Designing the concept for a mobile health solution to educate female scholars residing in a low- to- middle-income socio-economic setting in Cape Town about HPV and its vaccine.

By

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PLAGIARISM DECLARATION

I, Kedebone Oliver, declare that “Designing the concept for a mobile health solution to educate female scholars residing in a low- to- middle- income setting in Cape Town about HPV and its vaccine.” is my own work. It has not been submitted for any other degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Date: 15 March 2021

Signature:…….. Signed by candidate

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To support this worthy cause please visit: https://ikamvalabantwana.org/give/

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LIST OF ABBREVIATIONS

AIDS	acquired immunodeficiency syndrome
CIN	Cervical intraepithelial neoplasia
CIS	Carcinoma in situ
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DHIS	District Health Information System
DNA	Deoxyribonucleic acid
DOH	Department of Health
DSR	Design science research
EPI	Expanded Programme on Immunisation
FDA	Food and Drug Administration
HIS	Health Information System
HIV	Human immunodeficiency virus
HPV	Human papillomavirus
hr-HPV	High-risk human papilloma virus
ICO/IARC	Institut Català d'Oncologia/ International Agency for Research on Cancer
ILB	Ikamva Labantwana Bethu
ISR	Information systems research
LEEP	Loop electrosurgical excision procedure (same as LLETZ)
LLETZ	Large loop excision of the transformation zone (same as LEEP)

LMIC	Low-to-middle-income country
lr-HPV	Low risk human papillomavirus
mHealth	Mobile health
Pap smears	Papanicolaou smears
POPIA	Protection of Personal Information Act
SMS	Short Message Service
SRH	Sexual and reproductive health
STD	Sexually transmitted disease
STI	Sexually transmitted infection
VIA	Visual inspection with acetic acid
WHO	World Health Organization

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ABSTRACT

Introduction

Cervical cancer is the second most common cancer in South African women and fourth most common in women worldwide. Human papillomavirus (HPV) infection is the causative agent of 90% of cervical cancers. It can be prevented, especially in younger, non-sexually active individuals through a 2- or 3-dose vaccination.

The vaccines are given free of charge to female grade 4 learners (9-15 year-olds) in South African public schools since 2014. The vaccination programme was promoted through educational pamphlets, posters, publications on the government websites, social media, and broadcasts on national radio and television prior to the start of the campaign. However, the available vaccines do not protect against all types of HPVs, and thus consistent education would be useful to advise young girls about safe lifestyle choices. Young people use mobile devices extensively, and therefore these devices may be an effective way to reach them directly, and to engage with them consistently.

The project aimed to design the concept for a mobile health (mHealth) solution to aid in educating young female scholars residing in a low-to- middle-income setting in Cape Town about HPV and its vaccine.

Methodology

A user-centred approach known as the Information systems research (ISR) design framework was used to design the concept for a mHealth solution. It involved three main steps that were applied in a cyclic manner: namely the cycles of relevance, design and rigour. The relevance cycle involved assessment of the needs and knowledge of the target population (grade 4-7 female scholars of the Ikamva Labantwana Bethu tutoring programme in Crossroads)

through a quantitative survey with 43 participants, which was followed by two focus group discussion with 8 participants each. The focus group discussion formed part of the design cycle, where a mock mHealth tool (based on the survey results) was presented to the groups to engage them about their attitudes, preferences, and perceptions towards the proposed solution. The rigour cycle involved combining the survey and focus group discussion data with knowledge from literature, for the conceptual design of the mHealth tool.

Results

A total of 43 learners completed the survey, and all participants indicated that they were vaccinated for HPV at school; however, none of them were able to answer the HPV knowledge questions. There was a high level of access to mobile technologies, as all the participants reported that they had access to cell phones and laptops (own or borrowed).

The learners showed a strong preference for learning about sexual health and HPV from schoolteachers and tutors, with 25 out the 41 participants selecting this option, and 52% preferring an interactive learning style. During the focus group discussions, emphasis was placed on the mHealth application having entertainment features, while still being informative.

Conclusions

There was sufficient access to mobile technologies and WIFI access, which made an mHealth solution feasible. The fact that the participants had all been vaccinated, but they still didn't know what HPV was, showed that an mHealth tool could be useful. The learners prefer to learn interactively, and from their teachers and tutors, which is an element that can be introduced to the mHealth platform through a chatting function and educational video.

CHAPTER 1 INTRODUCTION

1.1. Background

The human papillomavirus (HPV) is responsible for approximately 90% of cervical cancer cases; and is mainly transmitted through penetrative and skin-skin sexual contact (WHO, 2007). Cervical cancer is ranked as the second most common cancer among women in South Africa and the most common cancer among South African women between 15 and 44 years of age (Bruni L, 2018). HPV infection is largely preventable if the prophylactic vaccines are taken properly and widely; as all the vaccines protect against the high-risk HPV types (causative agents of cancer) 16 and 18, which account for 70% of cancer cases (Dochez et al., 2014).

One of the strategies employed by the South African government for reducing the cervical cancer burden of disease was to launch a national school- based roll-out of the HPV vaccine, specifically to grade 4 (≥9 years old) public school females (Ngcobo et al., 2018). The success of the vaccine in the government's target population is maximized, as younger individuals are more likely to be precoital, and also have a stronger immune response post-vaccination (Kessels et al., 2012).

The vaccination campaign was launched by the Department of Health (DoH) as part of the Integrated School Health Policy, in collaboration with the Departments of Basic Education and Social Development (Tathiah et al., 2014). The campaign was promoted through various media channels including, print (posters, pamphlets), radio, television, social media, and government websites. Most of the social mobilization efforts were focussed on the caregivers, who would be granting their daughters consent to receive the HPV vaccine (Delany-Moretlwe et al., 2018). The first vaccination roll-out in 2014 managed to achieve a coverage of of 83% of eligible participants for the first dose. The coverage for the second dose was lower, with 65% of the vaccinated girls returning for their last shot (WHO, 2021).

It is important to educate the young adolescents about HPV because early adolescence is an important time in development where they can adopt practices that could have a long-term effect on their health (UNESCO, 2018). Empowering them with information could result in them making more responsible choices, especially since the HPV vaccines do not protect against all HPV types, therefore it is important to minimize risk factors that could result in HPV infection such as high parity, long-term oral contraceptive use, smoking, early sexual debut etc. (UNESCO, 2018; Harries et al., 2009; WHO, 2007). The focus of this research project was to investigate acceptable and accessible ways to deliver HPV and vaccine education to the target population itself, through a mobile health (mHealth) approach, because young people are enthusiastic mobile technology users (Feroz et al., 2019).

Digital technologies and social media have proven to be intrinsically attractive to youth as shown by the time they spend in the virtual environment, using multiple devices and software applications. Due to young people's affinity to mobile technologies, these have been used to provide them with certain health services (Li et al., 2015). The use of mobile technologies to increase access to health services or increase the efficiency of these services is known as mobile health (mHealth). Mobile health has the potential to address the barriers to healthcare, however the right design strategies need to be employed to ensure efficacy and appropriateness; this requires extensive research before and after mHealth solutions are implemented (Labrique et al., 2013).

1.2. Aims and objectives

The aim of this project was thus to design a concept for an mHealth solution, which would aid in educating young female scholars residing in a low- to- middle- income setting in Cape Town about HPV and its vaccine. The study will form the basis for the development of a fully functional and accessible mHealth solution, with the main purpose of educating young females about HPV and its vaccine.

The aim was achieved through the following objectives:

(i) Assessing the communication modalities currently being used for HPV/vaccine education, and contrasting these with the communication platforms that are accessible and acceptable to the female scholar group.

(ii) Determining what is understood by the female scholar about HPV and its vaccine, and where the gaps in knowledge lie.

(iii) Designing an mHealth concept solution that addresses the knowledge gaps of the female scholar and identified barriers to accessing this information.

1.3. Overview of the dissertation

Chapter 2 presents a literature review focused on HPV, its vaccines, the South African HPV immunization programme, and mHealth as a solution for educating young adolescents. Chapter 3 presents the methods followed to achieve the aim and objectives, namely a quantitative survey, analysis of survey results to inform the design of the prototype, and a focus group discussion to inform iteration of the design concept. Chapter 4 presents the study results. Chapter 5 presents a discussion of the findings of the study, along with study limitations, recommendations and concluding remarks.

CHAPTER 2 LITERATURE REVIEW

2.1. Cervical cancer

Cervical cancer is a malignancy of the lower part of the uterus known as the cervix. The cervix is comprised of the ectocervix (which leads from the vaginal canal to the cervix), and the endocervix which leads from the inside of the cervix to the uterus. The ectocervix is lined with squamous epithelium while the endocervix is lined with glandular epithelium; and the region where these cells "meet" is called the transformation zone (Wright, 2020). Most cervical cancers begin as a epithelial malignancy in the transformation zone (Crosbie et al., 2013).

According to the ICO/IARC HPV information centre, cervical cancer is the second most common cancer in South African women, and fourth most common in women worldwide (Bruni L et al., 2017). In the at risk population of South African women aged 15- 44 years, it is the most common cancer (Bruni L, 2018). The highest incidence rates are observed in less developed countries, with 80% of new cases occurring in these regions (Becker-Dreps et al., 2010). Cervical cancer prevalence in South Africa is 28.5 per 100 000; which is higher than the worldwide average of 15.1 (Bray F et al., 2018).

There is an estimated 19.81 million population of South African women aged 15 years and older, who are at risk of developing cervical cancer. An estimated 12 983 of those women are diagnosed with cervical cancer annually (Bruni L, 2018). This incidence does not seem to be too high, relative to the total number of women at risk; however the mortality of 5595 annually, means that a number relating to almost half (43.1%) of the newly diagnosed women die (Bruni L, 2018). The Department of Health (DoH) estimated the case fatality rate in 2017 to be higher than 50%. This indicates an inefficiency in the treatment of these women, largely due to presenting to healthcare facilities at advanced stages of the disease (Mishra et al., 2011). The late presentation is largely responsible for the poor cervical cancer prognosis, with the mean age of diagnosis in South Africa being 45; while many cases occur

before the age of 35 (Department of Health, 2017a).

Socio-economic factors in South Africa play a huge role in the distribution of cervical cancer disease burden and the prevalence. These factors include culture, race, poverty, social justice, location etc., and these influence the level and complexity of the impact that cervical cancer has on a community (Tathiah et al., 2014; Mosavel et al., 2009). Data indicates that black women and women living with HIV bear a larger proportion of the cervical cancer disease burden. The age of diagnosis for women co-infected with HIV is 10-15 years younger than the mean age of diagnosis in the country. This demonstrates how critical early detection and treatment is in South Africa (Department of Health, 2017a).

Treatment is most successful in the precancerous stages. The precancerous stage is known as cervical intraepithelial neoplasia (CIN) when it affects the squamous cells, and adenocarcinoma in situ (AIS) when it affects the glandular cells, which is less common (Wright, 2020). CIN is divided into three phases based on severity; namely CIN 1, CIN2, and CIN 3 (WHO, 2013). The severity of the CIN increases from the CIN1 which is mild, to the most severe CIN 3 (Mishra et al., 2011; Crosbie et al., 2013). Detection and effective treatment of these precancerous lesions can prevent the development into cervical cancer. Most mild CINs regress without intervention, however they may progress to a higher CIN level, which may then develop into cervical cancer (Vink et al., 2013). Development from CIN to cancer is usually gradual, and can typically take 7-20 years, which provides an opportunity for early detection and treatment (Mishra et al., 2011; Department of Health, 2017a). The cancer may sometimes be asymptomatic due to the slow growth; however when symptoms are present, abnormal vaginal bleeding (inter-menstrual bleeding) is usually the first to manifest (Mishra et al., 2011). Other symptoms such as abnormal vaginal discharge, abdominal/ back pain, post-coital and post-menopausal vaginal bleeding may appear at advanced stages of the cancer, when it has already spread to other parts of the body (Mwaka et al., 2015).

Cervical cancer prognosis depends on factors such as the age of the patient, their overall health and how advanced the cancer was at diagnosis (Herbst, 2017). The stage of the cancer is a classification system used to describe how advanced the disease is; based on the size of the tumour, the location of the cancer, and whether it has spread to other organs and nearby lymph nodes (Pecorelli et al., 2009). The staging provides guidance on the best treatment options for the patient (Department of Health, 2017a). Classification starts at stage 0 which is the earliest, up to stage 4, which is the final stage (Herbst, 2017). It is easier to treat in the early stages, and even better yet during the precancerous phases. When treatment is optimal, the 5-year survival rates per stage are; stage 0: 95-98%, stage 1: 75-85%, stage 2: 65-67%, stage 3: 30%, and stage 4: 5-10% (Department of Health, 2017a). The emphasis placed on early detection shows how important efficient screening systems are for improving the chance of survival (Herbst, 2017).

