynski and Schneider, 2009). Studies have shown that the HPV vaccine is a highly cost-effective health intervention (Goldie, Kohli, Grima, Wienstein, Wright and Bosch, 2004). Modelling studies have shown that if fully implemented, vaccination may lead to 31% percent reduction in pre-cancerous lesions which translate to about 68% decline in cervical cancer cases (Alliance for Cervical Cancer Prevention, 2003).

The vaccine is currently registered and already in use in more than 50 countries across Europe, Australasia and South America. In the UK, routine HPV vaccination is now offered to all girls age 12-13 years, with a 'catch-up' for adolescent girls up to 18 (Marlow, Waller, Evans and Wardle, 2008). Both vaccines have been licensed for use in SA in March 2008 but they are not yet available in the public health sector (Harries *et al.*, 2008). An important component to this study was a cost-effectiveness analysis of integrating cervical cancer prevention programmes by adding the HPV vaccine to the existing screening programme in the public sector. The study reported that adding a vaccine to the current screening programme to prevent HPV related diseases in South Africa is a cost-effective strategy (Harries *et al.*, 2008).

1.11. Problem Statement

The recent development of two prophylactic HPV vaccines offers great potential for primary prevention of cervical cancer in South Africa. However, as with any new product, there are many questions about how best to promote and deliver the vaccines to ensure optimal population coverage. Acceptability of the vaccine, owing to the sexually-transmitted nature of HPV, has been recognized as one of the keys to ensuring widespread immunization.

A significant body of literature exists about issues relating to HPV vaccine acceptability. However, these studies focus on awareness and knowledge about cervical cancer, HPV and HPV vaccine in relation to potential uptake and resistance in developed countries. To date, little has been done in developing countries and in particular, in South Africa where the knowledge and awareness of HPV might be different from developed countries. Equally important is the fact that the predictors of women's interest in HPV education and receiving the HPV vaccine has not been characterized in this country where a significant number can benefit from vaccination. Hence, it is necessary to have locally obtained data if it is to be of any use in guiding the formulation of policies which will be implemented in the introduction and propagation of HPV vaccination in South Africa.

1.12. Rationale of the study

Research demonstrates that about 10% to 39% of sexually active young adult women (ages 18-25) are infected with high risk HPV at any point in time (Koutsky, 1997; Alan *et al.*,

2001; Winer *et al.*, 2003). Since the majority of university students are of the above mentioned age group, they can be used as a proxy for this high risk group. In addition, university students may be potential social influencers in their own communities, because of their potential to attain higher education and social status. It is also noteworthy that female students will soon be mothers (if not already so) and are more likely to play a key role in HPV vaccination in the future if the universal vaccination of 11–12-year-old girls is recommended in South Africa, as has been the case in other countries (Markowitz, Dunne and Saraiya, 2007). This is largely due to the fact that people often infer others' needs from their own needs and beliefs and thus one may assume that women would infer their daughters' needs for HPV vaccination based on *their* perceived needs (Serpell and Green, 2006).

1.13. Aim of the study

The aim of the study is to investigate the knowledge and awareness of HPV infection among female university students and their intent to receive the HPV vaccine.

Objectives

- 1) To determine the level of HPV infection awareness among female university students.
- 2) To describe the knowledge of HPV infection and cervical cancer among the students.
- 3) To describe the HPV vaccine awareness among the students.
- 4) To describe the attitudes and beliefs of female university students towards the HPV infection and vaccine.
- 5) To analyze correlates and predictors of vaccine uptake.

1.15. Hypotheses

The Health Belief Model (HBM) codifies attitudes and beliefs that motivate vaccination (Brewer, Weinstein, Cuite and Herrington, 2004; Chapman and Coups, 1999; Becker, 1974). The model suggests that key predictors for acceptability of any vaccine include perceived disease likelihood and severity, perceived vaccine benefits and barriers, and cues to action. In the context of HPV vaccination, *perceived likelihood* is the belief that HPV infection and cervical cancer are likely outcomes. *Perceived severity* is the belief that HPV infection and cervical cancer would have serious negative health consequences. *Perceived vaccine effectiveness* (i.e. perceived benefit) is the belief that the HPV vaccine will reduce the risk of HPV infection or cervical cancer. Perceived barriers can be any perceived impediments to

vaccination, such as cost. Cues to action are situational and social factors that prompt one to get vaccinated.

The following hypotheses were tested in analysis:

H1: Individuals with low perceived severity to HPV infection would not be willing to be vaccinated.

H2: People with low perceived susceptibility to HPV infection would not be willing to be vaccinated.

H3: Participants with low perceived benefits to prevent HPV would not be willing to be vaccinated.

Chapter layout

This Chapter 1 provided the background to the study. It reviewed the pathological background of the Human Papilloma virus and highlighted the causal link between HPV and cancer of the cervix. It also described the burden of HPV infections and cervical cancer globally, within Southern Africa and South Africa.

Chapter 2 focuses on a review of relevant literature pertaining to this study. Both local and global studies are reviewed and an overview of the theoretical frameworks including the one that is utilized in this study.

Chapter 3 Outlines the methodology used in this study.

Chapter 4 Presents the results of the study.

Chapter 5 Discusses the results in reference to the literature, providing some possible explanations for the findings.

Chapter 6 Summarizes the findings and provides recommendations, based on the findings of the study.

Chapter 2: Literature Review

This review is presented in three parts. In the first part, global and national studies on awareness and knowledge of HPV infection or cancer of the cervix are reviewed. In the second part, a discussion of five theories of health behaviour, which offer *predictions* about the uptake of HPV vaccination, is given. In the third part, a review of studies on factors influencing HPV vaccine uptake is given. It is worth noting that this third part is based on studies that used Health Belief Model constructs as predictors of HPV vaccine acceptability.

A significant body of literature and interest has emerged over the past ten years around HPV vaccine acceptability (Klug, Hukelmann and Blettner, 2008). These studies focused mainly on HPV knowledge and attitudes towards HPV vaccination in relation to uptake or potential opposition (Klug *et al.*, 2008). Awareness and knowledge about HPV infection, cervical cancer and HPV vaccines are prerequisites for making informed decisions about vaccination (Kahn, Rosenthal, Hamann and Bernstein, 2003; Gerend, Lee and Shepherd, 2007; Zimet, Mays, Sturm, Ravert, Perkins and Juliar, 2005).



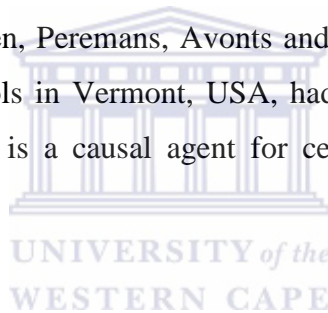
2.1. Awareness of HPV

Awareness about HPV infection has been found to vary considerably, with the proportions of respondents who have heard of HPV ranging between 13% and 93% (Klug *et al.*, 2008). A rigorous study among a representative group of sexually active college women in USA found that 13% of them were aware of HPV (Vail-Smith and White, 1992). The level of awareness has been found to be higher among women attending gynecological clinics, as was reported in a study of 1032 respondents attending a woman's wellness clinic in London (25%) (Waller, McCaffery and Forrest, 2003). A similar trend has been confirmed by Giles and Garland (2006) who found that 73% and 93% of Australian women visiting university health service and attending cervical dysplasia clinic, respectively, although this convenient sample was small (n=60) and not representative of the study population. Higher awareness also tend to be reported in studies that included women only; suggesting that women are more aware of HPV than men (Waller *et al.*, 2003; Yacobi, Tennant, Ferrante, Pal and Roetzheim, 1999).

2.3. Knowledge about HPV

Reported knowledge about HPV varies, with studies reporting between 8% and 68% of respondents being aware of the association between HPV and cervical cancer (Klug *et al.*, 2008). An e-mail survey in Iceland found that 34% of the respondents (60% response rate, n = 250) knew that HPV is a risk factor for cervical cancer (Gudmundsdottir, Tryggvadottir, Allende, Mast, Briem and Sigurdsson, 2003). However, when assessed using an open-ended question, knowledge about HPV was found to be consistently lower (between 0.6–11%) (Waller, McCaffery and Wardle, 2004; Pitts and Clarke, 2002; Baay, Verhoeven, Avonts and Vermorken, 2004; Klug, Hetzer and Blettner, 2005).

Health professionals had considerably more knowledge about HPV than other population groups and between 82–100% of physicians knew that HPV is a risk factor for cervical cancer (Chingang, Bischof, Andall-Brereton and Razum, 2005; Irwin, Montano and Kasprzyk, 2006; Baay, Verhoeven, Peremans, Avonts and Vermorken, 2006). Teachers and nurses in middle and high schools in Vermont, USA, had less knowledge than physicians, with only half aware that HPV is a causal agent for cervical cancer (Beatty, O'Connell, Ashikaga and Cooper, 2003).



Two large representative studies in the UK (Waller *et al.*, 2004; Wardle, Waller, Brunswick and Jarvis, 2001) and one among first year university students in the USA (Baer, Allen and Braun, 2000) found that women are more knowledgeable about HPV (*knowing that HPV is a risk factor for cervical cancer; and that HPV is transmitted by skin-to-skin contact*) than men.

The existence of genital warts was well known among most study participants, in stark contrast to the casual link between HPV and the cancer of the cervix (Ramirez, Ramos, Clayton, Kanowitz and Moscicki, 1997). Studies report that more than 88% of their respondents had heard of genital warts (Ramirez *et al.*, 1997; 2000; Baer *et al.*, 2000; Holcomb, Bailey, Crawford and Ruffin, 2004). Other studies report that between 5–64% of study participants knew that HPV can cause genital warts (Baer *et al.*, 2000; Holcomb *et al.*, 2004; Moreira, Oliveira, Ferraz, Costa, Costa Filho and Karic, 2006; Waller *et al.*, 2003).

HPV is often confused with other sexually transmitted infections, such as the human immunodeficiency virus (HIV) and herpes simplex virus (Baer *et al.*, 2000; Holcomb *et al.*,

2004; Ramirez *et al.*, 1997; Yacobi *et al.*, 1999). Ramirez *et al.* (1997) report in their study that 53% of university students in USA believed that HPV was related to the “AIDS virus” (HIV). Other studies found that 20% of the university students in the USA thought that herpes was a symptom of an HPV infection (Yacobi *et al.*, 1999), and 67% of patients attending family private practice in the USA were unsure whether genital herpes was a symptom of HPV infection (Holcomb *et al.*, 2004).

Despite the above mentioned inadequacies in knowledge about HPV, Klug *et al.* (2008) note that the level of knowledge is improving with more recent studies (see Fig. 4). Klug and colleagues performed linear regression of six robust studies on knowledge about HPV as a risk factor for cervical cancer to examine the influence of the year the study was done on knowledge of HPV infection. They found that the year of study conduct was positively correlated with knowledge (Spearman's correlation coefficient=0.38) and this may imply that people are becoming more aware of this important infection.

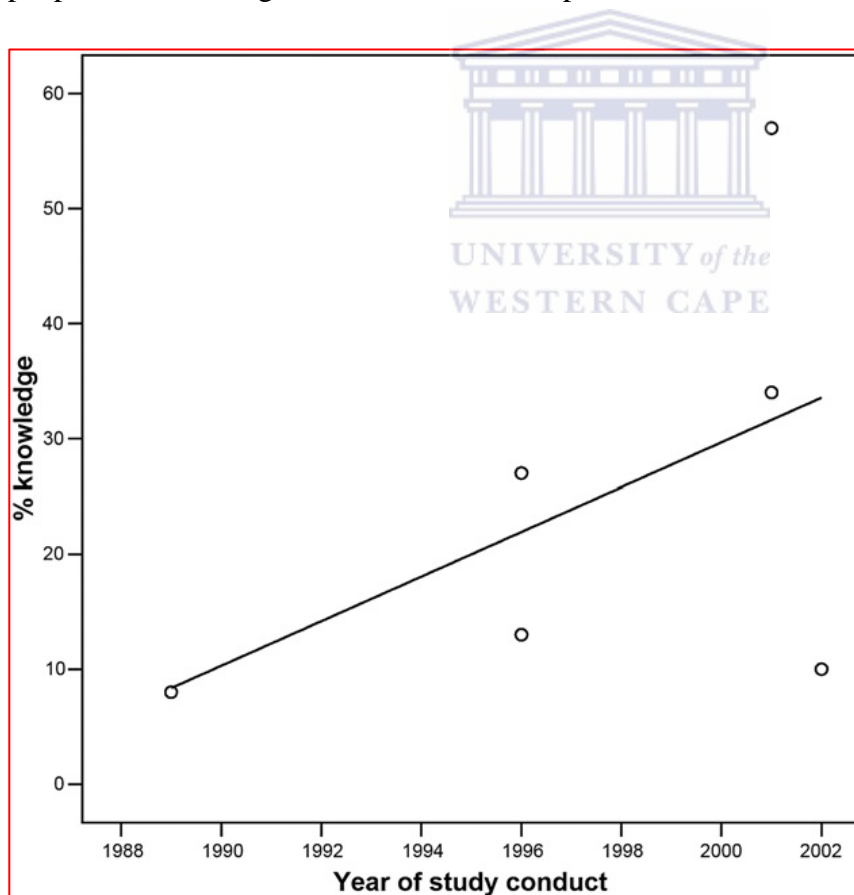


Fig 4: Linear regression-knowledge by year of study conduct. Source: (Klug *et al.*, 2008).