Screening is a secondary preventative measure, and involves testing women who do not have symptoms, to detect cancer risk. Screening aims to detect precancerous lesions and cancer predictors, and then link to efficacious treatment. The World Health Organization (WHO) has described an effective screening programme as one which achieves at least a 70% coverage of the target population, has methodical recruitment, effective patient follow-up and referral procedures, and careful monitoring and evaluation systems (WHO, 2020a). Additionally a good screening programme has efficient link to high quality care after diagnosis, enough resources and infrastructure for regular screening, and targets the correct demographic group with sensitive and specific screening tests (WHO, 2020a; Department of Health, 2017a).

In the South African public sector the first line of screening tests can consist of one of the following testing techniques; cytology (Papanicolau smear), genetic HPV testing (mRNA or DNA detection) and VIA/VILI/ VIAM (visual inspection using acetic acid or using Lugol iodine or with magnification respectively) (WHO, 2013; Jordaan et al., 2016; Mishra et al., 2011). In well-resourced settings, a confirmatory test can be performed prior to treatment being administered. Confirmatory tests can be a sequence of the tests used as the first line of

detection, or they can be more technologically advanced, and more expensive tests such as a colposcopy or colposcopy guided biopsy, for histological confirmation (WHO, 2013). Histological inspection of the biopsy specimen is important for diagnosis, particularly of early invasive cervical cancer. There are large disparities in the availability of resources in different parts of South Africa, and in some contexts VIA is the first line of screening, and the only line of screening for regions which follow a screen- and- treat approach (Department of Health, 2017a).

In the year 2000, the DoH launched the National Guidelines for Cervical Cancer Screening Program, which aimed to provide asymptomatic women over the age of 30 years, with three free pap smears at 10 year intervals, with the condition that the client tests negative and remains symptom free (Department of Health, 2017a). The programme came into practice in 2002 and failed to reach its goal of screening 70% of its target population, within a period of 10 years. According to the District Health Information Software (DHIS) where cervical cancer screening information is captured in the public sector, the national screening coverage increased from 54.5% in the 2014/15 financial year, to 57.4% in 2015/16 (Department of Health, 2017a). While the programme is showing improvement in coverage, it has not reached its target almost 20 years after inception due to the lack of resources (health force, and equipment), inefficient awareness programmes, failure in the follow-up of patients with abnormal cytology, programme recruitment being opportunistic (not routine-usually in response to symptom development), and not organized, among other challenges (Jordaan et al., 2016).

When secondary prevention fails, the final step is tertiary prevention. This involves the detection and treatment of invasive cancers through radiotherapy, chemotherapy, surgery, or a combination. It is important to detect the disease early and treat effectively to reduce the burden on the health sector, the individual, and society. Tertiary prevention employs a multidisciplinary approach that involves radiation and medical oncologists, social workers, pathologists, psychologists, nurses, surgeons, and is thus very costly. The treatment is often administered at tertiary and quaternary hospitals which is also expensive for the patients at

times, because they may have to travel long distances to access these institutions and thus incur travel and accommodation costs among other costs (Department of Health, 2017a).

When these levels of prevention fail and the patient is at a very late stage that cannot be cured, the patient is usually offered palliative care in the public sector. It is important to avoid reaching these higher levels of prevention, and for prevention to occur at the primary level to minimize costs and increase the chance of successful prevention (Jordaan et al., 2016). Primary prevention essentially involves avoiding all the risk factors that increase risk and susceptibility to HPV infection, as HPV is estimated to be the causative agent for 90% of cervical cancers (WHO et al., 2009).

2.2. Human papillomavirus

HPV infection is the most common sexually transmitted infection (STI) in the world, which most sexually active people contract at some point in their lives (Crosbie et al., 2013). It is asymptomatic in most cases, and it disappears spontaneously 90% of the time within 6-18 months (WHO, 2005; Crosbie et al., 2013). In the 10–12% of cases in which it persists, it may progress to cancer. It is responsible for an estimated 90% of anal cancers, 30- 40% of vulvar, penile and oropharyngeal cancers, and 12% of head and neck cancers, in addition to 90% of cervical cancers (Muñoz et al., 2006).

HPV is so ubiquitous, and is able to cause such a wide variety of ailments partly because there are 106 genotypes which are known to cause disease in humans (WHO, 2005). There are genotypes which have been termed “low-risk” HPV (lr-HPV) such as HPV 6 and 11, because they cause diseases which are generally not life-threatening such as genital warts, respiratory papillomas, CIN 1 and grade 1 precancers of the vagina, vulva, and anus (Stanley, 2012a). There are at least 13 “high-risk” HPV (hr-HPV) types which are causative agents of 95% of oncogenic HPV infections (Crosbie et al., 2013; WHO, 2005). Among these high-risk HPV types, HPV 16 and 18 are the most common, and they are responsible for approximately 70% of cervical cancer cases worldwide (Wheeler et al., 2012; Crosbie et al., 2013).

HPV is estimated to cause 5.2% of all cancers and is thus the most potent known human carcinogen. It however requires persistent infection for carcinogenesis (Muñoz et al., 2006; Stanley, 2012b). Persistent infection and progression to invasive cancer is aided by risk factors which include sexual activity at an early age, unprotected sex, cigarette smoking, high parity, long-term use of oral contraceptives, and co-infection with STI's such as human immunodeficiency virus (HIV), chlamydia, or the herpes simplex virus (Crosbie et al., 2013; WHO, 2007; Muñoz et al., 2006).

In addition to the presence of risk factors, HPV carcinogenesis also requires integration of HPV DNA into its host's genome. The HPV then uses host cell machinery for the expression of its viral oncogenes E6 and E7, which interact and deregulate the activity of well-known tumour suppressors p53 and pRb. The interference in the activity of tumour suppressors may lead to the disturbance of the cell cycle, and DNA mutations which may cause malignant transformation. Since most HPV infections regress, HPV DNA detection becomes redundant because of the high prevalence of HPV infections which will not progress to cancer (Kraus et al., 2006; Yusupov et al., 2019). The presence of HPV RNA is a good indicator of viral integration, and thus a better predictor of disease. The HPV cell cycle begins once the virus has entered the immature host cell (epithelial cells of mucosae or skin), and replication will then only take place in mature epithelial cells (Jordaan et al., 2016; Stanley, 2012a).

During the replication cycle, the virus evades the host immune system, as it delays and inhibits the host's defences. This replication cycle is rather intricate, and partly accounts for the lengthy infection period. It takes approximately three weeks to several months from the onset of infection; for infectious virus to be produced, after which viral transmission can occur (Stanley, 2012b). HPV manages to spread so widely because it causes chronic infections that are rarely fatal to the host, and rarely negatively impacts an individual, which allows for the virus to spread effectively (Stanley, 2012a). It is transmitted through penetrative sexual contact, exchange of bodily fluids, and skin-to-skin contact. Risk of HPV contraction can be lowered by using condoms, avoiding having multiple sex partners; and can be prevented for some types of HPV by vaccination (Herbst, 2017; WHO, 2007).

2.3. The HPV vaccine

HPV can be prevented, especially in younger, non-sexually active individuals through a 2- or 3-dose vaccination (Richter et al., 2014; WHO, 2014). There are currently three HPV vaccines available worldwide. These vaccines differ in the number of HPV genotypes that they protect against, the adjuvants that they contain and the way in which they are manufactured (e.g host cells used for propagation). Quadrivalent Gardasil (Merck) was the first to be approved by the American Food and Drug Administration (FDA) in 2006, followed by the bivalent Cervarix (GlaxoSmithKline) which was approved in 2009 (Maver and Poljak, 2018). Cervarix provides protection against two hr-HPV genotypes, 16 and 18; and Gardasil provides protection against lr-HPV genotype 6 and 11 in addition to the two high-risk types (Einstein et al., 2014; Richter et al., 2014; Mbulawa et al., 2018). The third vaccine is nonavalent Gardasil-9 which protects against the same HPV types as Gardasil (HPV 6, 11, 16, 18), and five additional hr-HPV types (31, 33, 45, 52, and 58) (Mbulawa et al., 2018). Cervarix and Gardasil have both been shown to provide cross-protection against hr-HPV types that have similar genomes to HPV 16 and 18, such as HPV 31, 33, 45 and 51 (Kumar et al., 2015). The cross-protection offered by the quadrivalent vaccine was found in a study by Wheeler et. al (2009) to be poor, and the duration of protection when it does occur, is unknown (Wheeler et al., 2009; Joura et al., 2015).

The bi- and-quadrivalent HPV vaccines currently available are produced by recombinant DNA methods where the gene for the L1 capsid protein is incorporated in host baculovirus/yeast cells genome, which then generates L1 proteins. The L1 proteins assemble into virus-like proteins (VLPs) which are then purified and adsorbed onto an adjuvant (Kumar et al., 2015). Gardasil is adsorbed onto a hydroxyphosphate adjuvant, while Cervarix's adjuvant is a combination of aluminum hydroxide and monophosphoryl lipid A (ASO4) (Yusupov et al., 2019). The VLPs lack viral genetic material and the absence of DNA means the VLPs cannot infect cells, replicate or cause disease. Both vaccines induce a strong and sustained immune response to the HPV types that they protect against in almost all patients (Stanley, 2012a). Cervarix generally induces a higher antibody concentration than the quadrivalent vaccine,

due to its unique monophosphoryl lipid adjuvant. This adjuvant supports a stronger immune response, however this has no clinical relevance as both vaccines have a 90% efficacy against CIN (Yusupov et al., 2019). Clinical trials have monitored the concentration of antibodies in vaccinated patients over a follow-up period of 5-8.4 years, and they have reported maintained levels of antibodies for both vaccines. The clinical trials are continuing to monitor the duration of protection, while mathematical modelling estimates that clinical protection will exceed 30 years, which essentially translates to lifetime protection. The need for booster shots has not yet been established (Kumar, 2005; WHO, 2014).

Gardasil and Cervarix have been proven to be safe; with very few adverse events directly linked to the vaccines (Mbulawa et al., 2018; Department of Health, 2017a). Both vaccines are given intramuscularly, which allows for speedy access to the lymph nodes, and thus bypassing the host immune system evasion, which occurs during the virus infectious cycle (Stanley, 2012a). The vaccines are recommended for three doses at zero, two and six months by the manufacturers. They are both free from preservatives and antibiotics (WHO, 2014). The side-effects associated with the bivalent vaccine include fatigue, headache, muscle/joint pain, and gastrointestinal symptoms; while the quadrivalent vaccine is associated with fever, nausea, and headaches. The most common side-effect by both vaccines is transient injection-site tenderness, which occurs with comparable frequency. The bivalent vaccine however showed more cases of severe injection-site tenderness and severe fatigue than its quadrivalent counterpart, due to its unique adjuvant (Yusupov et al., 2019). No serious systemic reactions from the vaccines were reported by the post-marketing surveillance and clinical trials. There have been reports of fainting after vaccination with adolescents; thus it is recommended that they are monitored for at least 15 minutes after the vaccine is administered (Joura et al., 2015).

The nonavalent Gardasil-9 is associated with an even higher rate of postvaccination injection-site tenderness than the quadrivalent vaccine; however, the frequency of the other side-effects (nausea, fever, headaches, fatigue) are comparable for the two vaccines. Increased injection-site tenderness is expected because the vaccine contains a higher amount of HPV

VLP antigens and an aluminum hydroxyphosphate sulfate adjuvant which boosts the immune response (Joura et al., 2015). The vaccine is produced by a yeast cell genome, and it also doesn't contain any preservatives or antibiotics. The nonavalent vaccine thus potentially increases cervical cancer protection from 70% to 90% (Yusupov et al., 2019; Joura et al., 2015). Table 1 summarizes the properties of the three HPV vaccines.

The HPV vaccines are purely prophylactic and are thus only effective in individuals who have not been exposed to the HPV types that they protect against. This is one of the reasons why vaccination has been encouraged to start as young as 9 years, before sexual debut. The vaccines are recommended for males and females between 9 and 26 years of age for maximum benefit; however randomized control trial VIVIANE demonstrated the efficacy and safety of Cervarix in women of all ages (Skinner et al., 2014). Clinical data also shows efficacy of Gardasil in women older than 26 years. Another reason why the vaccines have been recommended for younger individuals was the discovery that an equal and sometimes superior immune response is seen in younger adolescents after just two shots, compared to three shots with their older counterparts. WHO therefore recommended a 2-dose schedule for 9-13 year old's (on Gardasil) and 9-14 years old (on Cervarix) based on these findings. Countries must do an individual cost-to-benefit analysis, to determine their target population (age, sex etc.) for vaccine roll-out. (WHO, 2014; Mishra et al., 2015; Meites et al., 2016).

Table 1: Summary of the properties of the three HPV vaccines

Name of Vaccine	Type	Target	Side effects	Estimated cervical cancer protection
Cervarix (GlaxoSmithKline)	Bivalent	High risk: 16 and 18	Nausea Headaches Muscle/joint pain Gastrointestinal symptoms Fatigue* Post-injection site tenderness**	70%
Gardasil (Merck)	Quadrivalent	High risk: 16 and 18 Low risk: 6 and 11	Fever Nausea Headaches Fatigue Post-injection site tenderness	70%
Gardasil-9 (Merck)	Nonavalent	High risk: 16, 18, 31, 33, 45, 52 and 58 Low risk: 6 and 11	Fever Fatigue Nausea Headaches Post-injection site tenderness***	90%

* More severe fatigue than quadrivalent Gardasil

* * More severe post-injection site tenderness than quadrivalent Gardasil

*** Higher rate of post-injection site tenderness than the quadrivalent Gardasil

2.4. HPV Immunization programmes

HPV infection is largely preventable if the vaccines are taken properly and widely, which could result in a significant decrease in cervical cancer prevalence in the future. Various governments have rolled out these vaccines free of charge according to specific criteria; and for the South African national HPV vaccine roll-out, female grade 4 learners (9-15-year-olds) in public schools were selected as the target population (Tathiah, 2014). The focus is on pre-pubertal children and young adolescents because at that age, they are less likely to have had sexual relations which could put them at risk of contracting HPV, and they have a much stronger immune response to the vaccine (Graham and Mishra, 2011; WHO, 2014). In South Africa the vaccines are given free of charge to the targeted group since 2014, at their schools through the relaunched Integrated School Health Programme (ISHP), a collaborative effort between the Department of Basic Education (DBE) and Social Development (Department of Health, 2017a; Mbulawa et al., 2018; Richter, 2015). The choice of a school-based programme was motivated by evidence from pilot and national programmes in other countries and locally, achieving high vaccine coverage (Gallagher et al., 2017).

The full epidemiological benefits of the first HPV vaccine roll-out will be observed from the year 2034; at least 20 years after the grade 4 class of 2014 was vaccinated (when they reach the age range where CIN is less likely to regress spontaneously) (Department of Health, 2017a; Bekos et al., 2018). There are however some major immediate benefits, such as the strengthening of inefficient adolescent health systems, and the establishment of immunization programmes, which can be transferred and used for other conditions too. Additionally the programme would lead to improved HPV awareness for health care practitioners and the broader population; this would include the female caregivers, who are likely to be at an age where cervical cancer screening becomes critical, as HPV-related cancer incidence peaks between 45 and 64 years (Mbulawa et al., 2018; Richter, 2015; WHO, 2007).

2.4.1. Preparation

Challenges were expected, especially in the first year, with the introduction of a new vaccine, regardless of being well prepared. One of the most common problems is acceptability, as people will have concerns about vaccine safety and side effects. The HPV vaccine is targeted at one of the most vulnerable groups, which is young females thus it was especially important for acceptability studies to be done to inform the roll-out (Moodley et al., 2013). A potential concern that these studies identified was that HPV infection is mostly associated with being transmitted sexually, and thus a vaccine preventing an STI in children may be seen as encouraging sexual promiscuity. A similar issue was also observed when condoms were made available in schools (Katz et al., 2013; Harries et al., 2009).

The South African health system is resource limited and thus feasibility of carrying out a large vaccination programme was also a concern in addition to acceptability. There were a number of challenges with the initiation and implementation of this vaccination programme, these included limited resources (physical, financial, and human), the need for consent from caregivers / guardians, cold chain management (since the vaccine was delivered outside of a health facility), and access to remote schools (MacPhail et al., 2013; Delany-Moretlwe et al., 2018).

To reduce the risk of rejection, policymakers marketed the vaccine as apreventative measure for cervical cancer, rather than for the prevention of an STI (Harries et al., 2009). The risk of marketing it as a cervical cancer vaccine is that in South Africa as well as broader sub-Saharan Africa, the public knows very little about cervical cancer, and there are low awareness levels about how much it impacts on female mortality and morbidity. This could mean that the parents could be dismissive of the vaccine and consider it non-essential. Fortunately, the South African public has however grown accustomed to vaccination for children, due to the Expanded Programme for Immunization (EPI), where children are vaccinated against several diseases from birth, with the final vaccine being administered at 12 years of age. However,

adding a new vaccine, and offering it outside of a health care facility would still require a lot of careful marketing and education (Delany-Moretlwe et al., 2018).

Southern Africa has few national HPV vaccination programmes due to the high costs associated with the vaccine and the implementation of the programmes. These challenges are most prominent in regions that do not qualify for GAVI, the Vaccine Alliance funding (Delany-Moretlwe et al., 2018). South Africa has managed to launch this initiative by partly reducing costs through opting for a 2-dose schedule as opposed to the manufacturer recommended 3-dose (Moodley et al., 2016). The initiative was driven by a strong political mandate, which led to the campaign being co-ordinated and planned by a highly experienced and committed national DoH (NDoH) team, who established highly efficient communication systems between the provincial and district levels to keep track of progress and address challenges (Delany-Moretlwe et al., 2018).

2.4.2. Implementation

Each province prepared their own unique implementation and distribution plans; and the NDoH team supported the provincial, district, sub-district, and school teams. The NDoH and its supporting partners also prepared training materials (slides and field guides) for the aforementioned teams. Another level of support was offered by the national Ministers of Health and Basic Education involving school governing bodies, teachers' unions, school principal organizations, in conversations about the HPV vaccination programme and garnering their support. (Delany-Moretlwe et al., 2018).

The DoH and DBE prepared, and distributed consent forms accompanied by education and communication materials in the form of posters, frequently asked questions (Appendix G), guides for educators and fact sheets (Fig 1). These were distributed to schools, parents, and government employees (NR Dlamini, 2014). Informed consent is a big part of social mobilization efforts, and consent forms which were translated in all 11 official languages, were distributed to 18 000 public schools. The public was informed about the campaign

through publications on the government websites, social media, broadcasts on national radio and television (NR Dlamini, 2014; Delany-Moretlwe et al., 2018).

The final step was the administration of the vaccine, and the DOH teams had to follow meticulous processes and procedures when they visited their designated schools. These processes and procedures included providing education, ensuring eligibility, administering the vaccine, post-vaccination observation and data capturing (statistics of the number of vaccinated girls, record of adverse events etc.). Post-vaccination monitoring involved ensuring vaccinated and pre-vaccinated girls were physically separated and monitoring their side effects. The team also returned for "mop-up" visits, to vaccinate the girls that were eligible for vaccination, but were not able to receive it on vaccination day (Delany-Moretlwe et al., 2018).

2.4.3. Monitoring and evaluation

A new school-based database was developed for record-keeping of HPV vaccination data, and this data subset was linked to the DHIS (a routine system for tracking health service delivery in the public health sector, which also houses cervical cancer screening data) (Department of Health, 2017a; Dlamini and Maja, 2016). This database is an important part of the monitoring and evaluation of the programme, and the teams were expected to record a register of vaccinated girls, a summative report of the activities for the week, and the adverse events were recorded in the routine DoH adverse events reporting system (Delany-Moretlwe et al., 2018).

DHIS data reflected that the school coverage was 91% as 15620 of 17175 schools were reached during the first roll-out, which was a great feat because reaching some schools was a challenge due to flooding, lack of transport, and other logistical problems. In terms of learner coverage, Richter (2015) reported that there were 454 652 targeted learners in 2014. A study by Delany-Moretlwe et al. (2018) reports that during the first roll-out 408 273 learners were reached and given consent packages, and of those learners, 353 564 were

vaccinated. This thus means that they managed to reach 89.8%, and they vaccinated 77.8% of their target population. They vaccinated 86.6% of the population that they managed to reach with consent forms. Some of the reasons why the eligible girls that were in schools that were accessed, did not get vaccinated include them being absent on the vaccination day, not returning consent forms, and not being medically fit for the vaccine on the day. NDoH data reflects that 12% of the grade 4 learners were too young to receive the vaccine when the campaign was launched in March 2014. It was thus important to track these learners to ensure that they were vaccinated during follow-up and "mop-up" visits, even when they had moved on to the next grade. The programme estimated that 80% of the target population would have to be vaccinated to achieve herd immunity, which is a target that the first roll-out almost achieved (Delany-Moretlwe et al., 2018).

This momentum was maintained only for first two years 2014 and 2015, and percentage coverage of the target population that received the first dose has steadily been on the decline. Coverage dropped to 69% by 2019, before it went to an all time low of 3% in 2020 (WHO, 2021). The low coverage in 2020 has been attributed to the COVID-19 pandemic, partly because of the 50% attendance of the pupils (to ensure social distancing), and there has been anecdotal evidence that parents were confusing the HPV vaccine with the COVID-19 vaccine (Owings, 2021). Table 2 indicates that the number of students that return for their second and final shot drops each year.

Table 2: Coverage for the first and the second dose of the HPV vaccine among the target population for the years 2014- 2020

Year of vaccination	**First dose percentage coverage fo the target population**	**Last dose percentage coverage for the targe population**
2014	83	65
2015	82	61
2016	79	61
2017	69	56
2018	69	43
2019	69	43
2020	3	-

The first roll-out had very few reported adverse events, with only 10 out of 353 000 reported cases. All the cases were described as minor and transient reactions, which included nausea, dizziness, fainting, fever, abdominal pain, and rashes. Half of these cases occurred while the girls were still under vaccination staff observation, and the staff thus assisted them. The other half occurred when they were at home, and these were successfully self-managed. Adverse

events need to be managed efficiently, because they can fuel anti-vaccination movements (Delany-Moretlwe et al., 2018).

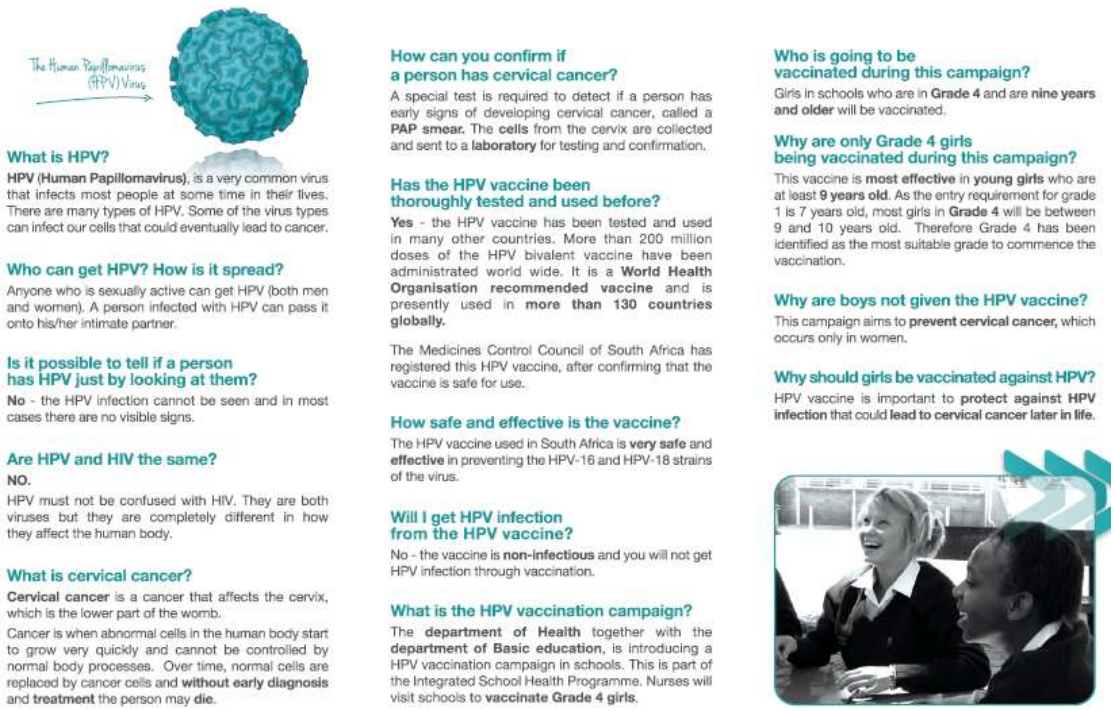

Figure 1: Frequently asked question sheet compiled by DoH and DBE

2.5. Sexual reproductive health empowerment of very young adolescents (VYAs)

Mokdad et al. (2016) highlights that young people are affected by diseases that could potentially have long-term effects on their health; and without intervention they may carry them into their adult years. This means that their offspring/ the next generation may also be affected. These diseases include mental illnesses, non-communicable diseases, trauma, and sexually transmitted diseases (Institute for Health Metrics and Evaluation, 2013). This emphasizes the need for health strategies focused on young people to ensure a healthier population in the future, and reduce the projected economic burden on the health system (Mokdad et al., 2016).

The lack of reliable and complete health data tends to be a barrier to youth-oriented health strategies. The reasons for this gap often includes the exclusion of young people from household surveys that request sensitive information, as an attempt to "protect" them (Khabour et al., 2017). This is especially observed with the exclusion of very young

adolescents (VYAs) from health programs and policies pertaining to sexual and reproductive health (SRH), which are usually directed to the older adolescents, or to their caregivers on their behalf. Very young adolescents are the age group 10-14 years within the adolescent group (Toolkits, 2020; Mokdad et al., 2016).