There is limited published research on the awareness and knowledge of HPV in South Africa. A cross-sectional survey of female students at the Walter Sisulu University (formerly University of Transkei) investigated their awareness of cervical cancer and its risk factors (Buga, 1998). The results of this study showed that 68% of the respondents were aware of the casual link between HPV and cancer of the cervix. This figure is quite high when compared to figures reported from other studies in developed countries.

A study in three districts of South Africa found that awareness of a pap smear (which can be used as a proxy for the awareness of HPV infection or cervical cancer) among women attending clinics varied widely depending on the race and level of income (Moodley, Kawonga, Bradley and Hoffman, 2006). In an urban district near Cape Town, made up of predominantly colored people of middle income, 95% of the participants were aware of a pap smear whilst only 10% of mainly black women in a low income rural district of Limpopo had ever heard of a pap smear. The same study reports that in district made up of mainly an urban informal settlement in Johannesburg, 33% of the clinic attendees had heard of pap smear.

Harries and colleagues (2008) conducted a qualitative study to explore key challenges and opinions towards HPV vaccination in three diverse areas in the Western Cape Province. Focus group discussions were carried out with women aged 21 - 57 years who had children who would be eligible for the HPV vaccine. Women's levels of knowledge and understanding of cervical cancer, the causative relationship between HPV and cervical cancer, and the purpose and preventive nature of pap smears, were found to be poor. The study reports that many knew of the availability of cervical screening services but did not fully understand the purpose of pap smears. Some associated pap smears with 'cleansing or scraping the womb', after possible exposure to a sexually transmitted infection, after having been raped or, in other instances, to ensure fertility.

2.4. Theories to predict vaccine uptake

A number of health psychology theories exist to explain health-related behaviors such as vaccination and guide interventions designed to promote vaccination (Becker, 1974; Chapman and Coups, 1999). These theories of health behavior can offer predictions about beliefs likely to increase adoption of the HPV vaccine. I will review five theories, namely the Game theory, Extended Parallel Processing Model, Framing Theory, Theory of Planned

Behavior and Health Belief Model as they have been noted to guide the introduction and propagation of vaccination interventions (Ajzen, 2006; Arnett, 2000; Hawe, Mckenzie and Scurry, 1998; Weerasinghe, Fernandes and Bagaria, 2007; Tversky and Khaneman, 1981).

2.4.1. The game theory

The game theory explicitly formalizes the relationship between individual decision-making processes and population dynamics (Bauch, Galvani and Earn, 2003). Though originally used to predict the economic behavior of people by Von Neumann and Morgenstern (1944), it can be used to relate population-level demand for vaccines to decision-making by individuals with varied beliefs about the costs of infection and vaccination (Reluga, Bauch and Galvani, 2006). The individual's decision to receive vaccination decreases their own risk of infection, as well as the risk for those people with whom they interact (Cullen and West, 1979). There exists an interplay between vaccine coverage, disease prevalence and the vaccinating behavior of individuals, through the emergence of herd immunity (i.e. the probability that an individual becomes infected depends upon how many other individuals are vaccinated) (Bauch and Earn, 2004). The value of vaccination to a community is greater than the sum of the benefits accrued by each individual (Cullen and West, 1979). Hence, in deciding whether to vaccinate their children, parents consider the risk of morbidity from vaccination, the probability that their child will become infected, and the risk of morbidity from such an infection. The decisions of individual parents are indirectly influenced by the decisions of all other parents, because the sum of these decisions yields the vaccine coverage levels in the population and hence, the course of the epidemic (Bauch *et al.*, 2003). Inversely, if everyone around them is vaccinated, they may be tempted not to vaccinate thinking that their child is protected through herd immunity. In this case, a slight perceived risk can tip the scales in favor of non vaccinating behavior and cause a decline in vaccine uptake.

The game theory attempts to predict individual behavior in such a setting, where the payoff to strategies chosen by individuals depends on the strategies adopted by others in the population. To understand this potentially complex interplay, a game dynamic model is developed in which individuals adopt strategies according to an imitation dynamic (*i.e.* a learning process), and base vaccination decisions on disease prevalence and perceived risks of vaccines and disease (Reluga *et al.*, 2006). Though the detailed mathematical formulae of

the model is beyond the scope of this study, in simple terms, the model predicts that oscillations (*i.e.* up and downs) in vaccine uptake are more likely in populations where individuals imitate others more readily or where vaccinating behavior is more sensitive to changes in disease prevalence (Bauch and Earn, 2004). Oscillations are also more likely when the perceived risk of vaccines is high.

Reluga *et al.* (2006) explain that when vaccine supply cannot satisfy demand, vaccine uptake will be stable. However, when the vaccine is in abundant supply, the dynamics of vaccine uptake depend on the individual's perceived utilities of vaccination and vaccine refusal and upon infection prevalence. When the utility (*i.e.* the perceived difference between benefits and costs) of vaccination is small and refusal is preferred even when infection is endemic, nobody will choose to vaccinate, and the dynamics are the same as those that would occur in the absence of vaccination.

When the utility of vaccination is large, vaccination is preferred even when the infection is absent from the population and the majority of the population will choose to vaccinate (Bauch and Earn, 2004). A large vaccination utility then implies that the vaccination coverage will be stable and sufficient for eradication. In some cases, the utility of vaccination will lie between these extremes: when the infection is endemic, individuals may prefer vaccination, but when the infection is rare, individuals may prefer not to risk vaccination (Reluga *et al.*, 2006). When prevalence is low, individuals place greater value on refusal, and when prevalence is high, individuals place greater value on vaccination.

This model reproduces salient features of the time evolution of vaccine uptake and disease prevalence during the whole-cell pertussis vaccine scare in England and Wales during the 1970s (Reluga *et al.*, 2006; Weerasinghe *et al.*, 2007). This suggests that using game theoretical models to predict the population dynamics of vaccinating behavior may be plausible.

2.4.2. Extended Parallel Processing Model

The Extended Parallel Processing model offers a framework for investigating attitudes toward the HPV vaccine and thus the effectiveness of fear appeals (Witte, Cameron, McKeon and Berkowitz, 1996) (Figure 5). It emphasizes that there are two general responses to health

and risk messages. People can adopt a “Danger Control Process” (DCP) in which they work to lower danger and fear by, for example, receiving the vaccine or stopping risky practices. This behavior indicates a cognitive process. On the other hand, people may choose to adopt the “Fear Control Process” (FCP). When people adopt this process, they attempt to minimize the associated problem by, for example, saying that the problem has been blown out of proportion. This is considered an emotional response. Optimistic bias of health hazards is a particularly common FCP and needs specific methods to combat it. For instance, in order to understand the best way to handle the propagation of large scale HPV vaccination in South Africa, we have to understand the role that optimistic bias plays. Optimistic bias explains the phenomenon that people are more likely to think that their own personal risk of a particular danger is less than that of their peers (Weinstein, 1989). The obstacle of optimistic bias can in many cases be difficult to overcome (Weinstein and Klein, 1995).

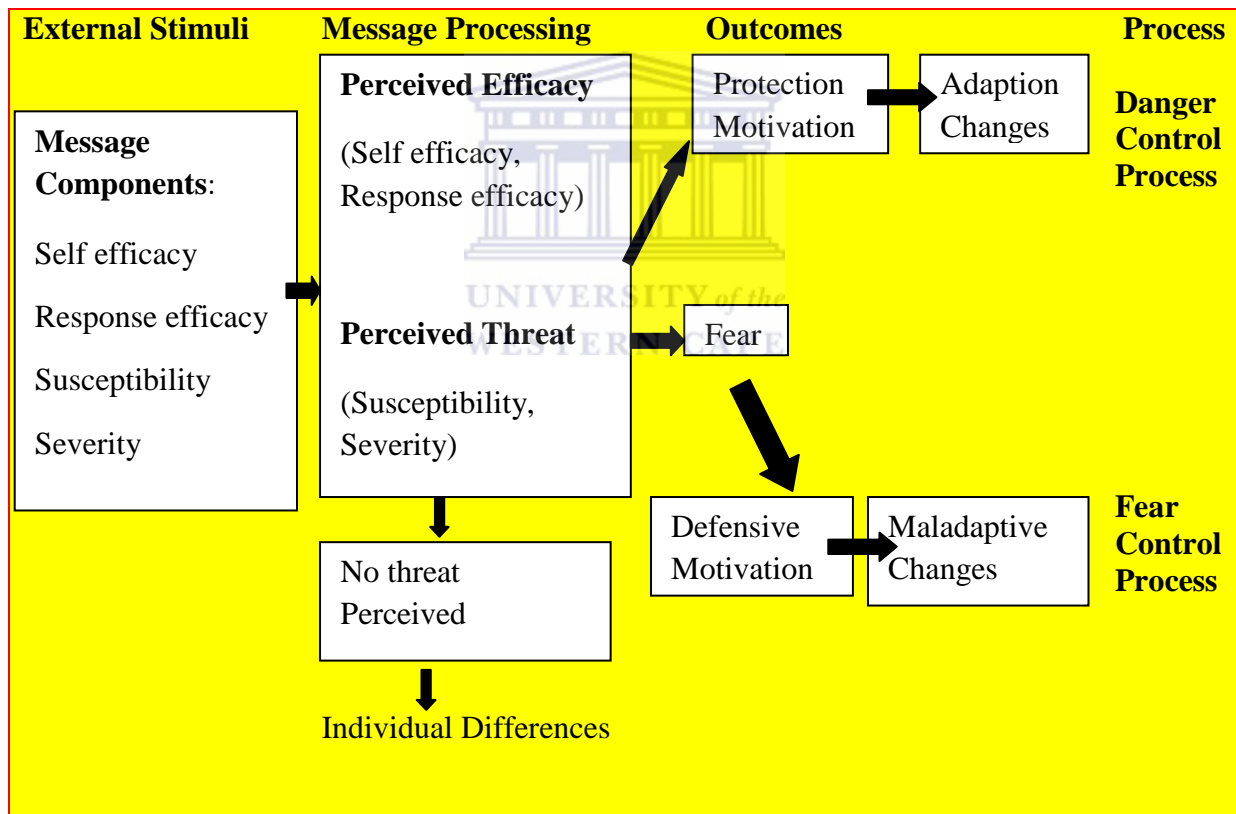


Fig 5: The Extended Parallel Processing Model (Witte *et al.*, 1996).

Optimistic bias has been shown to be a factor in a number of different health risks. For example, both adolescents and adults who smoke were shown to believe that addiction and death were problems for most smokers but felt that they had a much lower risk for those outcomes (Arnett, 2000). Another study of high school and college students showed that

there was a significant amount of optimistic bias regarding one's own chances of contracting HIV (Hardeman, Pierro and Mannetti, 1997). It is thus plausible that in the current scenario of HPV vaccination, some individuals may perceive their risk of HPV infection as so low that it may not warrant them receiving the vaccine.

Some factors that may lead toward an optimal DCP include *response-efficacy* - the perception that the actions a person takes can minimize a threat - and *self-efficacy* - the idea that people believe they are able to perform the recommended actions. Factors that may lead toward the less desirable FCP include perceived severity and susceptibility. If you believe that the danger is severe and unavoidable, you are more likely to adopt an FCP. Understanding these different processes is vital in determining whether a specific health campaign is likely to be effective.

2.4.3. Framing theory

A frame in social theory consists of a schema of interpretation that individuals rely on to understand and respond to events (De Martino, Kumaran, Seymour and Dolan, 2006). Framing refers to the social construction of a social phenomenon by mass media sources or specific political or social movements or organizations (De Martino et al., 2006). It is an inevitable process of selective influence over the individual's perception of the meanings attributed to words or phrases. A frame defines the packaging of an element of rhetoric in such a way as to encourage certain interpretations and to discourage others.