According to UNICEF (2019) adolescents (10-19 years old) made up 16% of the world's population in 2019, with a population of approximately 1.2 billion. VYAs make up 50% of the total number of adolescents, with a representation of approximately 600 million worldwide. The VYA stage is critical in adolescent development because it is during this time that they encounter major changes physically, socially, and psychologically. They are faced with the physical changes that come with puberty, and it is also during this time that they have a rapid increase in emotional and cognitive development. Socially they start to switch from being reliant on their parents, to becoming increasingly reliant on their peers; while still needing the guidance and support of their families and communities to feel a sense of belonging, for learning, and for helping them to establish boundaries (WHO, 2020b; Mokdad et al., 2016). As they experience these changes, they become highly experimental with practices that could affect their well-being now and in the future. It becomes critical during this stage for them to be well informed about sex, sexuality, pregnancy, sexual violence, and sexually transmitted infections (Toolkits, 2020).

Adolescents in South Africa have the right to consent to engaging in sexual activities from the age of 12, depending on the age of their sex partner. Health policies have been updated to correspond with this law, and to permit minors to access certain sexual and reproductive health services without the consent of parents or guardians (Strode, 2017). This increase in rights, translates into an increase in responsibilities to make informed choices. Adolescents thus need to be able to access information regarding their sexual health; and the best methods to deliver this information to them should be explored (Roberts et al., 2018).

Young people are known for being reliant on their mobile devices, and therefore these devices may be an effective way to: reach them directly, obtain information from them, and

to disseminate information to them (Roberts et al., 2018). Roberts et al. (2018) studied the possible barriers for direct messaging to adolescents to provide vaccine reminders, with their focus being parental attitudes. They suggested several reasons for discontinuation of vaccination among teenagers. The reasons identified included parental ignorance about the vaccine and that their child was due for a shot, and parents being against or indifferent to the vaccine, as well as safety concerns. The study recommendations included addressing this through sending text messages directly to the adolescents, as opposed to the conventional method employed by most studies, of sending reminders to the parents. Using mobile phones or portable electronic devices to strengthen health systems and improve access to health care, as seen in this study, is known as mobile health (mHealth) (Free et al., 2013).

2.6. The role of mHealth in educating young adolescent girls

Mobile technologies may not accessible to all South Africans; but it cannot be ignored that there are an estimated 24.5 million smartphone users, in a population of approximately 58.78 million(Statista, 2021; Department of Statistics South Africa, 2019). This represents a significant number of people that can be reached through internet based mHealth solutions; and those who can be reached through basic mobile functionality (calls and short message services) are even more numerous. Mobile phone ownership is extensive, even in poor and rural areas. More than half of the population in the Southern African development community owns a mobile phone, which well exceeds the regional average in Sub-Saharan Africa. However, there are significant variations in mobile phone penetration levels within the region. South Africa is the largest mobile market, accounting for nearly one-third of total subscribers in the sub-region, with 38 million unique subscribers in June 2015 (GSMA Intelligence, 2015).

The widespread cellphone subscription in South Africa reveals that mHealth solutions are feasible for reaching a wide range of consumers, and these solutions have been applied to different health-related initiatives in South Africa. Platforms for the empowering of young adolescent girls with sexual and reproductive health information and other adolescent issues

are on the rise. This is largely because young people are attracted and responsive to new mHealth approaches that address the challenges they experience in accessing SRH services and information. Examples of these challenges that young people face include costs (transport, and for the service), lack of privacy and confidentiality, fear of being judged or discriminated against when wanting to access information and services related to sensitive SRH issues (Feroz et al., 2019). Examples of mobile health platforms that focus on young girls which have been employed in South Africa include Choma, B-Wise and The Girl Effect, among others (UNICEF South Africa and HealthEnabled, 2017).

Choma is an HIVSA initiative which is targeted towards adolescent girls and young women (AGYW) between the ages of 15-25 years. It is an interactive mobile phone magazine which engages with its target audience through MXit, Facebook, Twitter, Mobi, and hi4Life (UNICEF South Africa and HealthEnabled, 2017). The platform includes topics pertaining to SRH and other health issues, and it covers HPV-related topics quite well, through 22 articles about different topics related to HPV, its vaccine, and cervical cancer. However, because of the great amount of information available on the site, one needs to search for HPV specific articles. The language used in the articles and packaging of content is tailored for the AGYW group, and could therefore be limited in accessibility to the VYA group (Choma, 2021).

A platform that also caters for the younger audience is the NDoH initiative, B-Wise. B-Wise contains age-appropriate information about topics such as sexual and reproductive health rights, SRH, other health issues, alcohol and substance abuse, gender-based violence, and other topics relevant to the 10–24-year-old age group (targeting both sexes). The mobisite is also interactive and engages with its users through live monthly chats with experts and polls (UNICEF South Africa and HealthEnabled, 2017). Although the site is interactive and one can ask about HPV-related information, a search for the key word “HPV” on the site does not return any results. This thus means that one needs to know what HPV-related information they are looking for, and would have to wait for the monthly chats to access it (B-Wise, 2021).

Springster, previously known as Girl Effect Mobile, is a Girl Effect initiative created by Praekelt.org, backed by major companies and organizations such as, Facebook, GAVI, Mastercard, Vodafone Foundation, UNICEF, BMGF and Nike Foundation among others. Springster aims to address the various vulnerabilities within the AGYW group by providing them with a platform to engage and share experiences, and by empowering them with skills and knowledge that build their agency, resilience, and enhance their health decisions and economic security. The site currently has over 1.3 million users in 66 countries, and has started to see indicators that the intervention is working. It has reported that there have been 1.2 million messages about sex and relationships on their chatbots in South Africa and India. They also reported that the chances of someone who has read the Girl Effect magazine in Malawi, to get their first HPV shot increased by 32% (Praekelt.org, 2021; UNICEF South Africa and HealthEnabled, 2017). Table 3 gives a summary of the aforementioned SRH based mhealth platforms that are currently active in South Africa, which target young people

Table 3: Summarizes the characteristics of three mHealth platforms.

Platform name	**Target audience**	**Health topics covered**	**Does it include specific HPV information**
Choma (HIVSA)	AGYW (15-25 years old)	SRH	Yes
B-Wise (NDoH)	10–24-year-old (males and females)	SRH and other health topics, gender-based violence, substance abuse and others.	No
Springster (Girl Effect and Praekelt)	AGYW	Health and economic security	Yes

A systematic review by Kessels et al. (2012) supports this observation by Girl Effect as it showed an association between a higher vaccine uptake with higher knowledge of vaccines, among other factors such as receipt of childhood vaccines, having medical aid, receiving information from health care providers, being older, and higher health care utilization. An example is that of a Kenyan study by Gibson et al. (2017) which showed success in the use of reminders and incentives to improve the uptake of childhood vaccines. The reminders were delivered through short messaging services (SMS); which are a commonly used tool in LMICs, along with voice calls (sometimes automated). The challenge with vaccine uptake in the developing world is not just limited to knowledge and remembering, but also various economic factors such as supply, geographic inaccessibility, health management systems that are failing etc. Interpersonal issues also affect uptake; these include lack of parental education, having more pressing priorities, safety insecurities, and attitudes. Employing mHealth technologies needs to be coupled with addressing these barriers as well (WHO, 2014).

2.7. mHealth design methodologies

Other popular mHealth themes include improving healthcare coverage, appropriate assistance in emergency situations, chronic disease management, and improved decision-making (Varshney, 2014). Health is a very sensitive domain and ill-designed solutions may be dangerous; thus, it is imperative that rigorous and appropriate design strategies are used when mHealth solutions are designed (Gregor and Hevner, 2013).

The design process typically involves problem identification, designing or implementing a solution to solve the problem, and testing the design within the context for which it was designed. New apps are relentlessly being released, but their design tends to not be directed by research, and they thus run the risk of being irrelevant, inappropriate, and ineffective

(Miah et al., 2016). The design of mHealth apps with an ongoing understanding of user requirements will ensure that they resonate with their target audience (Kazi et al., 2017).

Design science research (DSR) is a design method that follows the abovementioned steps of the typical design process; but however requires more intense and constant stakeholder engagement to attempt to tailor the solution for the target population (Labrique et al., 2013). DSR emphasizes the development of a prototype, which can be tested within the target community. This prototype is useful to evaluate the relevance, practicality, and the value of the mHealth solution. Miah et al. (2014) observed that few recently designed solutions have employed or fully employed this method; the testing phase for most mHealth designs is lacking as the solution is usually not tested directly or in an iterative manner with the target population.

A similar approach to the DSR method is the information system research (ISR) framework. This framework was employed in Schnall et al. (2016) to design an app for men who have sex with men; to support better HIV prevention behaviours. The method involves a user-centred approach; using methodologies such as focus groups, participatory design sessions, usability evaluation and end-user feedback. The ISR framework involves three main steps which are applied in a cyclic manner, rather than a unidirectional one: namely the cycles of relevance, design, and rigour. The relevance cycle aims to identify mHealth needs, gauge mobile app design preferences, and identify possible obstructions to and promoters of adoption and continued usage of the app.

As part of the relevance cycle, the Schnall et al. (2016) study used focus groups to identify desired features and app requirements to inform their app design. The most prominent functional requirements identified were HIV testing, a chat or communication portal, content about staying healthy, directory to resources, and personal information management capabilities (Schnall et al., 2014).

The relevance cycle was followed by the rigour cycle, where a literature search of similar apps was done. Elements of what was found in literature were combined with the target population information, to compile a presentation of possible features, content and functionality. The presentation was used to engage the participants in a discussion about their preferences; for the most suitable design features to be identified. The participants were not shown existing apps and prototypes, to avoid influencing their ideas. Their feedback was categorized and used to inform the next presentation. This process was repeated with focus being on the interface; and this design session led to the development of a high-fidelity prototype. The prototype was tested by informaticians with app interface design experience; and it was thereafter evaluated by the target population (Schnall et al., 2016).

Another user-centred approach in app design was employed by Lopes et al. (2014) to design and inspect a mobile application during development; to ensure that errors are rectified continuously to avoid them being carried through to the finished product. They made use of action research methodologies which merge academics with industry. The aim is to solve real life problem, but at the same time study the effects of the solution (Wohlin and Aurum, 2015). The methodology proceeds in a 5-step process of diagnosis, action planning, action taking, evaluating, and specifying learning. This method is made unique by the usage of modeling interfaces, and the development of hypothetical personas and scenarios on which to base and iterate the design.

2.8. Conclusion

A qualitative study by Katz et al. (2013) about the factors that influence HPV vaccine uptake among adolescents in Soweto (South Africa) found that adolescents described their caregivers as unapproachable (due to absentism, being stressed or cheeky) to talk to about sex-related matters. The caregivers in the study also expressed that they found it challenging to initiate sex-related conversations with their adolescent children. The adolescents in the study displayed self-reliance when it came to health-seeking behaviours, and mentioned that they seeked HPV vaccine trial information themselves and thereafter informed their

caregivers. Some also mentioned that they made their own decisions to receive the vaccine, and described receiving consent from their caregivers as just a formality.

This further shows that it is important for the development of programmes and policies about adolescent sexual reproductive health to rely on the opinions and experiences of adolescents. Intervention and descriptive research that has been employed in this area has mostly been done in high-income countries, and it is thus important for this research to be done in LMICs as well (WHO, 2020b).

CHAPTER 3 METHODOLOGY

This chapter describes the methodological strategy used to achieve the aim and objectives of the research study.

3.1. Introduction

This research employed both quantitative and qualitative research methods (mixed methods). The needs and knowledge of the target community were assessed through a quantitative survey, where a questionnaire (Appendix E) was collectively administered to the learners (in their tutoring rooms). The survey was later followed by a focus group discussion which aimed to clarify the discrepancies in the survey data and also focussed on understanding the perceptions, attitudes, and opinions of the target population towards the proposed mHealth solution. The information from the survey and focus group discussion was combined with knowledge from literature and was used to create a conceptual design for an educational mHealth tool about HPV and its vaccine.

3.2. Population

In South Africa the government provides the Cervarix vaccine in public schools to grade 4 female learners who are 9 years or older. The vaccine was rolled out for the first time in 2014 (Mbulawa et al., 2018). It is recommended for the age group 9-14 years because they are more likely to be precoital than older adolescents, and have a stronger immune response to the vaccine (WHO, 2014). The cohort that had received the vaccine at the time that this study commenced was the grade 4- 9 (older than 9 years) female learners in public schools; and therefore, they were the population of interest. It was believed that this cohort would thus be able to give valuable information about their experience with the vaccine. They were also expected to have basic knowledge about HPV and its vaccine, as they are the target population for the vaccine. Their knowledge levels can thus be used as an indicator of the efficacy of the conventional methods that have been used to educate them about HPV, especially during recruitment for vaccination.

3.3. Sampling and recruitment

A small subsection of the population was accessed through an after school programme called Ikamva Labantwana Bethu (ILB), which is based in the township of Crossroads (and also recently Nyanga) in Cape Town. The programme offers grade 4-7 learners weekday, Saturday, and holiday tutoring, and homework assistance through volunteer tutors. This tutoring programme was selected because the learners fell within the desired age bracket, and they all attended public schools. ILB was also selected because it was accessible due to an existing relationship between the student researcher and the founder/director, making it a convenience sample. The Crossroads branch had a total of 158 registered learners in 2019, with 55 of the learners being female.

As the study participants were minors, the recruitment began with requesting consent from their parents/legal guardians. An information session about the study was hosted for parents of the tutoring programme's learners. During this session, the study was explained, and thereafter an informed consent form and information sheet (Appendix A) were given to them for their perusal. These documents were drafted in English and translated into isiXhosa (Appendix B), which allowed the caregivers the option to choose a language they were most comfortable with. Once they agreed that they fully understood the consent form and information sheet, they were asked to sign the consent form if they were willing to allow their children to participate in the study.

The parents' meetings were very poorly attended; thus, the tutors were asked to distribute information sheets and consent forms to the learners whose parents did not attend the meetings. The learners were asked to return signed consent forms from their parents, should their parents agree to them to participate in the study.

The participants whose parents signed a consent form were gathered in a room according to grade, and an information sheet and assent form (Appendix C) were given to them for their perusal. None of the learners opted for the information sheet and assent form which were translated to IsiXhosa (Appendix D). The assent form lacked background on HPV and its vaccine, as this could have potentially compromised the results of the survey, due to a section in the questionnaire that tested the HPV knowledge of the participants. The facilitator

explained the study to them, and thereafter read and explained the contents of the assent form and the information sheet attached to it. Again, the facilitator allowed for questions and comments during the session and asked the participants if they fully understood everything before asking them to sign the assent form if they wished to participate in the study. Those who signed the assent form were asked to remain behind in the tutoring room.

The consent and assent forms were for both the questionnaire and the focus group discussion. Only the learners who participated in the survey were approached for the focus group discussion.

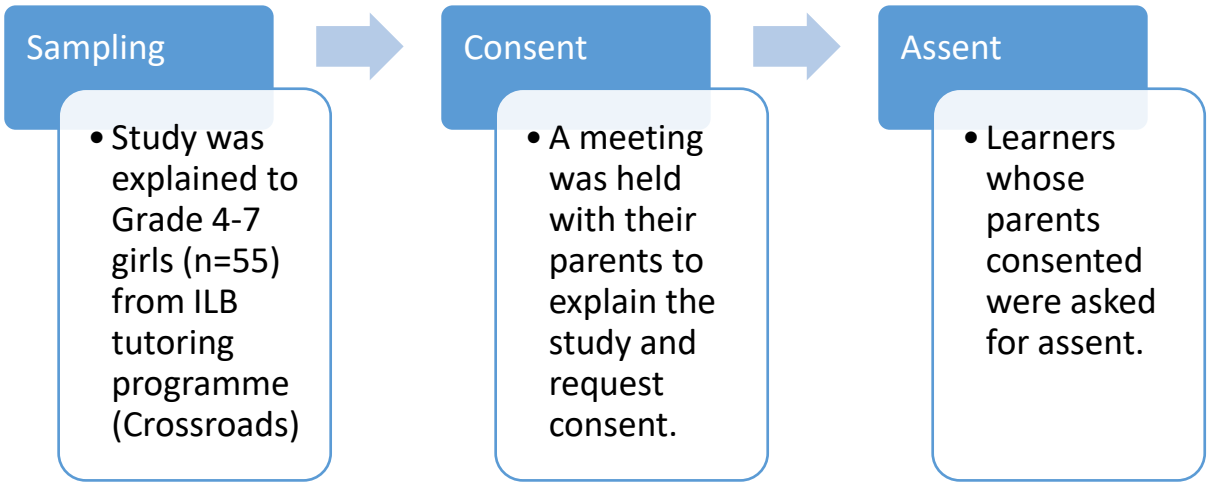

Figure 2: Recruitment and sampling process

3.3.1. Ethical practice and approval for research on minors

Informed consent and assent were completed in an ethical manner, and procedures were put in place to ensure the privacy and confidentiality of the participants. HPV infection is mostly transmitted sexually, which is a stigmatized topic, especially with minors. The

participants were protected by ensuring that the questionnaire and focus group discussions did not require them to share their personal sexual experiences, or their experiences with STI's/STD's.

To further ensure their privacy, participants were asked not to record their names on their questionnaires, and not to use their real names or those of the other participants, during the focus group discussions, as the audio was being recorded. As such, the names of the participants do not appear in the analysed data that will be used for publication research documentation and presentations that may arise from this study. As a further precaution, only the investigators of this project had access to the completed questionnaires, consent, and assent forms, which were locked away. The recordings of the focus group discussion were kept on password-protected mobile devices that only the student researcher had access to.

Ethics approval for this study was granted by the University of Cape Town Human Research Ethics Committee (HREC), and the study was given the reference number 281/2019.

3.4. Development and testing of research tools

The survey questions were formulated using Kumar's (2005) guidelines for questionnaires. These include using simple lay-man's terms, and avoiding questions that are ambiguous, double-barrelled, and leading/ presumptuous.

The questionnaires were tested out on female scholars between the age of 9 and 14, who fall outside of the research sample, to assess whether the questions meet the requirements. A group of five eligible participants with similar demographic characteristics from Khayelitsha, Cape Town, were selected through convenience sampling to test the research tool. The participants were also given the information sheet and assent forms to read through, and one of their parents was given a consent form and information sheet to read (in both English and IsiXhosa). The participants were observed while they were completing the questionnaire and while they read the assent forms and information sheet. The questions they asked during the survey, and the way they answered questions were used to identify questions that were ambiguous or unclear, and the research tool was edited accordingly.

The information sheets, and assent and consent documents were also edited for clarity based on the observations and the questions asked. It was then decided that due to the low literacy levels, the questionnaire administration would require facilitation. The data collected from the testing of the questionnaires was not used, only the interaction of the test participant with the documents was assessed.

3.5. mHealth design process

The concept for the mHealth solution was designed using a user-centred approach called the ISR design framework, which was explained in the literature review. The method involves multiple iterations of the three steps, namely the relevance, rigour, and design phases (Schnall, 2016). The ISR design framework illustrating that the cyclic nature of the system in illustrated in Figure 3.

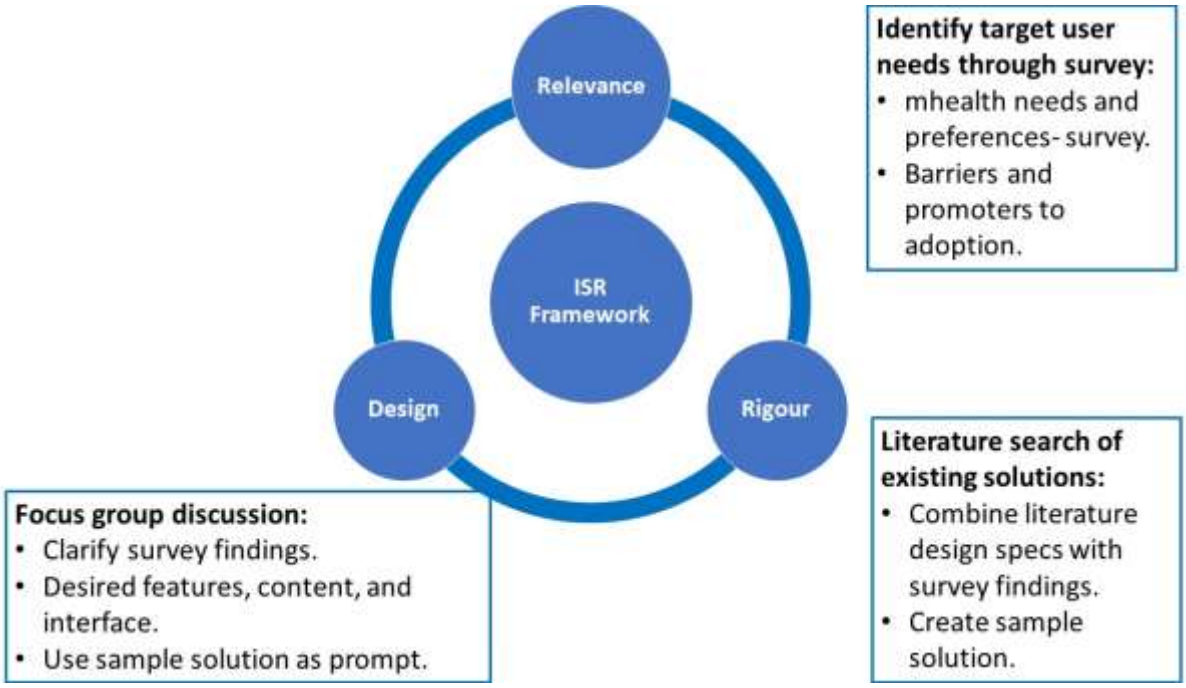

Figure 3: ISR design framework (adapted from Schnall et.al. (2016)).

3.5.1. The relevance cycle

During this cycle, the context, needs, desires, level of HPV and vaccine knowledge of the target population was established through facilitated surveys. The research project and

survey questions were explained to the participants clearly. The facilitator was present throughout the session to answer any questions about the survey and to ensure that the quality of the responses was not compromised by the lack of understanding.

3.5.1.1. Facilitated Surveys

Information from the surveys was used to establish a baseline for mobile phone accessibility, knowledge about HPV and its vaccine, and preferred communication modality for health information. The language (i.e., terminology) used in the questionnaire was tailored to the cognitive ability of the female scholar being assessed. All the learners opted for the English questionnaire; however, a Xhosa version was available (Appendix F). The session was mostly facilitated in IsiXhosa, due to the learners preferring IsiXhosa for verbal communication.

The quantitative data from the survey was analyzed to determine descriptive results (frequency distribution), for most sections of the questionnaire including socio-demographics, assessing mobile technology access and use, human papillomavirus knowledge, experience with the vaccine and learning preferences. The questionnaire comprised of mostly closed-ended questions, and a nominal scale was used to code the responses for statistical analysis on the Stata software. The frequency of some of the responses was used to inform the conceptual design, as the most popular selections on the questionnaire could be identified.

Inferential statistics were used to compare two variables in a contingency table, for example the demographics were put against variables of the mobile technology use section, to see if they are related. The chi-square test for independence was performed to see if the association between the two variable was significant or not. Significance level: if $p< 0.05$ the statistical probability that the given finding may have occurred by chance is fewer than 5%. The Pearson chi value was computed on Stata, and this was compared to the p-value threshold of 0.05 to decide whether to reject or fail to reject the null hypothesis (no association between the two variables). Due to the small sample size, Fisher's exact was also computed for the contingency tables, to determine the exact deviation from the null hypothesis.

3.5.2. The rigour cycle

This cycle involved reviewing literature on interventions that aimed to solve a similar problem to the one that this study was aiming to solve. Ideas from these were used in combination with information obtained from the relevance cycle, to compile a mock mHealth solution, which illustrated the possible features, content, functionality, and preferences.

3.5.3. The design cycle.

The mock mHealth solution compiled in the rigour stage was presented to the target audience in a focus group discussion; and their feedback was recorded and used to inform the conceptual design. The end-product was a document with recommendations on the most feasible and appropriate type of mHealth solution for the target population, with suggestions on possible functions, features, content, and user interface.

3.5.3.1. Focus groups discussions.

The discussions aimed to first clarify some data from the survey and secondly establish the preferences of the target group, by using the mock mHealth solution as a reference. The learners were presented with a very basic mock HPV vaccine website. The website appeared to have information about HPV, a blogging function for starting online conversations, and a scheduling option for reminders about vaccine appointments.

Two focus group discussions consisting of 7 (grade 5) and 8 (grade 4 and 6 combined) learners were conducted. The participants were chosen on a voluntary basis, from the group that participated in the survey. The conversations started with an icebreaker, followed by some questions about the survey, and then finally the mock-website was presented and discussed. Both sessions lasted less than 45 minutes and were recorded. The guide questions used in this discussion can be found under Appendix L.

3.5.3.2. Thematic analysis

Recordings from the focus group discussions were transcribed using NVivo. A thematic analysis was performed on Nvivo, where the most common themes were identified. These

themes, the survey data, and the information from the literature were combined to produce the mHealth conceptual design.

CHAPTER 4 RESULTS

4.1. Demographics

A total of 43 learners completed the survey, out of a target population (Ikamva Labantwana Bethu Crossroads branch) of 55 female learners, which made the response rate 78%. The distribution of grades in the population of 55 female learners was as follows: 12 were in grade 4, 16 were in grade 5, 13 were in grade 6 and there were 14 grade 7 learners.

Certain questions had less than 43 responses due to missing data. Missing data resulted when participants either skipped a question, selected more than one choice under a question that required only one answer, or when they selected an option and then scratched it out, making their final choice unclear. Contradictory responses between questions were also disregarded (e.g. when participants responded that they don't have access to a computer, but then select places where they access computers in another question),

Tables 4-7 show the demographic information of the participants. Most of the participants fell within the 11-12 years age bracket (Table 4). Despite most of the learners falling within the 11-12 years age group, the number of learners was more evenly distributed between the grades, with a range of 20.9-27.9% (Table 5). Most of the learners resided in Crossroads (Table 6), which was expected, as the tutoring programme branch that was targeted was the Crossroads one.

Table 4: The age of the participants.

Characteristic	Options	Frequency	N (%)
Age	9-10 years	7	16.3
	11-12 years	21	48.8
	13-14 years	15	34.9

Table 5: The grades of the participants.