Framing effects arise because one can frequently frame a decision using multiple scenarios, wherein one may express benefits either as a relative risk reduction (RRR) or absolute risk reduction (ARR) (De Martino et al., 2006). Extrinsic control over the cognitive distinctions (between risk tolerance and reward anticipation) adopted by decision makers can occur through altering the presentation of relative risks and absolute benefits. People generally prefer the absolute certainty inherent in a positive framing-effect, which offers an assurance of gains (Tversky and Khaneman, 1981). When decision-options appear framed as a likely gain, risk-averse choices predominate. On the other hand, a shift toward risk-seeking behavior occurs when a decision-maker frames decisions in negative terms or adopts a negative framing effect.

A much cited example demonstrating the power of framing is provided by Kahneman and Tversky (1981) in their research on heuristics. They gave experimental subjects the following statement:

"Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows: If Program A is adopted, 200 people will be saved. If program B is adopted, there is a one-third probability that 600 people will be saved and a two thirds probability that no people will be saved. Which of the two programs would you favor?" (Tversky and Khaneman, 1981: 455).

The results were as follows: 78 chose Program A; 22 chose Program B. However, when the wording was altered so that the consequences remained the same but referred instead to the number of deaths (e.g. If Program A is adopted, then 400 people will die), the results were nearly reversed.

In a similar way information on vaccination can be presented (framed) in such a way as to increase its uptake. Three basic frames have been described namely *Gain-framed* (i.e. emphasizing the advantages of getting vaccine), *Loss-framed* (i.e. emphasizing the disadvantages of not getting vaccine) and a *Non-framed* control where information only provided. Smith and Petty (1996) propose that gain-framed messages are more effective in improving vaccine uptake when compared to non framed controls.

Thus, in the context of HPV vaccination, we may predict that a gain framed message such as:

*Angela felt very healthy and didn't believe she would be infected by the HPV. But she followed the advice of the South African Medical Association and **got 3 HPV vaccine shots** over 6 months. Because of this, **she is protected against HPV infection**. Now she is much less likely to get sick or die from serious cancer of the cervix, and she can look forward to a long and healthy life, watching her child grow up.*

will more likely yield a greater vaccine uptake than a non-framed control message such as:

We want to remind you that hepatitis HPV can be transmitted by unprotected sex. A vaccine for HPV exists. It requires 3 shots over 6 months to be most effective at preventing infection with the HPV.

2.4.4. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is based on the notion that since getting vaccinated is a discrete behavior, it may be amenable to simple, brief persuasive message interventions. The TPB of Icek Ajzen helps us to understand how we can change the behavior of people (Ajzen, 1991). It is a theory which predicts deliberate behavior because behavior can be planned. The TPB is a successor of a similar Theory of Reasoned Action (Ajzen and Fishbein, 1975; Ajzen and Fishbein, 1980). The success was a result of the discovery that behavior appeared to be not 100% voluntary and under control. This resulted in the addition of Perceived Behavioral Control and with this addition it was called the Theory of Planned Behavior.

In short, according to TPB, human action is guided by three kinds of considerations explained below. *Behavioral Beliefs*, which are beliefs about the likely consequences of the behavior. *Normative Beliefs*, which are the perceived behavioral expectations of such important referent individuals or groups as the person's spouse, family, friends, and depending on the population and behavior studied teacher, doctor, supervisor, and co-workers. Finally, *Control Beliefs*, which basically entail beliefs about the presence of factors that may facilitate or impede the performance of the behavior.

These three considerations are crucial in circumstances or programmes where the behaviour of people needs to be changed. In their respective aggregates, Behavioral Beliefs produce a favorable or unfavorable attitude towards the behavior; Normative Beliefs result in perceived social pressure to engage or not to engage in a behavior or subjective norms; whilst Control Beliefs give rise to perceived behavioral control which refers to people's perceptions of their ability to perform a given behavior (Ajzen, 2006).

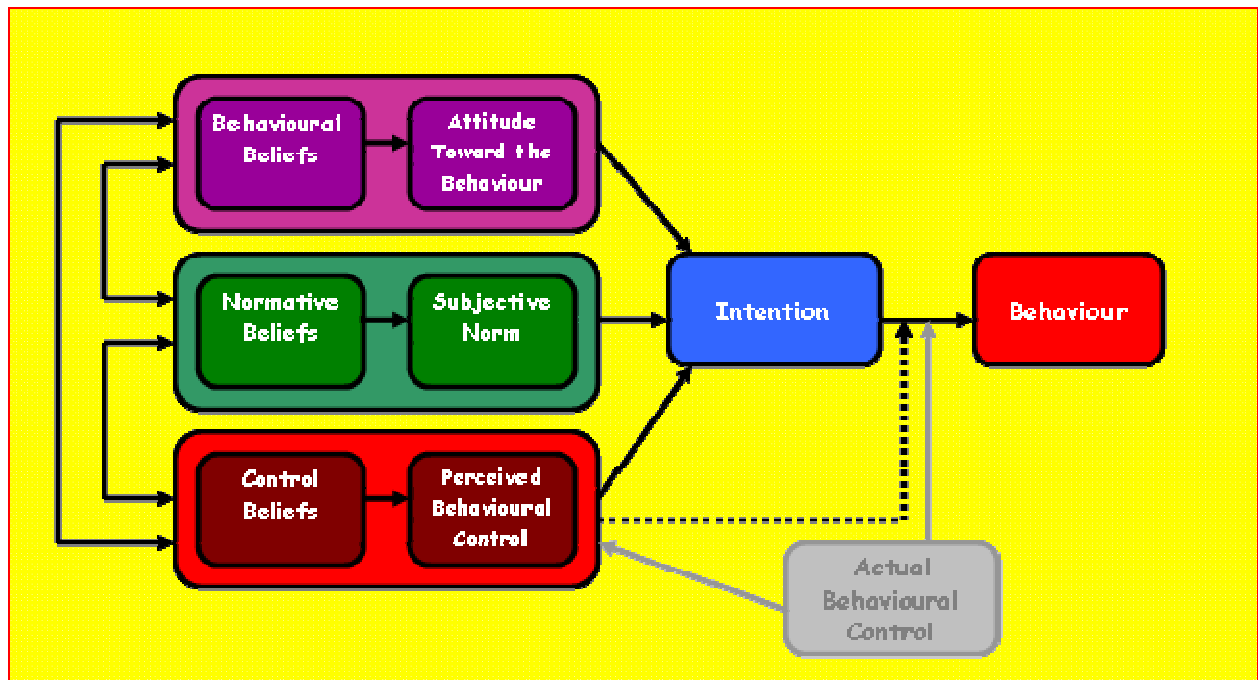


Fig 6: The Theory of Planned Behavior (Ajzen, 2006).

In combination, attitudes towards the behavior, subjective norms and perceived behavioral control lead to the formation of behavioral intention (Ajzen, 1991). Intention is an indication of a person's readiness to perform a given behavior, and it is considered to be the immediate antecedent of behavior. As a general rule, if the attitude and subjective norm are favorable, the perceived control will be greater and the person's intention to perform the behavior in question, say vaccination, should be stronger. This theory may help us explain why advertizing campaigns merely providing information may sometimes not work. Increasing knowledge only does not help change the behavior very much. Campaigns that target attitudes, perceived norms and control in making the change may be more likely to have better results.

2.4.5. The Health Belief Model

Becker (1974) developed the concepts of the health belief model (HBM). Health belief is based upon the idea that an individual must have the willingness to participate in health interventions and believe that being healthy is a highly valued outcome. Therefore, it may be possible to predict if an individual would engage in positive health behaviors by determining the individuals' perception of the disease, illness or accident, identification of modifying

factors, and the likelihood that the individual will take some action. The most influential factor that might prevent an individual from engaging in healthy behaviors is the perceived barriers (Bastable, 1997). Becker's model can be presented diagrammatically as shown in figure 7.

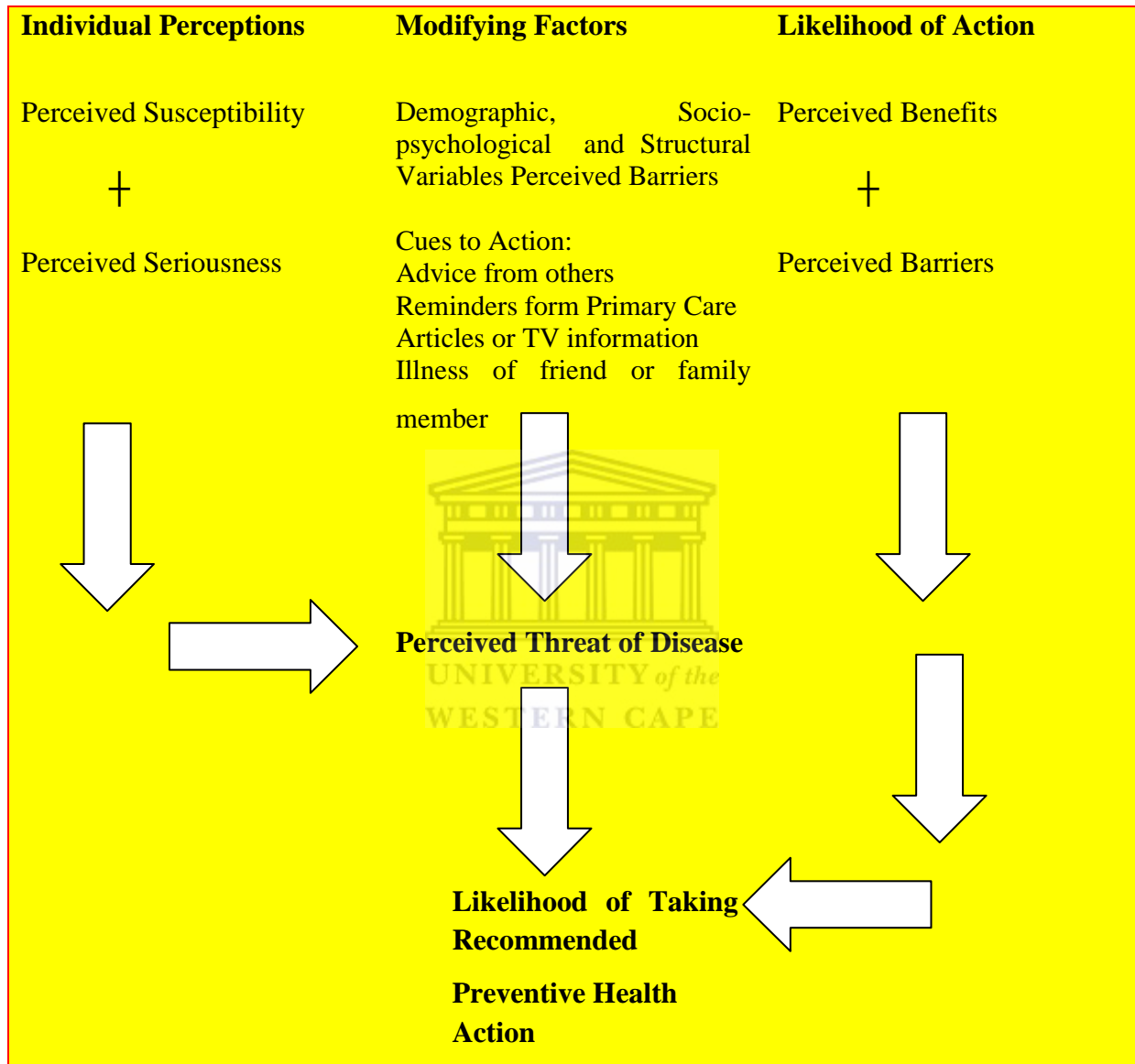


Fig 7: The Health Belief Model (Bastable, 1997:135)

In the context of HPV vaccination, *perceived likelihood* is the belief that HPV infection and cervical cancer are likely outcomes. *Perceived severity* is the belief that HPV infection and cervical cancer would have serious negative health consequences. *Perceived vaccine effectiveness* (i.e., perceived benefit) is the belief that the HPV vaccine will reduce the risk of HPV infection or cervical cancer. *Perceived barriers* can be any perceived impediments to

vaccination, such as cost. *Cues to action* are situational and social factors that prompt one to get vaccinated.

It is noteworthy mentioning that many of the attitudes and beliefs that motivate influenza and other vaccination behaviors are codified in the health belief model (HBM) (Brewer *et al.*, 2004; Chapman and Coups, 1999; Becker, 1974). It is also interesting to note that interventions guided by the health belief model have been shown to increase vaccination rates (Hawe *et al.*, 1998; Larson, Bergman, Heidrich, Alvin and Schneeweiss, 1982).

Nonetheless, even though the above theories were put forward by different authors at different time settings, they are similar in one way or the other. For instance, the facts that individuals will consider risk of morbidity from vaccination and risk of morbidity from the disease as stated in the Game Theory are the equivalents of the constructs of perceived barriers and perceived severity as put forward in the Health Belief Model. In a similar manner, the concepts of normative beliefs and control beliefs in the TBP theory are similar to the constructs of cues to action and perceived self-efficacy as highlighted in the HBM.

2.5. Intention to take up HPV vaccine

Globally, the findings of both qualitative and quantitative research strongly suggest that most women have positive attitudes about receipt of a HPV vaccine (Baykal, Al and Ugur, 2008; Donders, Gabrovska and Bellen, 2008; Fazekas, Brewer and Smith, 2008; Gerend *et al.*, 2007 and Lee, Kwan and Tam, 2007). The highest rate of acceptability (96%) was found among urban Turkish women aged 17 to 35 years, recruited from an obstetrics and gynecology clinic (Baykal *et al.*, 2008). The lowest rate was found among urban women in Belgium, where only half of the respondents (also sampled from obstetrics/gynecology clinics) indicated intention to be vaccinated (Donders *et al.*, 2008).

2.5.1. Vaccine acceptability among individuals

Attitudes regarding HPV vaccine acceptance can be assessed based on acceptability of previous vaccines and surveying patients, parents and health care providers. Kahn and colleagues surveyed 52 young women who were attending medical clinics in the US regarding HPV vaccination, and they found that most viewed vaccination positively (Kahn *et al.*, 2003). Most of the respondents (98%) reported intention to receive the vaccine for

themselves and their hypothetical daughters. The same study found that knowledge of HPV and the vaccine, personal beliefs about vaccination, beliefs that others would approve of vaccination, higher number of sexual partners, and perceived support of provider, partner and parents, were all significantly associated with the intention to receive the vaccine.

In another study of 256 college students, 74% endorsed HPV vaccination (Boehner, Howe, Bernstein and Rosenthal, 2003). Of those surveyed, acceptance was significantly correlated with higher number of sexual partners, parental support, endorsement of universal HPV vaccination, low cost, and vaccine safety. Similar findings were reported by a study which examined the attitudes about hypothetical HPV vaccines in adolescent ($n = 20$) and adult women ($n = 20$) attending two urban STI clinics in Indianapolis, United States (Zimet, Mays and Fortenberry, 2000). The study found that the idea of an HPV vaccine was favorably received. Several factors affected potential acceptance, including vaccine efficacy, physician endorsement as well as cost.



2.5.2. Vaccine acceptability among parents

Vaccine acceptance among parents is not universal. Concern over potential side-effects from vaccines is a common barrier to vaccination (Taylor, Darden, Brooks, Hendricks, Wasserman, and Bocian, 2002). Parents may also object to vaccination for religious or philosophical reasons (Diekema, 2005). The sexual nature of HPV infections may introduce unique barriers to parental consent not previously encountered with other vaccines. For instance, parents may feel that consenting to a vaccine for an STI may inadvertently encourage their adolescent children to engage in sexual intercourse (Davis, Dickman, Ferris and Dias, 2004). Concomitantly, some parents might think that vaccination at an early age will encourage earlier sexual debuts.

Contrary to the above mentioned findings, other studies suggested that the sexually transmitted nature of HPV may not pose a major obstacle to HPV vaccine acceptance. In one study conducted by Mays and workmates, 70% of parents approved of vaccination for STIs (Mays, Sturm and Zimet, 2004). The same study found that desire to protect their children, concern about specific disease characteristics, and personal experience with an STI were directly correlated with vaccine acceptance. It also reported that rejection of the vaccine was associated with the perception that their child was at low risk for infection or with the parent

having a low concern about severity of the disease. It is worth noting that both of these reasons for refusal of the vaccine are codified in the concepts or constructs of the Game theory and HBM.

In a similar study, Zimet and colleagues questioned 278 parents about their attitudes towards adolescent vaccination, incorporating nine hypothetical STI scenarios defined along four different dimensions: mode of transmission (STI vs non-STI), severity (curable/chronic/fatal), vaccine efficacy (50%, 70%, 90%), and behavioral method for prevention (available/not available) (Zimet *et al.*, 2005). Interestingly, the study reported that whether a disease was sexually transmitted or not, did not affect the parents' decision. Instead, severity of the hypothetical disease and vaccine efficacy predicted vaccine acceptance, which is in agreement with the HBM constructs of perceived severity and perceived benefits respectively (Zimet *et al.*, 2005).

When parents who were undecided about HPV vaccination were provided with a basic information sheet about HPV and HPV vaccines, they became significantly more likely to support HPV vaccination (Davis *et al.*, 2004). This may imply that failure to take up the HPV vaccine due to lack of knowledge may be overcome by giving potential recipients adequate information about the vaccine before asking them to be vaccinated. Physician endorsement and school requirements have also been identified as important catalysts for parental vaccine acceptance (Zimet *et al.*, 2005). Again, these findings are in line with the concept of normative beliefs and the construct of cues to action which are clearly spelt out in the TBP theory and HBM respectively.

2.6. Predictors of vaccine uptake

The constructs in the health belief model - perceived risk, perceived effectiveness of the vaccine, perceived barriers to vaccination, and cues to action - are among the most important predictors of influenza vaccination (Becker, 1974; Chapman and Coups, 1999). A number of studies assessing HPV vaccine acceptability among female have been carried out using beliefs based on the Health Belief Model, and the constructs of this model has been shown to predict vaccine uptake among females.

Perceived likelihood

Between 21% and 46% of adolescents and young adult respondents perceived themselves to have some chance of being infected with HPV (Ramirez *et al.*, 1997; Yacobi *et al.*, 1999). Similarly, adult women reported high perceived chances of getting cervical cancer (Anhang, Wright, Smock and Goldie, 2004; Kahn *et al.*, 2003). Higher perceived likelihood of HPV exposure or infection was related to higher vaccine acceptability (Boehner *et al.*, 2003; Friedman and Shepard, 2006; Olshen, Woods, Austin, Luskin, and Bauchner, 2005). The association between perceived likelihood of getting cervical cancer (as distinct from HPV infection) and HPV vaccine acceptability was also reported in a study by Gerend and colleagues among females recruited from community health clinics in the USA (Gerend, Lee and Shepherd, 2006).

Perceived severity

Studies show that women believed cervical cancer is a health problem with severe consequences (Anhang *et al.*, 2004; Kahn *et al.*, 2003; Mays *et al.*, 2004). However three studies reported that higher perceived severity of HPV infections or cervical cancer was not related to greater vaccine acceptability (Boehner *et al.*, 2003; Kahn *et al.*, 2003; Dempsey, Zimet, Davis and Koutsky, 2006). This is despite the fact that one study highlighted that perceived severity was the second most influential factor in rating the acceptability of sexually transmitted infection vaccines among parents (Zimet *et al.*, 2005). There is a dearth of literature on the relationship between perceived severity of cervical cancer (as distinct from HPV infection) and HPV vaccine acceptability.

Perceived effectiveness

Although no published studies reported mean levels of perceived vaccine effectiveness, higher perceived effectiveness was associated with greater HPV vaccination intentions for both parents of adolescents and adults in three studies (Davis *et al.*, 2004; Dempsey *et al.*, 2006; Zimet *et al.*, 2005). In the study by Zimet and friends, parents rated vaccine effectiveness as the most important attribute of an acceptable sexually transmitted infection vaccine (Zimet *et al.*, 2005). Furthermore, perceived effectiveness of the vaccine, specifically against HPV infection, predicted vaccine acceptability in one study (Gerend *et al.*, 2006). However there is paucity of published studies reporting on the role of perceived effectiveness of the vaccine against genital warts or cervical cancer in acceptability.

Barriers

As mentioned previously, concern among parents that vaccination could promote adolescent sexual activity is a barrier to HPV vaccination. In the four studies that quantified how common this concern was, only 6% to 12% of parents endorsed it (Constantine and Jerman, 2007; Davis *et al.*, 2004; Mays *et al.*, 2004; Zimet *et al.*, 2005). On the other hand, two qualitative studies that did not quantify how common this theme was, reported that parents had strong concerns that administering the HPV vaccine would implicitly condone youth sexual behaviors (Friedman and Sheppard, 2006; Olshen *et al.*, 2005).

Cost is a commonly stated barrier to receiving the HPV vaccine (Boehner *et al.*, 2003; Friedman and Sheppard, 2006; Zimet *et al.*, 2005; Hoover *et al.*, 2000). *Low perceived vaccine safety* is another barrier to vaccination (Constantine and Jerman, 2007; Boehner *et al.*, 2003; Dempsey *et al.*, 2006). One study reported that *getting multiple shots* was not a barrier to vaccination (Gerend *et al.*, 2006). *Anticipated side effects* from the HPV vaccine such as pain or discomfort are also reasons for low acceptability (Davis *et al.*, 2004; Dempsey *et al.*, 2006).

Situational and social factors that influence vaccine uptake

HPV vaccine acceptability was higher among parents and young adults who believed that their physician would recommend it (Boehner *et al.*, 2003; Davis *et al.*, 2004; Dempsey *et al.*, 2006; Gerend *et al.*, 2006; Kahn *et al.*, 2003; Olshen *et al.*, 2005), but few studies reported the frequency of this belief. Additionally, parents who opposed the HPV vaccine were less likely to be influenced by physician recommendations than parents who were more accepting of the vaccine (Davis *et al.*, 2004). School requirements for children to receive the HPV vaccine were associated with higher acceptability of the HPV vaccine (Davis *et al.*, 2004).

Demographics

Studies report that other factors other than the HBM constructs such as age and marital status have been associated with vaccine acceptability. Two studies found that vaccine acceptability decreased with age (Marshall, Ryan and Robertson, 2007; Baykal *et al.*, 2008). It may be due to the fact that some older women believe that it is too late for them to get the vaccine (Fazekas *et al.*, 2008). Other studies found that, compared to women in polygamous relationships, married women and those in monogamous relationships viewed HPV

vaccination as less acceptable (Kahn *et al.*, 2003; Marshall *et al.*, 2007; Fazekas *et al.*, 2008). The reason for this could be that these women see themselves at relatively low risk for HPV infection and thus, are less likely to be interested in vaccination. Interestingly, two studies found no statistically significant association between age or marital status to vaccine acceptability (Khan *et al.*, 2003; Baykal *et al.*, 2008). This may indicate that these clearly defined demographic factors are not determinants of attitudes about HPV vaccine.

Experience with HPV related conditions

Women's historical/behavioral experiences related to HPV may play a role in vaccine acceptability. The relationship of abnormal pap smears with vaccine acceptability was inconsistent with some studies finding a link (Ferris, Waller, and Owen, 2008), while others finding no relationship (Gerend *et al.*, 2007; Baykal *et al.*, 2008).

Knowledge about HPV

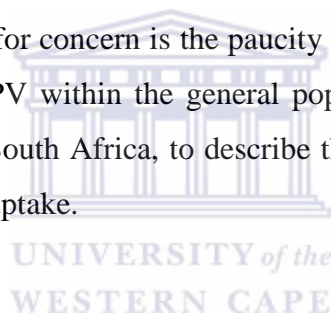
Studies reported mixed findings about the relationship of HPV knowledge to vaccine acceptability (Boehner *et al.*, 2003; Dempsey *et al.*, 2006; Kahn *et al.*, 2003). One educational intervention presented brief factual information on HPV increased vaccine acceptability (Davis *et al.*, 2004). However, because changes in knowledge were not reported, the study findings cannot be tied to knowledge with any certainty (Davis *et al.*, 2004). Limited knowledge and awareness of HPV make it difficult for some people to discuss HPV vaccine acceptability (Friedman and Sheppard, 2006; Olshen *et al.*, 2005). Even so, HPV vaccine acceptability is high despite generally low levels of HPV knowledge (Harries *et al.*, 2008; Wong, 2008).

There has been rather limited research on the acceptability of the HPV vaccines in South Africa. A recent qualitative study in Western Cape Province investigated the key challenges and barriers towards the introduction of HPV vaccination (Harries *et al.*, 2008). Fifty in-depth interviews and six focus groups were conducted with policy makers, health care workers and ordinary members of the community. Harries and colleagues reported that the need for a vaccine to prevent cancer resonated with all respondents including community members. This was despite the overall poor community knowledge of cancer of the cervix. Also, the causal relationship between cervical cancer and HPV was noticed amongst the respondents. In addition, the potential barriers to vaccine uptake namely: cost and concerns about increased sexual activity following vaccination, were raised by the respondents. It was proposed that

they could be circumvented by giving the vaccine free of charge and marketing the vaccine as a preventive measure for cancer, rather than taking it as a preventive measure for sexually transmitted infections.