Characteristic	Options	Frequency	N (%)
Grade	4	9	20.9
	5	11	25.6
	6	11	25.6
	7	12	27.9

Table 6: Shows where the participants stay.

Characteristic	Options	Frequency	N (%)
Location	Crossroads	38	88.4
	Phillipi	4	9.3
	Other	1	2.3

Table 7: The schools that the participants attend.

Characteristic	Options	Frequency	N (%)
School	Sikelela Imizamo Primary	11	25.6
	Imbasa Public School	6	14
	Sigcawu Primary School	16	37.2
	Kuyakhanya	3	7
	Cornflower Primary School	2	4.7
	Lantana Primary School	3	7
	St Augustine's	1	2.3
	Stephen Road Primary School	1	2.3

4.2. Mobile technology access

Table 8 shows that 29 of the participants have access to their own mobile phones, while the 14 that do not own a phone have access to a mobile phone which they can borrow. This thus means that the entire sample has access to a mobile phone.

Table 8: The number of participants who own mobile phones vs those who can borrow phones.

Own Mobile	**Borrowed Mobile**		**Total**
	Yes	No	
Yes	0	29	29
No	14	0	14
Total	14	29	43

Table 9 shows that 15 of the 29 participants who indicated that they had their own mobile devices, confirmed that their devices were smartphones. There were 14 participants whose responses were recorded as unspecified mostly because they only wrote down the make of their phone and not the model.

Table 9: Mobile phone ownership among participants against smartphone ownership.

Own Mobile	**Smart Device**	**Unspecified**	**No Mobile**	**Total**
Yes	15	14	0	29
No	0	0	14	14
Total	15	14	14	43

Table 10 shows that the most preferred communication tool among the participants was texting (63%), and the preference for video calls and voice calls was similar.

Table 10: Preferred communication tools.

Characteristic	Options	Frequency	N (%)
Most-used communication tool	Voice call	8	20
	Text	25	62.5
	Video call	7	17.5
Total		40	100

Table 11 shows that most participants (51.2%) indicated that they purchased less than R12 airtime weekly, and this included participants who do not purchase any airtime at all. 37.2% of the participants indicated that they purchased R12> R30 airtime, and only 9.3% indicated purchasing more than R30 airtime weekly. Despite the low access to airtime among participants, 87.8% of participants had access to WIFI. Access to computers (laptops) was also high at 91.7%.

Table 11: Mobile technology access.

Characteristic	Options	Frequency	N (%)
Airtime bought weekly	<R12	22	51.2
	R12>R30	16	37.2
	R30>R50	4	9.3
	>R50	1	2.3
Access to computer	Yes	33	91.7
	No	3	8.3
Access to WIFI	Yes	36	87.8
	No	5	12.2

Table 12 shows that participants who don't have their own phones tend to either not purchase airtime or to purchase lower amounts of airtime, compared to those participants with their own mobiles.

Table 12: Amount of airtime purchased by participants who own phones against those who borrow phones.

Airtime	**Mobile Ownership**		**Total**
	Own Mobile	**Borrowed**	
> R12	12	10	22
R12 > R30	14	2	16
R30 > R50	3	1	4
> R50	0	1	1
Total	29	14	43

4.3. Mobile technology preferences

Participants were asked to rank their three most-used applications (Table 13). For the most-used app category, there were 42 unique responses. The number of responses decreased to 27 and 29 for the intermediately and least used app categories, respectively.

Social media apps are the most popular among the target population, as they rank highest for the most-used (50%) and intermediately used (44.4%) app categories. Educational apps ranked second (23.8%), games and entertainment ranked third (21.4%), and accessories ranked last (4.8%) in the most-used app category.

Table 13: The type of applications that participants used the most.

Options	Most-used	Second most-	Third most-
Social media	21 (50%)	12 (44.44%)	6 (20.7%)
Games and Entertainment	9 (21.4%)	8 (29.63%)	12 (41.4%)
Educational	10 (23.8%)	2 (7.43%)	2 (6.9%)
Accessories and tools	2 (4.8%)	5 (18.52%)	9 (31%)
Total	42 (100%)	27 (100%)	29 (100%)

Cross tabulation Key

Row 1: row percentage (frequency in brackets)

Row 2: column percentage (bold)

* Significance level: if p< 0.05 the statistical probability that the given finding may have occurred by chance is fewer than 5%

Null hypothesis (H0): no association

Alternative hypothesis (H1): there is an association

Table 14: Preferred communication tools vs age.

	Communication Tool			
Age (years)	**Voice call (%)**	**Text (%)**	**Video call (%)**	**Total (%)**
9 to 10	50 (n=2)	0	50 (n=2)	100 (n=4)
	25	**0**	**28.6**	**10**
11 to 12	9.5 (n=2)	71.4 (n=15)	19.1 (n=4)	100 (n=21)
	25	**60**	**57.1**	**52.5**
13 to 14	26.7 (n=4)	66.7 (n=10)	6.7 (n=1)	100 (n=15)
	50	**40**	**14.3**	**37.5**
Total	20 (n=8)	62.5 (n=25)	17.5 (n=7)	100 (40)
	100	**100**	**100**	**100**

Pearson chi^2 (4) = 9.5442 Pr = 0.049

Fisher's exact = 0.025

A chi-square test of independence was performed to determine whether there is an association between the preferred communication tool and the age of the participants (Table 14). The older participants who fell within the 11-12 (71.4%) and 13-14 (66.7%) age groups showed significantly greater preference for texts compared to the 9-10 (0%) age group (Fisher's exact p = 0.025 at a threshold of 0.05). The highest preference across all age groups for video calls (57.1%) and texts (60%) was seen in the 11-12 age group; while the highest preference for voice calls (50%) was seen in the 13-14 age group.

Table 15 shows that a significantly larger proportion of participants in the 11-12 (63.2%) and 13-14 (64.3%) age groups indicated "Most-used" when asked about their usage of social media app compared to the 9-10 (0%) age group (Fisher's exact p = 0.006). The larger proportion of participants in the 9-10 (66.7%) age group indicated "Least used" when asked about social media usage.

Table 15: Social media as the preferred application against age.

	Social Media			
Age (years)	**Most-used**	**Intermediately used**	**Least used**	**Total**
9 to 10	0	33.3 (n=2)	66.7 (n=4)	100 (n=6)
	0	**16.7**	**66.7**	**15.4**
11 to 12	63.2 (n=12)	31.6 (n=6)	5.3 (n=1)	100
	57.1	**50**	**16.7**	**48.7**
13 to 14	64.3 (n=9)	28.6 (n=4)	7.1 (n=1)	100
	42.9	**33.3**	**16.7**	**35.9**
Total	53.9 (n=21)	30.8 (n=12)	15.4 (n=6)	100
	100	**100**	**100**	**100**

Pearson chi^2 (4) = 15.9987 Pr = 0.003

Fisher's exact = 0.006

Table 16: Preference for educational applications against age.

	Educational			
Age (years)	**Most-used**	**Intermediately used**	**Least used**	**Total**
9 to 10	100 (n=7)	0	0	100
	70	**0**	**0**	**50**
11 to 12	50 (n=2)	50 (n=2)	0	100 (n=4)
	20	**100**	**0**	**28.6**
13 to 14	33.3 (n=1)	0	66.7 (n=2)	100 (n=3)
	10	**0**	**100**	**21.4**
Total	71.4 (n=10)	14.3 (n=2)	14.3 (n=2)	100
	100	**100**	**100**	**100**

Pearson chi^2 (4) = 14.0000 Pr = 0.007

Fisher's exact = 0.011

Table 16 shows that a significantly larger proportion of participants in the 9-10 age groups (100%) indicated "Most-used" when asked about their usage of educational applications, compared to the 11-12 (50%) age group and the 13-14 (33.3%) (Fisher's exact p = 0.011). The larger proportion of participants in the 13-14 (66.7%) age group indicated "Least used" when asked about educational app usage.

Preference for games and entertainment and accessories applications against age showed a Fischers exact of p-value of 0.349 and 0.717 respectively. There is thus not enough evidence in the data set to support an association.

4.4. Experience with the HPV vaccine

The section about the experience with the HPV vaccine on the questionnaire was responded to well overall. All 43 participants indicated that they were vaccinated for HPV at school, after the facilitator explained the HPV school vaccination campaign. The number of adverse events was low and the side-effects that were reported were mild. Five out of forty-three of the participants reported experiencing side-effects, which included dizziness, nausea, a headache, and a pimple or bump.

An association between the age of the participants and the number of HPV vaccine shots that they had received at the time of the survey was determined through a chi-squared test of independence. Table 17 showed a significant increase in the number of shots received, with increased age (Fisher's exact $p < 0.001$). There were over 90% of 11-14 years olds who reported that they received two shots, as opposed to 100% of 9-10-year-olds only receiving one shot at the time.

Table 17: Number of HPV shots received against age

	Number of shots		
Age (years)	**One**	**Two**	**Total**
9 to 10	100 (n=7)	0	100 (n=7)
	70	**0**	**16.3**
11 to 12	9.5 (n=2)	90.5 (n=19)	100 (n=21)
	20	**57.6**	**48.8**
13 to 14	6.7 (n=1)	93.3 (n=14)	100 (n=15)
	10	**42.4**	**34.9**
Total	23.3 (n=10)	76.7 (n=33)	100 (n=43)
	100	**100**	**100**

Pearson chi^2 (4) = 27.6317 Pr < 0.001

Fisher's exact = <0.001

4.4.1. Fear of receiving the HPV vaccine

Of the 43 participants, 34 indicated that they were scared before they received their first HPV shot, and 8 were not scared (Table 17). Of the 43 participants, 33 indicated that they received both HPV shots, and were thus able to answer the question about whether they were scared before they received the second shot as well. However, one out of the 33 participants neglected to respond to the "Scared 2" question.

Table 18: Fear of receiving the first HPV vaccine shot (Scared1).

Number of shots	Number responses	Scared 1	
		Yes	No
1	10	7	2
2	33	27	6
Total	**43**	**34**	**8**

Figure 4 compares the number of participants who were scared the first time they received the HPV vaccine (Scared 1), with those who were scared the second time (Scared 2). Of the 32 participants who received two shots and answered the "Scared 2" question, 22 indicated that they were not scared prior to the second shot, 4 were still scared, and 6 were not scared both times. There was a decrease in the number of fearful participants between the first shot and the second shot.

The relationship between whether a participant was scared prior to being vaccinated the first time and their age, has a p-value of 1.00. We thus failed to reject the null hypothesis, because there is no evidence in the current data to support an association.

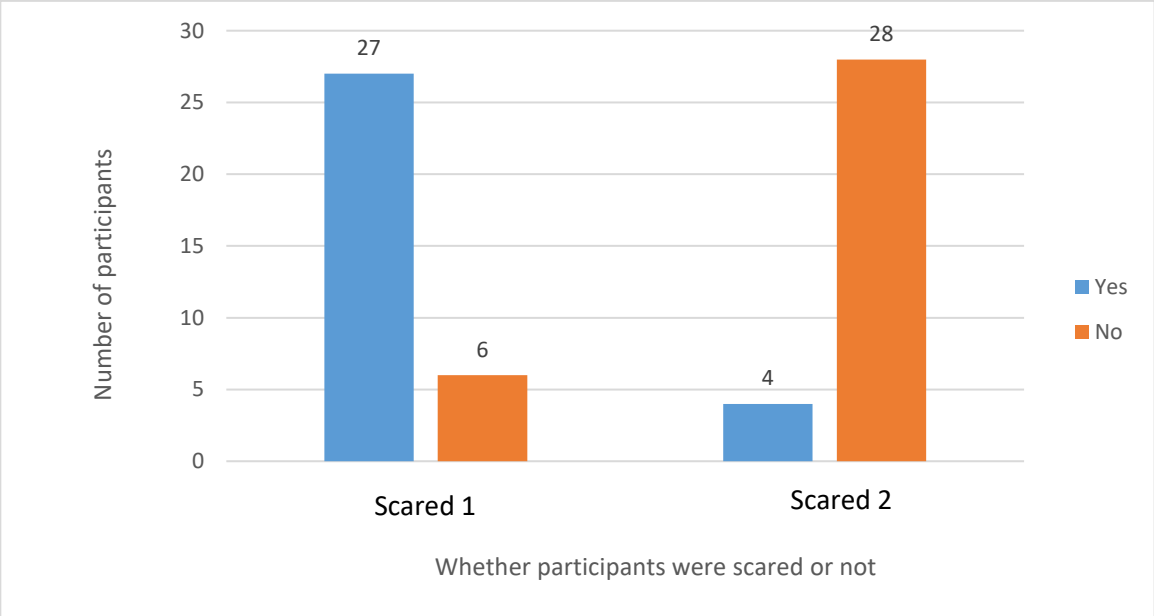

Figure 4: Participant fear before the first HPV shot (Scared 1) vs fear before the second shot (Scared2).

4.5. HPV knowledge

Forty participants indicated that they did not know what HPV was, and three had missing data due to skipping the question and ambiguous responses. All 43 participants failed to complete the HPV knowledge section.