2.7. Summary

In this chapter, it has been shown that world wide awareness and knowledge of HPV infection are generally limited. However people seem to be more aware of genital warts than the causal link between HPV and cancer of the cervix. A number of theories exist which can be used to guide vaccination interventions in order to maximize uptake of the HPV vaccines. Vaccination interventions guided by the Health Belief Model have been shown to greatly improve vaccination rates. Generally, it is reported that the public have positive attitudes towards the HPV vaccine. A number of factors which may predict vaccine uptake have been characterized. However, a cause for concern is the paucity of studies done locally to describe awareness and knowledge of HPV within the general population. Equally important is the fact that little has been done in South Africa, to describe the attitudes towards HPV vaccine and assess predictors of vaccine uptake.



Chapter 3: Research Methodology

3.1. Study design

A quantitative, cross-sectional survey of female students at a South African University was conducted to describe their knowledge about Human Papilloma Virus (HPV), cancer of the cervix, HPV vaccine and factors that influence HPV vaccine acceptability among them.

I opted for a cross-sectional survey design for this project as it was ideal for descriptive epidemiology to answer the so-called “*descriptive pentad of Who, What, Why, Where and When*” (Grimes and Schulz, 2002:145). In a descriptive study, a phenomenon is described or the relationship between variables is explained (Rothman, 1986). A survey, by definition, provides data about the present and indicates what people are thinking, planning and doing (Polit and Hungler, 1999). Thus, I used a survey for this study to describe the prevailing situation regarding HPV and vaccine knowledge among the students and their intention to receive HPV education and vaccine. Hence, it was best suited to answer the objectives (1, 2 and 3 as mentioned in chapter 1) of the study.

Although generally distinguished from a case-control study, a cross-sectional study can be thought of as a case-control analogue of a population cohort study (Rothman, 1986). Thus, the design is an analytical study. This positive spin-off allowed logistic regression to be used to determine the predictors of interest in HPV education and correlates of HPV vaccine acceptability thus, answering the fifth objective of the study. Another advantage was that since both predictors (exposures) and outcomes (dependents) were ascertained at the same time (the defining feature of a cross-sectional study), it was less time consuming and the costs involved were smaller. This also meant that loss to follow-up was not a problem and that fewer ethical difficulties existed. Consequently, it was relatively easier to carry out the study.

3.2. Study Population

The study or target population can be defined as: “*the entire specific aggregate of cases about which the researcher would want to make generalizations*” (Granziano and Raulin, 2000: 133). For the purposes of this study, the target population was composed of all the female students registered at the University during 2009 and attending lectures at the time of the study.

3.3. Sampling

Researchers do not often study the entire target population due to time and cost constraints and thus, a portion of the target population is subjected to research (Leedy, 1997). A sample may thus be defined as that portion which is selected to represent the study or target population (Fitzpatrick, 1999). For the purposes of this study, it was those female students who were chosen to take part in the study.

The sample size was guided by the requirement to measure the percentage of participants who were aware of HPV or cervical cancer. Given that there were about 5000 registered female students at the university, on the basis of the most conservative estimate that 20% of them were aware of HPV/cervical cancer, allowing 15% or 25% as the worst acceptable values and a 95% confidence interval, the required sample size that was calculated to be 150 using the Epi info 2007 version (Stat Calc).

Sampling refers to the process of selecting a portion (sample) from the target population in order to gather data that represent the target population (Fitzpatrick, 1999). A sample is considered to be representative of the target population if all the members of the target population have an equal chance of forming part of the sample (Pollit and Hungler, 1999). The concept of randomness or probability sampling is central to the process of obtaining a representative sample (Leedy, 1997). Also, a representative sample makes it possible for the findings of the study to be generalized to the target population (Leedy, 1997).

Since I sought to generalize the findings of the study to the female student body at the university, I employed a stratified random sampling method to obtain a representative sample of the female students. Each of the five faculties was considered to be a homogeneous stratum. A random sample of 30 participants was then selected from each faculty. Stratified sampling was employed mainly as a means of saving time and money because the target population was spread out, and I could not sample from everywhere. Consequently, the survey was easier to administer operationally. Other trade offs of this method of sampling were firstly, a potential for greater information yield as I could obtain statistics within each strata as well as of the whole sample and secondly, that stratified random sampling can markedly improve the precision of estimators especially if the strata are homogenous by reducing the variance of the estimates (Pollit and Hungler, 1999).

3.4. Data Collection

The data collection was done after the University of the Western Cape's Research and Ethics Committee had approved the research proposal and the Registrar of the University had granted permission for the research to be done. I then sought assistance from the five faculty officers to randomly sent emails (based on student numbers) to 60 email addresses belonging to female students registered in each of the five faculties. Each e-mail invited the student to participate in a "female health awareness study" by filling a 5 minute questionnaire which was available on request at their prospective faculty office and get two vouchers for free lunch and supper. In addition to this, flyers advertising the study were put near entrances of the faculty offices.

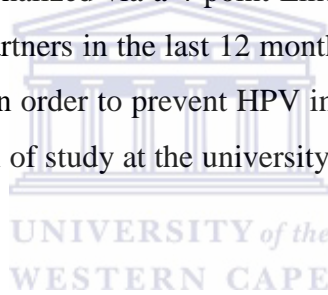
Self-administered, anonymous, confidential questionnaires, consisting of close ended questions were used to collect information. In each faculty office, the interested participants were issued with an information sheet which they read and signed before completing an attached questionnaire to show their informed consent. The information sheet explained the purpose of survey and gave detailed information to the study participants on their rights as enshrined in the Human Sciences Research Council's (HSRC) ethical guidelines (HSRC, 2009). It also reminded them to ask for assistance on anything that they did not understand. After completing the questionnaire, students were asked to place questionnaires in box located in the faculty officer. General knowledge HPV pamphlets (published by the Cancer Association of South Africa [CANSAs]) were placed next to the questionnaire box for students to take at will (CANSAs, 2009). At the end of each day, I would go to the five offices to collect the completed questionnaires until 30 were filled in each of the faculty. It took two and half weeks for me to get the required number of completed questionnaires.

The Survey Instrument

Stone and Campbell highlight that a questionnaire can be standardized and this increase the reliability, comparability and precision of data from one region or time frame to another (Stone and Campbell, 1984). They also note that it allows the data to be quantified and thus, aggregate results can be presented concisely. In addition, because the data collected is structured, statistical methods can be applied to assess the relationships between the variables measured (Pollit and Hungler, 1999). The questionnaire is also inexpensive (no extensive training is required to administer it) and can be quickly administered if distributed to a group of participants which is in keeping with snap shot aspect of a cross sectional study design

(Grimes and Schulz, 2002). The fact that the questionnaire was self-administered minimized issues of confidentiality which were particularly important in this study, where sensitive issues like sexual activity were asked. Its close ended nature meant that exact responses were obtained which in turn, were easy to code and analyze. I therefore wanted to capitalize on these advantages of questionnaires in this study.

The questionnaire (survey instrument) used in this study was a modified version of the Knowledge and Perceptions Survey (KAPs). The KAPs instrument, which is a standardized questionnaire, was designed by McPartland and colleagues to assess perceived severity, susceptibility, knowledge of HPV and intent to practice HPV preventative health behavior (McPartland, Weaver and Koutsky, 2005). Questions to examine knowledge of existence of HPV vaccine, perceived barriers, perceived benefits and self efficacy to take up more HPV education and HPV vaccination were incorporated in KAPs for the purpose of this study. Each HBM variable was operationalized via a 4-point Likert scale. In addition, questions on participants' number of sexual partners in the last 12 months and their intent to take up more HPV education and vaccination in order to prevent HPV infection were added. Demographic characteristics included age, level of study at the university and ethnic background (*Appendix 3*).



3.5. Pilot Study

A pilot study is the collection of data before the main study is executed (Leedy, 1997). The rationale of the pilot study was to determine whether the survey instrument was clearly worded, free from biases, solicited the information that was required. It was also important in assessing the time requirements for completing the questionnaire and detecting any other unforeseen flaws or gross inadequacies before the full scale study was embarked upon (Fitzpatrick, 1999; Pollit and Hungler, 1999).

A pilot study was done by distributing 10 questionnaires to 10 female students who were in the main library. After they had completed filling the questionnaires, I asked them to engage in some verbal discussion to elicit some feedback on ways to improve the survey instrument. I however requested them not to participate in the full scale study which was due to run in the following two months. Analysis of the pilot study data was also done and sent to the supervisor before embarking on the main study.

Changes to be made to the data collection tool based on the Pilot Study

Question number 2 which asked the ethnicity (e.g. Xhosa, Zulu e.t.c.) of the respondents was changed to be two questions: one simply asking whether the respondent was black, white, Asian or colored and another which asked whether the student was a SA citizen or not. This is because I realized during the pilot study, that some respondents were non SA citizens and hence could not identify themselves with any of ethnic groups that were listed. This led to some of them leaving the question blank. Question number 3, which asked about the current level of study, was similarly split into two: one asking for the level and another stating the faculty in which the student was learning.

Based on the feedback received from the participants, I noted that though most of them had heard of cancer of cervix or Pap smear before, they were not aware of the term HPV. This prompted me to expand the “awareness” question number 8 to three which all specifically asked whether the participant has heard of HPV, Cancer of the cervix or Pap smear separately.

The pilot analysis revealed that the HPV knowledge question number 12 was often left blank by quite a significant number of the participants. Oral feedback from them showed that some of the questions were not familiar with them and the answers “*true*” or “*false*” made it difficult to answer, to such an extent that some even just guessed as they felt obliged to say something. The final version of the questionnaire included an option of “*not sure*”. Since one of the main objectives of the study was to determine the participants attitudes and beliefs towards the HPV vaccine, and given the apparent limited knowledge of the subject of matter (HPV) among the participants, I had to modify Section C of the questionnaire (i.e. Health related beliefs section). This was achieved by inserting some more information about HPV in bold at the beginning of the section i.e.: “***HPV is a sexually transmitted virus that can cause genital warts or cancer of the cervix. The following are specific questions about an HPV vaccine that has been developed to prevent HPV Infection, genital warts and cancer of the cervix. I am interested in how people might feel about this vaccine. So for now, please pretend the vaccine is available***”. By giving the respondents this basic information, I hoped this allayed the fears that those who had little information about the subject matter could still go ahead and complete this section as they then had some basic understanding of what was being expected of them.

Despite the challenges described above, a number of positive findings were noted during the pilot study. For instance, all the participants finished completing the questionnaires in 5 minutes, proving that the time requirements were as previously expected. This was quite encouraging given the fact that the study was conducted in the month of November when students are usually busy preparing for their end of year examinations hence, would want a questionnaire which took the minimum amount of time from their busy schedule. More over, all of the participants completed all the questions requesting sensitive information regarding their sexual life thus, allaying my fears that some of these questions eliciting invaluable information might be left blank thus potentially affecting the outcome of the study.

3.6. Data analysis

3.6.1. Coding

The questionnaires were given numbers (from 1 up to 150). This gave them a unique identification number which made it easier for each set of electronic data to be traceable to the original questionnaire. Race was coded into a categorical variable: Black (1), White (2), Colored (3) and Asian/Indian (4). The citizenship status was coded into a dichotomous variable: SA (South African) and Non-SA (not a South African).

Knowledge of the HPV infection and HPV vaccine was coded and analyzed as follows: Each correct response was coded (2), each incorrect attempt was coded (1) and (0) was coded for those who were not sure. To get the total knowledge score for each participant, one point was awarded for every correct answer and zero for incorrect or the 'not sure' responses. This total knowledge score was then converted into a dichotomous knowledge variable by using the *define* and *assign* functions of Epi info 2007 version. Low knowledge was below mean score and high knowledge was any score above the mean of total knowledge score as in McPartland and colleagues (McPartland *et al.*, 2005). Code 1 was given for "high" and 0 for "low".

Other information was coded as follows: 1 was given for 'yes' and 0 for 'no' unless otherwise stated. However, for number of sexual partners, 1 was given for those that reported more than 1 partner, and zero for those with 1 or no partners. Source of information was

coded into a categorical variable: Media (1), Friends and Family members (2) and Health care professionals (3).

All constructs of the HBM were turned into dichotomous variables for the purpose of data analysis. For instance, intent to take up HPV education the answers “not at all likely” and “fairly likely” were recorded as 0 (no intention to take up vaccination) and answers “very likely” and “definitely likely” were recorded as 1 (intention to be educated about HPV). All other variables using likert scales were coded in a similar fashion.

3.6.2. Cleaning

Obvious data entry error such as outliers (really high or low numbers) e.g. .age=220 (really 22 or 20), values which were entered but did not exist for the variable (for instance if sexually active) and any missing values were checked for and corrected using the original questionnaire. Double entry was done. This entailed entering the data twice into Epi Info, then comparing both data sets by the *Data Compare* function for discrepancies. Any differences between the two data sets were checked up and appropriately corrected using the original questionnaire. Univariate data analysis (i.e. exploring each variable in the data set with box plots) was used to check the quality of the data. Box plots were used to check if the maximum and minimum values made sense, and also to see if all subjects had data or if some values were missing. Inconsistencies or unexpected results were investigated and corrected using the original questionnaire.

3.6.3. Statistical Analysis

The Epi info 2007 version was used to analyze the data. There were two main outcome variables in this study: participants’ intent to take up HPV education and their willingness to be vaccinated. There were six main predictor variables; each of the five HBM constructs (namely: perceived severity of HPV infection, perceived likelihood of HPV infection, perceived effectiveness of the HPV vaccine, perceived barriers to HPV vaccination, cues to HPV vaccination) and the participants’ score on the HPV/cervical cancer knowledge. Other variables that were assessed and treated as predictor variables were; participants’ ethnic background, whether they are sexually active, whether they are in a relationship, number of sexual partners in the last 12 months and if they used a condom in their last sexual encounter.

For descriptive analysis means and standard deviations were calculated for continuous variables such as age and the HPV/cervical cancer knowledge score, whilst frequencies were computed for categorical variables such level of study and racial background.

In addition, simple and multivariate logistic regression analysis was performed to assess the relationship between predictor variables with each of the outcome variables whilst concurrently adjusting for confounding using a p-value of 0.05.

3.7. Validity

Brewer defines internal validity of a study as an assessment of how well the study measures what it seeks to measure (Brewer, 2006). To ensure high internal validity of the study the researcher did the following:

The questionnaire was pilot tested on 10 subjects to establish questionnaire logistics, time frame, skip patterns and replace vague or confusing questions. The subjects were asked to complete the questionnaire and provide feed back questions. Face validity was examined by cervical cancer specialist and public health educator. The feedback obtained from these sources was used to develop the final version of the survey instrument as described in Section 3.5 above.

Confounding or blurring of effects, which is another form of bias and a threat to internal validity, was controlled by the multiple logistic regression method during data analysis. This is a multivariate technique which allowed me to determine the effect of level of HPV knowledge on the willingness to be vaccinated whilst controlling (i.e. keeping them constant) for the other covariates such as age and sexual behavior which can be potential confounders.

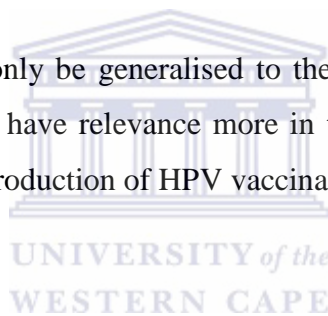
As a way of ensuring a high degree external validity, which is the ability to extrapolate the findings to the study population, a representative sample was selected by probability sampling (Mitchell and Jolly, 2001). Moreover, a high participation rate was encouraged by making the students complete the questionnaires at their own free time thus minimizing the disruption of their studies. Offering them free lunch and supper vouchers as well as assuring the participants that the data would be confidential also motivated them.

3.8. Reliability

Reliability is a measure of reproducibility of a survey instrument (Shadish, Cook and Campbell, 2004). It describes the precision or random error of the instrument (Shadish *et al.*, 2004). To improve reliability, participants completed a modified version of a self-administered questionnaire called the Knowledge and Perceptions Survey (KAPS). The KAPS is a standardized instrument which was originally designed by McPartland and his colleagues in 2005 to assess perceived severity, susceptibility, knowledge of HPV, and intent to change behavior among college-aged students (McPartland *et al.*, 2005). The knowledge scale of the KAPS had high internal consistency (Cronbach's $\alpha=0.93$) in a study conducted by Yacobi and colleagues among university students (Yacobi *et al.*, 1999). Study manuals were also available for both my assistant and I to refer to for guidance any time that problems arose during data collection.

3.9. Generalizability

The results of this study could only be generalised to the study population. However, it is anticipated that the findings will have relevance more in this country as the Department of Health embarks on wide scale introduction of HPV vaccination.



3.10. Ethics

Ethical approval by the University of the Western Cape's Research and Ethics committee was sought and permission to conduct the research amongst university students had to be granted by the Registrar of the university before the research commenced. Given the sensitivity of this research, which requested for some aspects of the private life of university students, I guaranteed that the basic principles of human research ethics (respect of persons, beneficence, non-malevolence, voluntary participation, confidentiality and justice) will be safeguarded (Human Sciences Research Council, 2009).

This research will be of a great benefit to the females of South Africa, as recommendations on promoting HPV vaccination will be made to the ministry of health. Participation in this study did not result in any harm to the participants. On the other hand, declining to participate in the study did not result in any harm to those who refused to participate. Participation in the study was voluntary and participants were given an option to answer only the questions they felt comfortable with. Also, they could withdraw from the study at any time. Those who wished to withdraw were instructed to simply not answer any further questions but to remain

in their seats until the end. In this way, they could withdraw anonymously. The use of anonymous self-administered closed questions guaranteed the respect of privacy.



Chapter 4: Results

4.1. Description of study participants

The survey included 150 (3%) of the almost 5000 female students who were registered at the university in 2009.

The mean age of the respondents was 22 years (standard deviation = 2.3 years). Most respondents were South African (70.7%) and Black (88%). Most respondents (79.3%) were senior students (i.e. 2nd, 3rd and 4th year students in their undergraduate degrees).

Table 6: Demographic characteristics

Age	Frequency	Percentage
18 – 20	37	24.7
21 – 24	87	58.0
25 - 30	26	17.3
Race		
Black	132	88.0
Colored	8	5.3
Asian/Indian	6	4.0
White	4	2.7
Nationality		
South African	106	70.7
Non South African	44	29.3
Year of Study		
First	31	20.7
Second	66	44.0
Third	34	22.7
Fourth	12	8.0
Postgraduate	7	4.7
Faculty		
Education	30	20.0
Law	30	20.0
Management and Commerce	30	20.0
Science and Agriculture	30	20.0
Socials Science and Humanities	30	20.0

4.2 Sexual behavioral characteristics

Most respondents reported to be in a relationship (71.3%) and being sexually active (71.3%). More than a third of sexual active respondents (37.4%) indicated that they had more than one

sexual partner in the past 6 months. More than half of the sexually active participants (60%) indicated that they had used a condom in their last sexual encounter.

Table 7: Sexual and Behavioral Characteristics

	Frequency	Percentage
In a relationship	107	71.3
Sexually active	107	71.3
Had more than 1 sexual partner in the last 6months	40	37.4
Used a condom at last sexual encounter	65	60.0

4.3. Awareness and knowledge about HPV

Few study participants (22.7%) had ever heard of the Human Papilloma Virus (HPV); whereas most had heard about cancer of the cervix (90%) and the Pap smear (70%) (Table 8). Media (electronic and print) was the most common source of information reaching 58% of respondents. Health care institutions ranked the second (25.2%), followed by family and friends (25.2%).

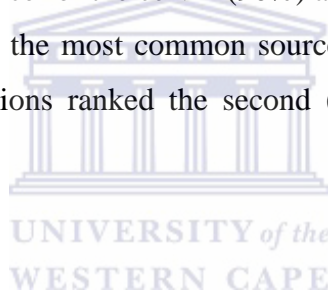


Table 8: Awareness of HPV

	Frequency	Percentage
Awareness		
HPV	34	22.7
Cancer of the cervix	135	90.0
Pap smear	105	70.0
Source of information		
Media	81	58.3
Family and friends	23	16.5
Health care providers	35	25.2

The knowledge was generally limited with none of the participants being able to answer all 11 questions correctly. The mode score was 4 and median 4. Less than 5% (7) got 75% of

questions correct; and 22% got none correct. Most respondents (72%) were not sure about the association between HPV and Herpes (that HPV can cause Herpes genital infection); only 9.3% gave the correct answer. On the other hand, 67.3% of respondents knew that there was a link between HPV and cancer of the cervix. Further, 43% of respondents were aware of the link between HPV and genital warts.

Table 9: Knowledge about HPV

Question	Percentage who got it correct
HPV can cause herpes	9.3%
Genital warts are caused by HPV	43.3%
HPV can cause CA cervix	67.3%
If the Pap smear is normal, then you don't have HPV	14.0%
Changes in Pap smear may indicate HPV	28.7%
A negative test for HPV means you don't have HPV	10.0%
Most people with HPV have no visible signs or symptoms	38.7%
I can transmit HPV even if I don't have symptoms	39.3%
Having one type of HPV means you can't acquire new types	33.3%

Awareness of the HPV vaccine

Less than a third (32%) of respondents knew that a vaccine existed to prevent HPV and cervical cancer, and only 22% (33) of the study participants were aware that the vaccine is available in the country.

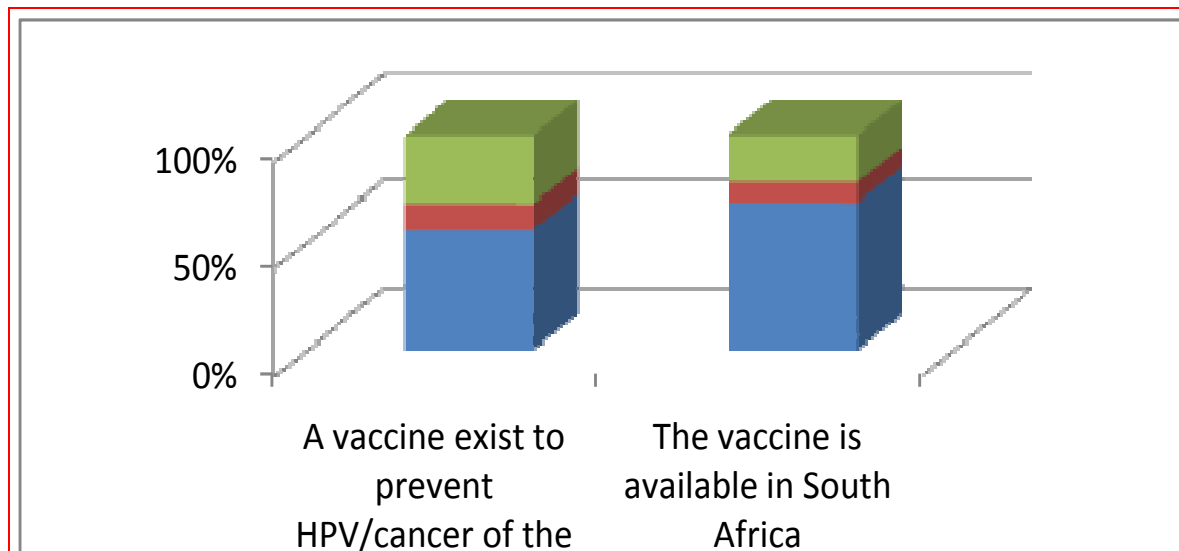


Figure 8: Awareness of availability of HPV vaccine

4.4. Health related beliefs and uptake of HPV vaccine

Risk perception for HPV among respondents was low with 41.3% (62) believing that they were at risk (Table 10). Most considered HPV infection and its consequences to be severe (78%), and believed that being vaccinated would effectively protect them against HPV (83.3%). Interestingly, most of the participants (89.7%) indicated a desire for more information on the HPV infection, cervical cancer and the HPV vaccine.

Slightly over 80% (122) of the students were willing to be vaccinated if the vaccine was available. Vaccine uptake would be greatest among the study respondents if the vaccine can prevent cancer (71.3%) and both cancer and warts (93.3%). There was low interest (42.7%) in the vaccine, if it only prevented warts.

More clients (70%) preferred to be vaccinated with once off dose than two doses over a three month period (28%). Similarly, a greater percentage of the participants (78%) would opt for a vaccine administered free of charge than when it is sold for R500 (22%).

Table 10: Health related beliefs and vaccine uptake

	Frequency	Percentage
Believe they are at risk of HPV infection	62	41.3
Believe HPV infection is severe	117	78.6
Believe that the HPV vaccine is effective	125	83.3
Would want to get more education about HPV	147	89.7
Would opt to be vaccinated if:		
Available to them	122	81.3
It prevents warts only	64	42.7
It prevents cancer only	107	71.3
It prevents both	140	93.3
1 dose, once off	106	70.7
2 doses, three months apart	42	28.0
Vaccine is free of charge	117	78.0
Vaccine costs R500	64	42.2
Recommended by a doctor	126	84.0
Recommended by spouse/family/friend	88	58.7

A doctor's recommendation for the vaccine would result in higher potential vaccine uptake (84%); although many indicated that a recommendation from the spouse, family or friend would motivate them to be vaccinated (58.7%).