All 43 participants responded that they would like to learn more about HPV. Figure 5 shows that 31 learners indicated that they did not know enough about HPV, 10 indicated that they were uncertain about whether their knowledge of HPV was sufficient, and two indicated that they knew enough about HPV. The distribution for the question about whether they knew enough about sexual health was also similar and was 32, 7, and 4 for, “no”, “I don’t know” and “yes” respectively.

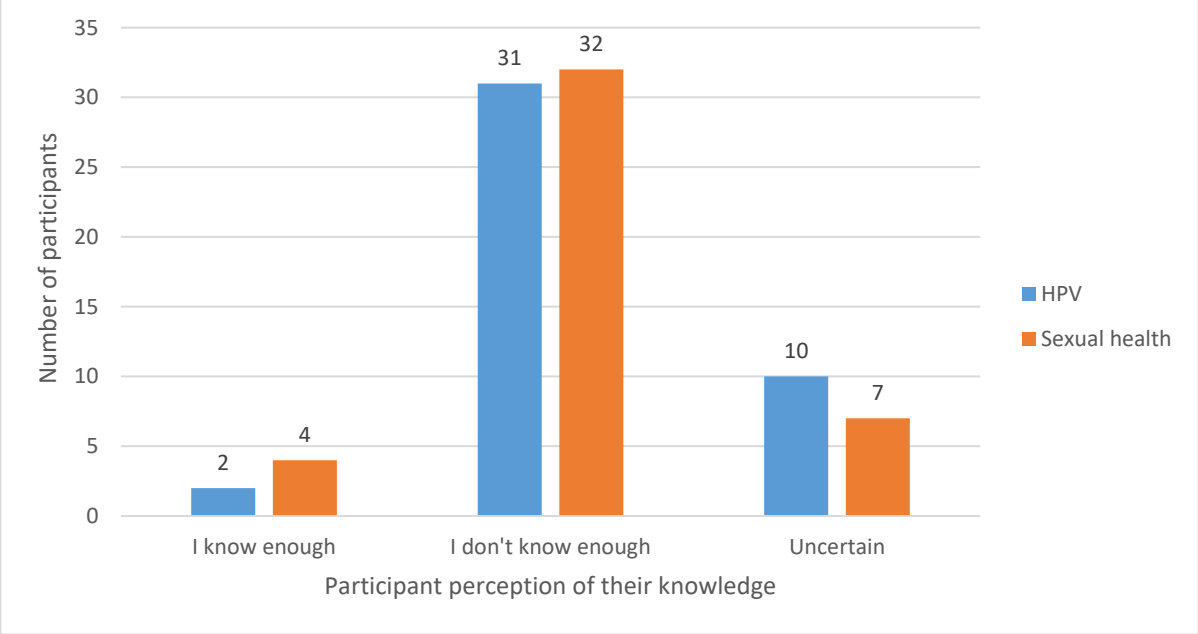

Figure 5: The participants’ perception of their knowledge about sexual health and HPV.

4.6. Participant learning preferences.

For the learning preference section, the question about where the participants learnt about HPV or sexual health only had 13 legitimate responses. Forty-one and thirty-nine participants indicated that they did not know enough, or they were uncertain about whether they knew enough about HPV and sexual health, respectively. Thus, it is not surprising that they did not indicate where they learn about HPV or sexual health, because they might not be learning about those topics at all. The 13 learners who did respond to the question, answered that six of them learnt from healthcare workers, four learnt from schoolteachers and tutors, two

learnt from the media, and one from social media. None of the learners indicated that they learnt from peers, parents/ family members, or websites.

In Figure 6 the learners showed a strong preference for learning about sexual health and HPV from schoolteachers and tutors, with 25 out the 41 learners who responded to this question, selecting this option. The preference to learn from health care professionals was the second most preferred and was chosen by nine learners. Four out of the 41 learners selected learning from parents and family members, and three chose to learn from websites.

The learners were also asked to indicate which learning style would be easiest for them to learn about HPV and sexual health, and 22 of them chose an interactive style, while 13 chose visual learning and 7 chose to learn through reading, as illustrated by Figure 7.

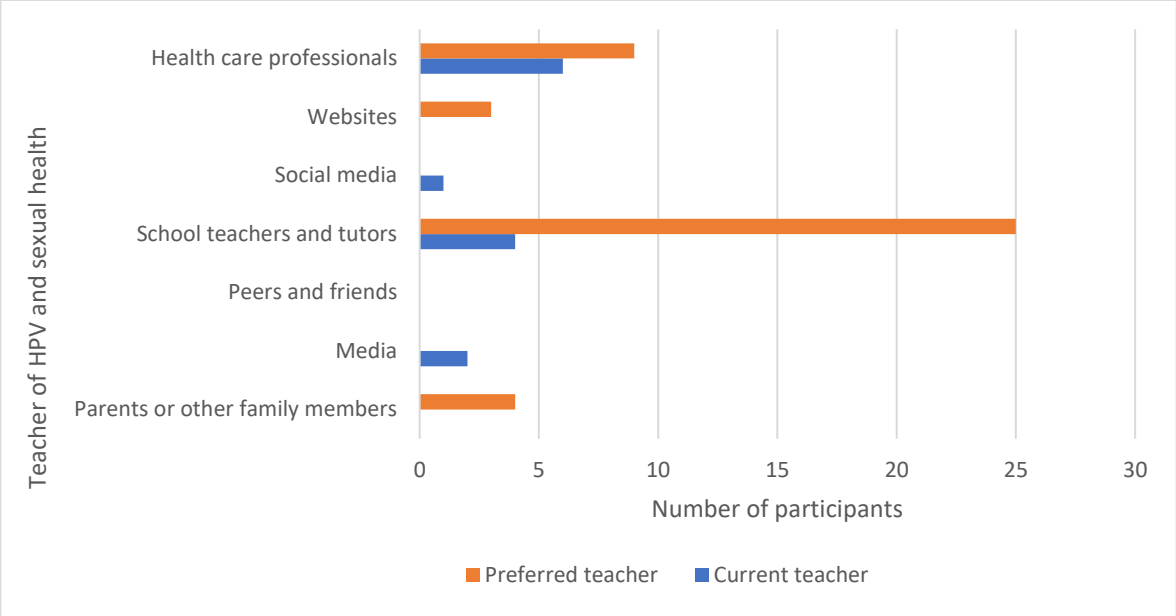

Figure 6: Compares where the participants learnt about HPV and sexual health against where they would have preferred to learn.

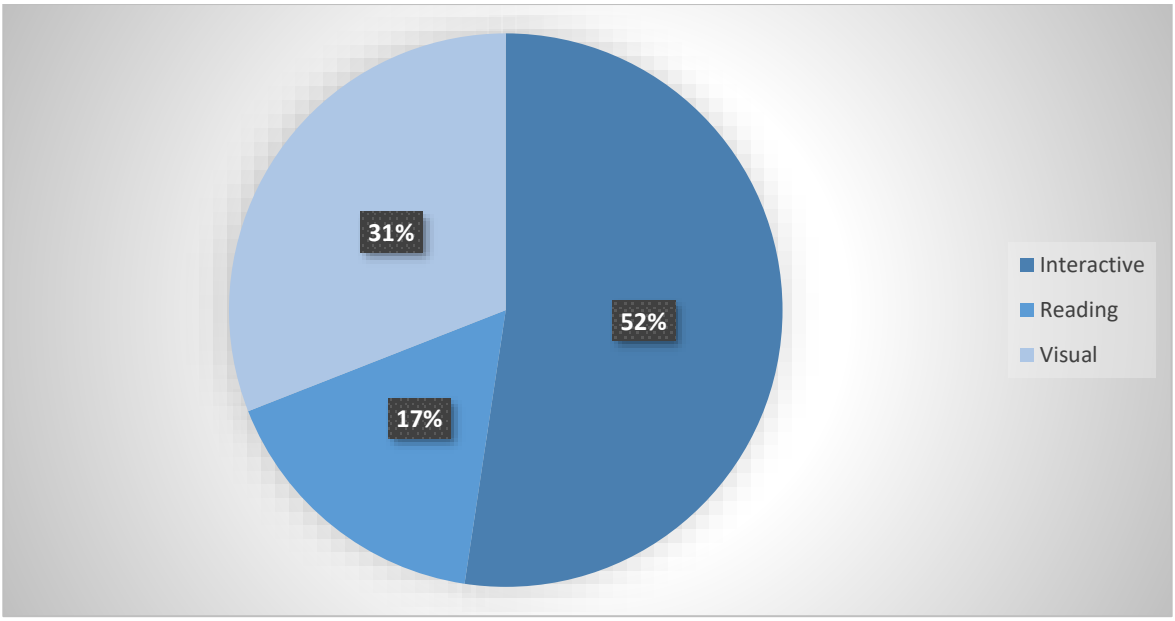

Figure 7: Shows the learning style preferred by learners for learning about sexual health and HPV.

4.7. Thematic analysis

The two focus group discussions were conducted with a group of eight study participants each. The focus group discussions aimed to gain deeper insights on the type of mHealth solution for learning about HPV that would be ideal for participants in terms of accessibility, affordability, usability, and appeal (content, interface, and features).

4.7.1. Sufficient mobile technology access

Mobile technology access within the focus group discussion was substantial. The grade 5 focus group of 8 participants had only one learner who did not have a phone, and the rest owned smartphones. The mixed group of 4 grade 4 learners, and 4 grade 6 learners only had 3 cell phone owners among them, and these were feature phones. However all the participants in the mixed group said that they had access to smartphones that they could borrow. When the participants were asked how long they were given access to these borrowed phones, they mentioned different periods ranging from 30 minutes to 4 hours.

The mixed group also had much lower access to WIFI, with only one participant saying they had access to WIFI from a neighbour, *"In my street, from one of the neighbours who lets us*

use it." The grade 5 group all had free WIFI access at school, tuckshops in the neighbourhood, and at home. They however mentioned that they were allowed only between 15 to 30 minutes of WIFI access at tuckshops and at school.

4.7.2. Desire to learn more

The desire for knowledge was a common theme in both focus group discussions. When the participants were asked what would make them interested in visiting a HPV website, a participant said, *"If it provided more information, so that you know more, so that you can teach others about HPV".* The participants not only wanted the website to be informative, but they were also hoping that it would include visuals, which was evident when a participant said, *"I would have an interest because they may show pictures and other things that I may not know."*

A participant responded, *"I would want to learn because my tutor would have maybe not explained all the details, then it would give me maybe other things that my tutor hadn't told me about"* when asked if they'd be interested in learning from a website instead of their tutors about HPV. The sample group as a whole, however, indicated a heavy reliance and trust in the information provided by their tutors and teachers as shown when they said*, "Because you can ask for clarity when you don't understand something."* Another participant agreed with this sentiment and said, *"I also agree with her, but I would like to add that when you write it on the board, for some it might still not be clear. However, if you explain it face to face, and allow for questions, they will understand it more."*

The participants showed a higher level of trust in their tutors and teachers compared to their parents when they said, *"Because our mothers won't know everything, but our teachers will at least give more information."* They seemed to even rely on their tutors' and teachers' interpretation of information on the internet as illustrated by the statement, *"But the tutor will read what appears on Google, and then explain to you. If you don't know what a word means, a tutor will be able to tell you."* They trust their tutors more than they trust themselves as seen when they said, *"Some of us don't want to Google, because it might give us a different explanation. But when we are here, we will get a better definition than what we will hear on Google."* The trust in their tutors seemed to be deeper than just trusting them

for reliable information, but they also appeared to trust them as confidants when they said, *"Because sometimes you are not overly familiar with the tutor, and you feel safer to speak to someone you are not too familiar with."*

4.7.3. Desired platform

The participants were asked to describe the type of features and interface they would like the mHealth solution to have. They were prompted with a question about what their favourite features of the applications that they use are, and if they would like to incorporate them into the mHealth solution. They were also prompted with a mock HPV website (Figure 8). The name of the site was Vaccine-Nation and the slogan was, "Healthy choices happy cervix." The main interface colours used were black, white, and blue. The site appeared to have information about HPV, a vaccine scheduling feature that issues reminders for when shots are due, and a blogging section with a chat portal.

There was great interest in having entertainment features within the website, which include music, dramatizations, dancing, games, quizzes, and cartoons. However, they also mentioned that it should still be informative when they said, *"There should also be parts which are spoken. Like someone standing there and explaining."* The participants were asked which features they would like to emulate from their favourite applications, and they mentioned the following, *"There could maybe be a quiz after you have learnt about HPV, then there can be a quiz that asks you about what you have learnt. If you get the questions right, then it can allow you to play games."*

A few of them mentioned Talking Tom and Talking Angela which are applications with anthropomorphic animal characters that repeat the things said by the users, however they didn't mention what it is about those applications that they would like incorporated in the website. Some participants did however mention Whatsapp, and they said the functionality that they would incorporate into the website would be, *"To communicate with people who can advise about things such as HPV."* Another participant also mentioned Facebook messenger as one of her favourite Facebook features, while another responded, *"Commenting on funny posts"* when she was asked what she likes to do on Facebook.