4.5. Predictors of vaccine uptake

Being aware of the existence of a Pap smear and having more knowledge about HPV were associated with a four (OR = 3.54 [95% CI: 1.51-8.27]) and three-fold (OR =2.94 [95% CI: 1.23-7.02]) increase, respectively, in odds of being willing to be vaccinated ($P=0.003$ and 0.01 respectively). Those who believed HPV and its consequences to be severe were observed to be five times (OR=5.42 [2.23-13.2]) more willing to be vaccinated ($P= 0.0002$). Individuals who believed that the vaccine was effective were ten times (OR=10.09 [95% CI: 3.84-16.5]) more willing to be vaccinated, when compared to those who did not believe the vaccine was effective ($P=0.0000$).

However, being in a relationship, sexually active, having more than 1 sexual partner, using a condom at last sexual encounter and being aware of cancer were not significantly associated with opting for vaccination.

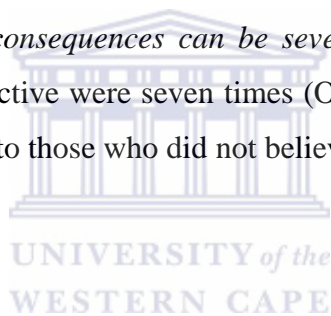
Table 11: Simple Logistic Regression

Predictors	Odds Ratio	95% CI	P-Value
Sexual Behavior			
Being in a relationship	2.20	0.94-5.16	0.06
Being sexual active	0.64	0.24-1.72	0.38
Having >1 partner in past 6 months	0.68	0.29-1.63	0.39
Used a condom at last sex	1.04	0.41-2.61	0.94
Awareness and knowledge about HPV			
Aware of Cancer of the cervix	2.43	0.76-7.79	0.13
Aware of HPV	1.96	0.63-6.09	0.28
Aware of PAP smear	3.54	1.51-8.27	0.003
Has higher knowledge about HPV	2.94	1.23-7.02	0.01
Health Beliefs			
Believe to be at risk of HPV infection	1.99	0.81-5.16	0.13
Believe that HPV infection can be severe	5.42	2.23-13.2	0.0002
Believe that the HPV vaccine is effective	10.09	3.84-16.5	0.0000

Table: 12: Multivariate Logistic Regression

Predictors	Odds Ratio	95% CI	P-Value
Believe that vaccine is effective	7.30	2.52-21.1	0.0002
Has higher knowledge about HPV	1.93	0.67-5.55	0.22
Aware of Pap smear	1.90	0.63-5.80	0.26
Believe that HPV can be severe	2.16	0.72-6.48	0.17

Table 12 above displays the results of multivariate logistic regression. Only *the belief that the vaccine would be effective* was statistically significant in predicting those clients that would opt to be vaccinated when accounting for *knowledge about HPV*, *awareness of pap smear* and *the belief that HPV or its consequences can be severe* ($P= 0.0002$). Individuals who believed that HPV would be effective were seven times (OR=7.30 [2.52-21.10]) more likely to be vaccinated when compared to those who did not believe the vaccine was effective.



Chapter 5: Discussion

5.1. Introduction

This chapter presents the key results of this study in relation to the objectives as well as to the findings of similar studies whose results have been published elsewhere.

5.2. Representativeness of study sample

The racial distribution of the sample was similar to that of the university population in 2008 and in both cases; black students constituted almost 90% of the population (see fig. 2 and table 6). It was also observed from table 6, that undergraduate students constitute the majority (95%) of the enrolment, which again compares well with the 2008 enrolment as shown in fig. 3. The minor differences could be explained by the fact that enrolment differ slightly year. This suggests that the sample was representative of the study population.

The study revealed that about 70% of the respondents were sexually active. This is similar to that reported (65%) by the recently published Higher Education South Africa (HESA) study (Higher Education HIV and AIDS Programme (HEAIDS), 2010). It was also observed in this study that 40% of the study participants indicated that they had *not* used a condom at their last sexual encounter and this is exactly the same figure reported by the HESA study (HEAIDS, 2010). It is also comparable to the findings of the 2008 Behavioral Survey which reported that 41.9% had *not* used a condom in their last sexual encounter (Shishana *et al.*, 2009).

However, the study found a higher percentage of individuals (37.4%) reporting that they had had more than 1 sexual partner I the 6 months prior to the study compared to those reported (6%) in the 2008 Behavioral Survey and HESA study (Shishana *et al.*, 2009; HEAIDS, 2010).

5.3. Awareness and knowledge of HPV and vaccine

In this study, 22.7% of the participants were found to be aware of HPV. This compares fairly well with findings from other studies. A study among sexually active female college students in the US found that 13% of them had heard of HPV. A systematic review of 60 studies on

awareness about HPV among females of diverse backgrounds reported a range of between 13% and 93 (Klug *et al.*, 2008).

In contrast to low awareness of HPV, most (90%) of the participants were aware of cancer of the cervix. This could be due to the fact that HPV is a microbiological term and as such could be difficult for the non-clinical people (i.e. none medically trained) to recall when compared to cancer of the cervix which the general population would tend to recall more easily.

The study showed that 70% of the respondents had heard of Pap smear. This is less than 95% that was reported for females who were staying in an urban district in Cape Town (Moodley *et al.*, 2006). The difference could have arisen because the Cape Town study focused on women attending gynecological clinics and as such, they could have been more aware of pap smear due to their frequent contact with health workers. It was worrying to note that, in this study, more participants (58%) cited media as their source of information when compared to health care workers (25%). Similar findings were also reported (81% media versus 2% health care workers) in the aforementioned study by Moodley and colleagues (Moodley *et al.*, 2006).

It was found in this study that the knowledge about HPV in general was poor. It was however encouraging to note that 67.3% of the students knew of the association between HPV and cancer of the cervix. This finding was almost the same (68%) as the one that was reported in a study of female university students at the Walter Sisulu University (formerly University of Transkei) (Buga, 1998). The finding of this study was higher than that found among female students in Iceland where only 34% of them knew of the association between the two (Gudmundsdottir *et al.*, 2003). This is quite a positive sign since it is well known that HPV is necessary, though not sufficient, cause of cervical cancer, and that over 99% of cervical cancers world-wide result in genital infection with HPV (WHO, 2005; Munoz *et al.*, 2006).

However, this study highlighted the confusion between HPV and other sexually transmitted infections. For instance, only 9.3% of the students knew that HPV did not cause herpes. A similar finding was also observed in a study among female university students where 80% of them thought there was a link between HPV and herpes genitalis (Yacobi *et al.*, 1999).

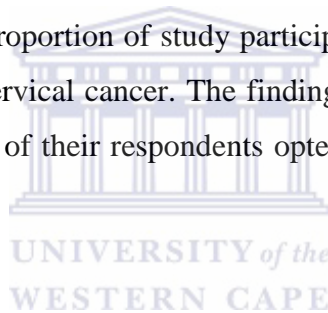
This study found that less than a third of the respondents were aware of a vaccine to prevent HPV and cervical cancer, and even less (22%) were aware that the vaccine is available in the country. This is worrisome considering the fact that the vaccine, which has a potential to

reduce the incident cancer cases by 68%, had been licensed for use in the country for one and half years before the study was commenced (Alliance for Cervical Cancer Prevention, 2003; Harries *et al.*, 2008).

5.4. Vaccine acceptability

This study showed that 80% percent of the respondents would opt to be vaccinated if it were available to them. These findings confirm the high levels of acceptability that has been documented in literature. In urban Turkey, acceptability of a HPV vaccine was even higher (96%) among a non-representative sample of women attending a gynecological clinic (Baykal *et al.*, 2008). Locally, a qualitative study in the Western Cape Province among members of the community revealed that the need for a vaccine to prevent cancer resonated with all respondents, despite the overall poor knowledge about cancer of the cervix and its causal relationship with HPV (Harries *et al.*, 2008).

This study found that a greater proportion of study participants wanted a vaccine that would prevent both genital warts and cervical cancer. The finding confirmed what was reported by Hoover and colleagues that 97% of their respondents opted for a vaccine that prevents both diseases.



5.5 Cues to action

This study also revealed that more clients (70%) would prefer to be vaccinated with a once-off dose than two doses over a three month period (28%). This may have implications on the acceptability of the current vaccine which is to be administered via three doses three months apart with each dose costing R450; thus putting the total cost at R1350 (Medical News Today, 2008). Moreover, the observation that a greater percentage of study participants (78%) would opt for a vaccine administered free of charge than when it is sold for R500 (22%) suggest that something has to be done to make the vaccine affordable and hence accessible to the greater part of the populace.

This study found that a doctor's recommendation for the vaccine would result in a potential 84% vaccine uptake whilst a recommendation from the spouse, friend or family of the study respondents would lead to about 60% uptake. Such findings have also been confirmed in studies done elsewhere. For instance, physician's endorsement of a vaccine has been

identified as an important catalyst for vaccine acceptance (Zimet *et al.*, 2005). In a similar way, a number of studies report that higher acceptability of the vaccine was found among subjects who thought that their doctors would recommend it (Boehner *et al.*, 2004; Dempsey *et al.*, 2006; Khan *et al.*, 2003). This finding lends support to the notion that among various possible cues to action, physician recommendation is likely to be a key ingredient of successful HPV vaccination programs. This is because physicians may be uniquely persuasive in addressing perceived barriers, for example by initiating a conversation with patients about their concerns, clarifying any misunderstandings and recommending the vaccine.

5.6 Health Belief Model constructs as predictors of vaccine uptake

HBM constructs have been reported to be predictors of potential vaccine uptake (Becker, 1974; Brewer *et al.*, 2004). A number of studies documented that higher perceived risk of HPV infection was associated with higher vaccine acceptability (Boehner *et al.*, 2003; Friedman and Sherpard, 2006; Olshen *et al.*, 2005). However in this study it was found that higher perceived risk of HPV infection was not statistically significantly associated with higher vaccine acceptability.

The study also found that perceived severity is significant predictor of willingness to be vaccinated. This finding is in contradiction which the documented literature which state that perceived severity was not related to vaccine acceptability (Boehner *et al.*, 2003; Khan *et al.*, 2003; Dempsey *et al.*, 2006). This difference could have arisen due to the fact these studies were done in the western world where the beliefs could potentially differ from the predominantly this African group that I conducted my study on.

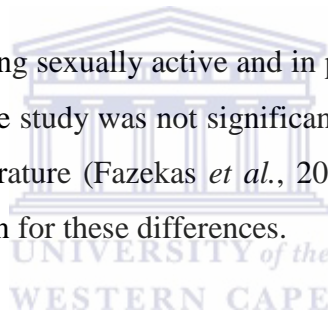
In this study, it was found that perceived vaccine effectiveness was associated with higher vaccine effectiveness. This variable remained statistically significant even when all the variables were put into a multivariate regression model. This confirmed the findings in previous studies (Davis *et al.*, 2004; Dempsey *et al.*, 2006). It was interesting to note that this study confirmed the reports of literature that perceived vaccine effectiveness as the most important attribute of an acceptable vaccine, as it had the highest Odds Ratio among all the other variables (Zimet *et al.*, 2005). By this line of reasoning, it is plausible that HPV vaccine

programs in South Africa should emphasize the high likelihood of HPV infection, high vaccine effectiveness, and physicians' recommendations.

5.7. Other predictors of vaccine uptake

This study found that those who had higher knowledge of HPV and vaccine were almost three times more likely to opt for the vaccine compared to those with poor knowledge. However, this finding contradicts other studies that found HPV vaccine acceptability to be high despite generally low levels of knowledge about HPV (Harries *et al.*, 2008; Wong, 2008). The findings of the two studies are quite surprising since one would presume that limited knowledge and awareness of HPV may make it difficult for some people to discuss HPV vaccine acceptability (Friedman and Sheppard, 2006; Olshen *et al.*, 2005). This issue should be pursued in future research.

It was noted in this study that being sexually active and in particular having more than sexual partner in the six months prior the study was not significantly associated with higher vaccine acceptability as suggested in literature (Fazekas *et al.*, 2008; Marshall *et al.*, 2007). Future research should explore the reason for these differences.



5.8. Outcomes of Hypotheses testing

The discussions in sections above show that the following were the outcomes:

Intention to be vaccinated/Perceived severity.

H1: Female students were more likely to be vaccinated if they perceived the infection or its consequences to be severe.

Intention to be vaccinated/Perceived susceptibility.

H2: Female students were more likely to be vaccinated if they perceived that they were at risk of infection.

Intention to be vaccinated/Perceived effectiveness.

H3: Female students were more likely to be vaccinated if they perceived that the vaccine is effective in preventing the infection and its consequences.

Chapter 6: Conclusions and Recommendations

6.1. Strengths of the study

This study is unique in that it was one of the first studies to apply the Health Belief Model to HPV vaccine acceptability among college students in South Africa. I was able to survey a random sample of female students from the university, thereby increasing the generalizability of the findings to the university female student body. A few of the studies on this topic found in the literature on South Africa used convenience samples to collect data. This study utilized a questionnaire to collect data. The fact that a questionnaire can be standardized increases the reliability, comparability and precision of data from one region or time frame to another. Also, the fact that it was self-administered minimized the issues of confidentiality which were particularly important in the case of sensitive issues like sexual activity. This increased the likelihood of respondents answering candidly because the anonymity and confidentiality of their responses were ensured. Its close ended nature meant that exact responses were obtained and thus, easy to code, analyze and interpret.

6.2. Limitations of the study

It is important to note that there may be several limitations to the generalizability of the current findings. Firstly, because the students were made aware of the nature of the survey before they accessed it, those who participated may have chosen to do so because they had a personal interest in the knowledge about HPV, and those who were not comfortable answering questions about their sexuality and health beliefs regarding a sexually transmitted infection may have avoided taking the survey. Secondly, due to the study design, students who had a lower frequency of accessing their e-mails were likely to be under-represented thus; the findings may not be generalizable to other students in other centres of tertiary education across the country.

Thirdly, because all of the data were collected via self-report, participants may not have answered all of the questions truthfully due to recall bias. Information bias may also be present that occurred, as responses to questions 5, 6, 7 and 8 in section A of the questionnaire may have been influenced by social desirability. It must however, be pointed out that questions used for self-declaration of intimate or socially stigmatized behaviors were

questions that have been used and validated in other health and social surveys dealing with similar issues (McPartland *et al.*, 2005).

Moreover, questionnaires are prone to a number of non-sampling errors. They suffer from cultural re-interpretation. This is an observation that people do not respond to the formal content of a question, but to the meanings (associations and connotations) which they have. For instance, in one study, the question whether one had ever heard about abortion was interpreted as looking for whether one had a personal experience of abortion (Stone and Campbell, 1984). Hence in this case, asking whether a study participant had heard of HPV infection could have been interpreted as asking whether they ever had the infection.

Fourthly, the study only assessed intended acceptance of HPV vaccination hypothetically, and this may not map directly on to actual acceptance of the vaccine. However, the first pilot study done in the United Kingdom on uptake of the HPV vaccine in 12-13 year old girls, found that levels of uptake were broadly consistent with previous hypothetical studies (Waller *et al.*, 2004). Moreover, I used a single-item measure to assess acceptability to keep the questionnaire short and simple but also because when adolescent girls are invited to have HPV vaccination, they will have to make a dichotomous decision (i.e. to accept or not accept the invitation). However it is often argued that single item measures can have a large error (Burak and Meyer, 1997).

6.3. Main findings of study

This study described the sexual behaviour characteristics, knowledge of HPV infection/vaccine and factors associated with vaccine acceptability among female students at a university in South Africa.

The following patterns of sexual behaviour were noted:

- About 70 % of them reported that they were sexually active.
- At least 40 % of them reported that they had not used a condom at last sexual encounter.
- 37% of them stated that they had had more than 1 sexual partner in the last 6 months.

Awareness and knowledge on HPV/vaccine were generally poor and marked by the fact that:

- Only 22% of them were aware of HPV.
- Greater proportions were aware of cancer of the cervix (90%) and Pap smear (70%).
- Health care workers were stated as sources of information by 25% of students.
- 67% of them knew the association between HPV and cancer of the cervix.
- Only 32% of them knew that a vaccine against HPV has been developed.
- Only 22% knew that the HPV vaccine is available in the country.

The following factors were noted on vaccine acceptability:

- 80% stated that they would be willing to be vaccinated.
- A greater proportion preferred a vaccine that would prevent both warts and cancer.
- More than 70% of the students would opt for a vaccine that was free of charge and given as a single once off dose.
- More respondents would opt to be vaccinated if it's recommended by their physician (84%) than when it's a family member or friend (58%).
- Perceived vaccine effectiveness was the most (5 times more likely to opt for the vaccine) important attribute of an acceptable vaccine.
- Perceived HPV severity was associated with 3.5 times more potential vaccine uptake.
- Perceived risk of infection was associated with 1.7 times more uptake.
- Higher knowledge of HPV was associated with higher vaccine acceptability.
- It was noted that HBM constructs are associated with vaccine acceptability.

6.4. Recommendations for strategies to be considered during the introduction and propagation of public health care system based HPV vaccination in South Africa.

Based on the aforementioned findings of this study the following recommendations can be drawn.

- There is need to embark on behaviour modification education among university students, given the high prevalence of risky sexual behaviours reported in this study.
- A lot still needs to be done in educating the population about HPV, cancer of the cervix and HPV vaccine, in view of the poor knowledge demonstrated by university students whom, because of their potential to attain higher education and social status one could assume they know better than the ordinary women in the community.
- Health care institutions and workers should take the centre stage in providing this information because have been to be shown in this study to have more positive influence and also have the technical know how to correct any misconceptions which have been shown to be prevalent in this study.

- There is urgent need to review the cost of the vaccine, or make it available in the public health sector so that it will be accessible to a greater number of clients. Otherwise, vaccine uptake may be harmed by the existing disparities in health care access and thus, widen rather than narrow existing disparities in cervical cancer deaths among South African women.
- The findings about factors that affect vaccine acceptability lends support to the notion that for the vaccine marketing strategy to be effective, it should educate the women on HPV, emphasising their susceptibility (i.e risk) to contracting this infection which has severe (i.e. severity) consequences and also about the vaccine effectiveness in preventing HPV and cervical cancer including its potential impact if adopted on a wide scale.

6.5. Recommendations for future research

- More studies are urgently needed to address the paucity of HPV vaccine acceptability research and literature in developing countries and in particular, Southern Africa.
- This study focused on female students at one university and as such, may not be generalizable to females in South Africa. It is therefore necessary to embark on a wider research to target the ordinary population in the country.
- This study assessed hypothetical vaccine acceptability. It would be necessary to have studies that report actual acceptability during the early implementation of wide spread vaccination campaigns in the near future.
- Future studies may explore the effects of knowledge levels, sexual activity and having more sexual partners on vaccine acceptability.

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Appendix 1: Consent Form

UNIVERSITY OF THE WESTERN CAPE
School of Public Health

Private Bag X17 • **BELLVILLE** • 7535 • South Africa
Tel: 021- 959 2809, Fax: 021- 959 2872

CONSENT FORM

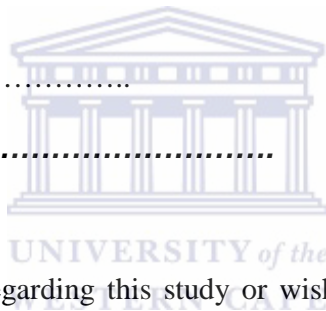
Title of Research Project: Human Papilloma Virus (HPV) Infection Awareness and Knowledge among Female Students at a South African University and their Intention to Receive an HPV Vaccine in 2009

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name.....

Participant's signature.....

Date.....



Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: Dr. Brian Van Wyk

University of the Western Cape

Private Bag X17, Bellville 7535

Telephone: (021)959-2173

Cell: 082 804 9055 Email: bvanwyk@uwc.ac.za

Appendix 2: Information Sheet

UNIVERSITY OF THE WESTERN CAPE

School of Public Health

Private Bag X17 • BELLVILLE • 7535 • South Africa

Participant Information Sheet

Dear Student: You are invited to participate in the research project “**Knowledge and Awareness of HPV and vaccine among university students**”.

Why are we doing this?

The aim of the project is to determine what students know about Human Papilloma Virus (HPV) which is a sexually transmitted virus, cancer of the cervix and to ascertain their intention to take up an HPV vaccine.

Who is the researcher?

The study is being conducted by, Dr A.Chikandiwa, as a partial fulfilment of a Masters Degree in Public Health, at the University of the Western Cape, South Africa.

What do I expect from you in this study?

Attached to this letter is a questionnaire that contains 27 questions which you will be asked to respond to. It will take you about 10 mins to complete. Please look over the questionnaire and, if you choose to answer it, please sign in the consent form provided. By signing, it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project with the understanding that anonymity will be preserved. Your participation is voluntary and there is no penalty if you do not participate. However, I urge you to participate and complete all questions. You will be given a brochure which has general knowledge on HPV and cancer of the cervix at the end of the survey and a break fast voucher as a token of my appreciation of your participation.

Anticipated benefits of the study to society:

The results of this survey will inform the department of health in developing appropriate future preventive strategies against HPV and cancer of the cervix.

What will be done to ensure confidentiality?

This is an entirely anonymous questionnaire, and so your responses will not be identified with you personally in any way. To ensure security, the questionnaires will be kept under lock and key. They will be destroyed after data entry. Data will be stored electronically in a database on a secured server and access is restricted by password to the researcher.

Yours Sincerely, **Dr. Admire T Chikandiwa.**

Please keep this information sheet and if at any stage you have any queries or concerns regarding your participation in the study, please contact me on: Email:

addychiks@doctor.com Cell: 0027 719 698 643

Appendix 3: Questionnaire

HPV Questionnaire

SECTION A: Socio-demographic characteristics

Please tell me a little bit about your self

1) Current age in completed years. _____

2) Race/Ethnicity and nationality (please tick any two that apply).

Black	White	Colored	Asian/Indian	South African	Non-South African

3) Current level of study in the University (please tick one).

1 st year	2 nd year	3 rd year	4 th year	Postgraduate

4) Faculty in which you in (please tick one that applies).

Education	Law	Management & Commerce	Science & Agriculture	Social & Humanities

5) Are you in a relationship? __ YES __ __ NO __

6) Are you sexually active? __ YES __ __ NO __

7) How many sexual partners have you had in the past 12 months?

0	1	2-3	4-5	5+

8) Did you use a condom at your last sexual encounter? __ YES __ __ NO __

SECTION B: HPV/VACCINE AWARENESS AND KNOWLEDGE

HPV is a sexually transmitted virus.

9) Have you ever heard of Human Papilloma Virus or HPV? __ YES __ __ NO __

10) Have you ever heard of cancer of the cervix/mouth of the womb? __ YES __ __ NO __

11) Have you ever heard of a Pap smear/Test? __ YES __ __ NO __

12) If any of your answers to the three questions above is yes indicate your source of information by ticking in the appropriate box below:

Media (TV, Radio, newspapers, internet)	Family members or friends	Health care providers
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13) HPV knowledge:

Question	True	False	Not Sure
A: HPV can cause herpes.			
B: Genital warts are caused by HPV.			
C: HPV can cause cancer of the cervix.			
D: If a woman's pap smear is normal, she does not have HPV.			
E: Changes in a pap smear may indicate that a woman has HPV.			
F: A negative test for HPV means that you do not have HPV.			
G: Most people with HPV have no visible signs or symptoms.			
H: I can transmit HPV to my partner even if I do not have symptoms.			
I: Having one type of HPV means that you cannot acquire new types.			
J: A vaccine exists to prevent HPV infection/cancer of the cervix.			
K: The vaccine is available in South Africa.			

SECTION C: Health related beliefs.

HPV is a sexually transmitted virus that can cause genital warts or cancer of the cervix. The following are specific questions about an HPV vaccine that has been developed to prevent HPV Infection, genital warts and cancer of the cervix. I am interested in how people might feel about this vaccine. So for now, please pretend the vaccine is available

14) How likely do you think it is that you will get infected with HPV?

Very likely	Fairly likely	Not likely	Very unlikely

15) How severe do you think it would be to have Human Papilloma Virus infection?

Very severe	Fairly severe	Not severe	Not at all severe

16) How likely do you think that being vaccinated against HPV will help reducing your chances of getting infected?

Very likely	Fairly likely	Not likely	Very unlikely

17) Would you want to be vaccinated to prevent HPV infection and cancer of the cervix or cancer of the womb? ___ YES ___ NO ___.

How likely would you get the vaccine if:

	More likely	Likely	Unlikely	More unlikely
18. It prevented cervical cancer in women, but did not prevent genital warts				
19. It prevented genital warts, but did not prevent cervical cancer in women				
20. It prevented both genital warts and cervical cancer				

Would the following potential features make you less likely or more likely to get an HPV Vaccine?

	Much less likely to get	Less likely	More likely	Much more likely
21. Having to pay R500 for the HPV vaccine myself.				
22. Having the HPV vaccine for free.				
23. If the HPV vaccine was recommended to me by my doctor				
24. If the HPV vaccine was recommended to me by my spouse/partner/parents/family members				
25. The HPV vaccine was given as three doses 3 months apart.				
26. The HPV vaccine was given in as a single dose.				

27: Do you intent to get more education on HPV and vaccine? ___ YES ___ NO ___

That's it! You're done! I appreciate your willingness to answer these questions!



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