There was also a high demand for visuals, and they mentioned that an advantage that the website has over being taught by tutors is that they can see visuals, as shown when they were asked what the website was lacking, *"Something that explains HPV, even if it's a video"* and *"Maybe a video of someone who has HPV".*

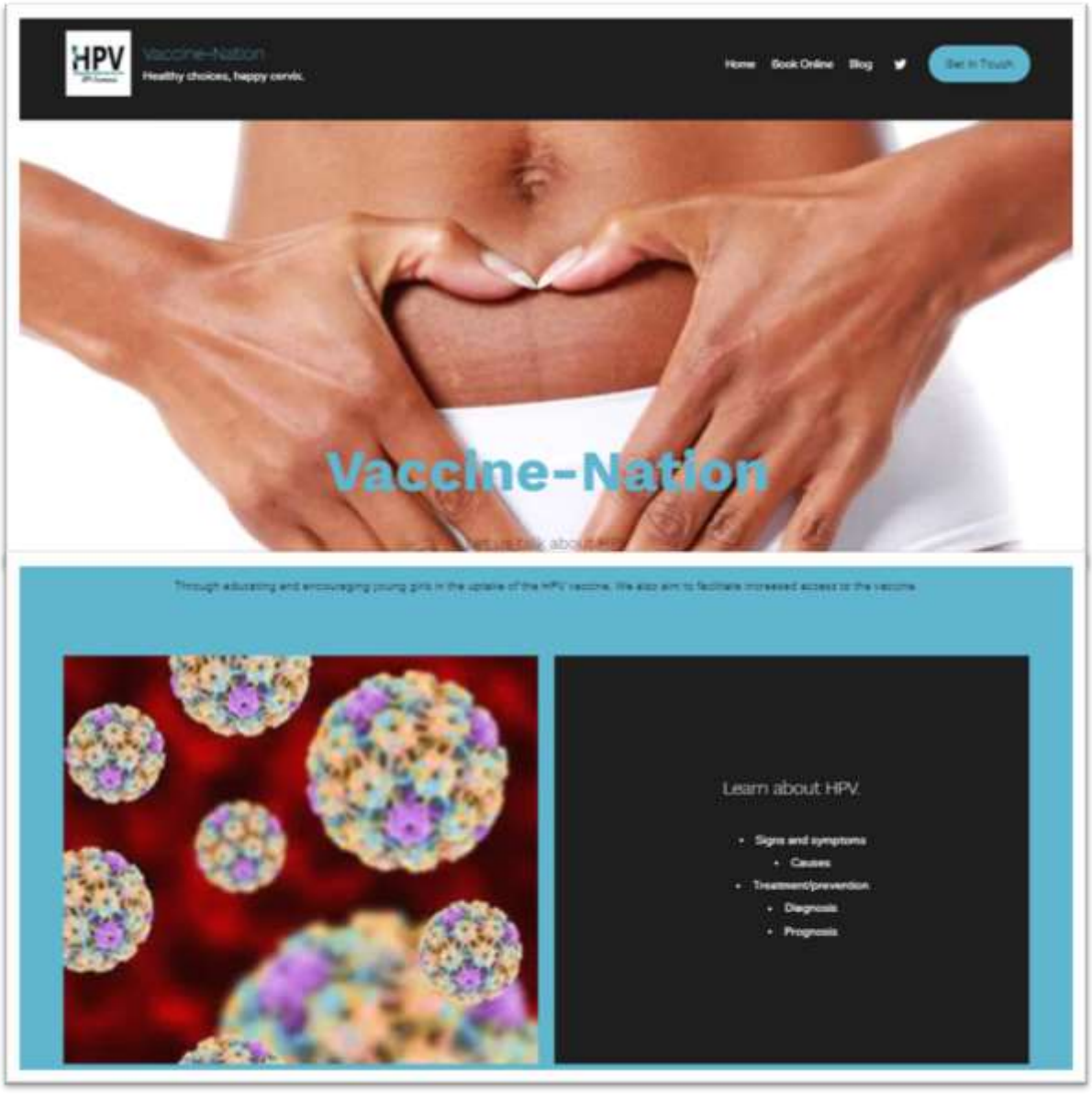

Figure 8: Screenshot of the HPV mock-website that was shown to the participants.

Figure 8: (Continued) Screenshot of the HPV mock-website that was shown to the participants.

CHAPTER 5 DISCUSSION AND CONCLUSION

5.1. Introduction and section overview

The purpose of this study was to design a conceptual mHealth solution, which would aid in educating young female scholars residing in a low-middle income setting in Cape Town about HPV and its vaccine. The study provided recommendations and insights that can be used for the development of a fully functional and accessible mHealth solution. This goal was achieved through the assessment of needs and knowledge of the target population (grade 4-7 female scholars) using a quantitative survey. The survey results guided two focus group discussions and the design of a prototype which was presented to the groups during these discussions to engage with the participants. The attitudes and preferences of the participants towards the prototype and towards learning about HPV were discussed in the focus group discussions. The survey data and the insights gained from the focus group discussion were combined with literature, to design the conceptual mHealth tool.

5.2. Objective 1:

Objective 1 focussed on assesing the communication modalities currently being used for HPV/vaccine education and contrasting these with the communication platforms that are accessible and acceptable to the female scholar group.

This objective was achieved through an internet search, to determine how the government educated and communicated with its target population about HPV and its vaccine. The findings highlighted that the DOH and DBE distributed invitation letters, consent forms, factsheets, classroom posters, pull-up banners and FAQs sheets in an effort for mobilization of the different stakeholders (target population, government employees, schools, and parents) (NR Dlamini, 2014). A few examples of the different communication tools that were sent out by different levels of government (through various platforms) can be seen in appendices G-K, and these included copies of the consent forms (Appendix K), factsheet (Appendix J) and FAQs sheets (Fig 1) that were distributed prior to the roll-out.

The success of the HPV immunization programme also relied on public support and public opinion, and thus informing and educating the public was also prioritized. The public was informed about the campaign through publications on government websites (Appendix H), social media pages (Appendices G and I), and broadcasts on national radio and television (Delany-Moretlwe et al., 2018). Radio broadcasts were done in all 11 official languages by celebrities (NR Dlamini, 2014). Provincial health departments also raised awareness through their social media pages and on their websites.

The strength of the government campaign lied in the different platforms that were used to attempt to reach as many people as possible. The downfall of this approach however is that there is no centralized government HPV information repository that can be accessed for information on HPV, its vaccine, and the details of the government roll-out at any given time. Information needs to be extracted from various government websites, policy documents, and social media pages. This presents an opportunity to centralize information in one document or platform dedicated to HPV, its vaccine, and the South African HPV immunization programme. A weakness of the campaign is that the information was mostly targeted towards the caregivers who were going to give consent, and very little was targeted towards the young girls who would be receiving the vaccine. This weakness presents further opportunities in the development and design of a digital health solution.

Young people are enthusiastic users of mobile technologies and delivering information to them about HPV and the HPV vaccine using mobile technologies is a viable option. This is supported by a study conducted between 2012-15 in Ghana, South Africa, and Malawi by Hampshire et al. (2015) which surveyed 4626 young people between the age of 8 and 25 years to determine their usage of communications technologies, especially related to mHealth. The study showed that mobile phone ownership and usage were highest in South Africa (Hampshire et al., 2015). The study recruited 467 children between the age of 8 and 13 years in South Africa, and this subset is similar in age range to the target population for this study, however the Hampshire et al. (2015) study also recruited boys. They found mobile phone ownership among the 8–13-year age group to be 34%, while 78% of them had a used a phone within a four-week period (which indicates access to phones).

The mobile phone ownership and access in this master's research project was higher than that seen in the Hampshire et al. (2015) study, with 100% of the participants having access to a mobile phone (own or borrowed), while 67% of them had their own phones, and 32% of the participants confirmed that they owned a smart phone. The findings of the focus group discussion were also consistent with these numbers, as 100% of the 16 participants indicated that they had access to a smartphone. It must be considered however that the sample size for this study was a tenth of the Hampshire et al. (2015) study and was conducted 3 years later. The difference is expected since mobile penetration is continually on the rise in sub-Saharan Africa. GSMA reported 367 million unique mobile subscribers in 2015, compared to 444 million in 2018, in sub-Saharan Africa (GSMA Intelligence, 2015; GSMA Intelligence, 2018). Both this master's study and the Hampshire et al. (2015) studies essentially depict that that the target population can be reached through mobile technologies, and the GSMA (2015 and 2018) statistics, show that mobile phone access is continually on the rise.

Since this study was based in a South African township the socio-economic status needed to be considered, therefore it was necessary to also establish the affordability of the sample group in accessing mobile platforms. This was firstly done by evaluating the amount of airtime that the participants bought on a weekly basis, and 51% of the participants indicated that they bought R12 or less airtime, while 47% indicated that they bought more than R12 and less than R50 airtime on a weekly basis. The use of borrowed phones could be a factor in participants buying R12 and less airtime, because the responsibility for recharging the phone might not lie with them. To further assess their affordability, their access to Wi-Fi was established, and 88% of the participants indicated that they had access to Wi-Fi from places like their homes, Ikamva Labantwana Bethu tutoring programme, neighbours, community libraries, tuck-shops, and school. The results for access to airtime and access to Wi- Fi further suggest that mobile technologies are accessible to the sample group.

It is important to not only assess accessibility to mHealth solutions, but also to establish whether mHealth would be acceptable to the target population. The success of platforms that aimed to solve similar problems can be indicative of the level of acceptability for mHealth solutions that are concerned with educating about health issues. Examples that we

have explored include Choma, which targets the AGYW population (15-24 years old). In 2019 HIVSA (the creators) reported over 1 003 621 site visitors since its inception in 2013 (Choma, 2021). Springster on the other hand was created for specifically 14–16-year-olds (with users typically aged 13-24 years), and has reported over 1.3 million worldwide users, with 497 000 being South African subscribers. The B-Wise platform provides age-tailored information to 14-24 year olds, and showed an audience of over 100 000 unique users in 2017 (UNICEF South Africa and HealthEnabled, 2017). All these platforms show that using mHealth to reach adolescents in South Africa is something that has been and can continue being implemented successfully. The target population for the abovementioned interventions is slightly older than the target population for this study, therefore there may be differences in acceptability and thus it was necessary to study the younger VYAs.

These findings highlight that the current methods for educating the target population of this study about HPV and its vaccine are not tailored to them, and thus may result in acceptability and accessibility issues for the group. They also further highlighted the gap for a mHealth platform focused specifically on the government's HPV vaccine target population recipients.

5.3. Objective 2:

To determine what is understood by the female scholar about HPV and its vaccine, and where the gaps in knowledge lie.

The participants were asked if they knew what HPV was and, forty participants indicated that they did not know what HPV was, and three had missing data due to skipping the question and ambiguous responses. The questionnaire also consisted of a "HPV Knowledge" section (Appendix E) with 10 general knowledge questions about HPV, which were to determine the participants level of knowledge about how HPV is transmitted, prevented, the prognosis, and the vaccine etc. All 43 participants failed to complete the HPV knowledge section, however when they were asked if they thought they knew enough about HPV, the majority of the learners (n=31 learners) indicated "no", 10 selected the "I don't know" option, and two selected "yes" (despite failing to complete the knowledge section). Although the knowledge

levels of the group were low, they showed a willingness to learn, because 43 participants responded that they would like to learn more about HPV.

A similar study by Liu et al. (2019) which evaluated HPV and vaccine knowledge and attitudes of primary school learners between the ages of 10 and 14 years also found very low self-reported levels of knowledge among their participants. The study recruited participants from an urban and rural school between 2015 and 2016. At baseline, only 34.3% (570/1659) of students reported to have ever heard of cervical cancer and/or genital warts. When asked about HPV, only 15.1% (216/1649) of students reported to have heard of it (Liu et al., 2019).

These findings in the Lui et al. (2019) study as well as the findings under this objective indicate a need for educating the target population of the HPV immunization about HPV and its vaccine in a more individualized and intentional manner as the messaging and campaigning from government efforts does not appear to be reaching the target population or does not appear to be comprehendible by the target population.

5.4. Objective 3:

To conceptually design a mHealth solution that addresses the knowledge gaps of the female scholar about HPV and its vaccine and identified barriers to accessing this information.

The learners were asked to indicate which learning style would be easiest for them to learn about HPV and sexual health, and the majority (52%), selected the interactive style. This finding was supported by the strong preference to be taught by their tutors about HPV and sexual health, as seen in Figure 4.3. This finding is consistent with the fact that VYAs are at that stage where they are starting to gain independence from their families and communities, but are still reliant on those structures (Toolkits, 2020). In this study they seem to prefer particularly their tutors because they perceive them as knowledgeable individuals, unlike their parents, and they feel like it will be easier to discuss sensitive topics with someone that they are not overly familiar with. The innovative thought process to maintain this trust relationship, included having video content presented by a character similar to their

tutors, or chatbot can also be designed to emulate their tutors so that they are comfortable, as seen with the Choma chatbot, which takes the role of a friend (Choma, 2021). However, there is a need for more conversations with the participants to understand this reliance on the tutor further, in order to incorporate the relevant elements into the solution. A study by Lee et al. (2019) took a similar approach, when its participants preferred a female doctor as a spokesperson. The aim of the study was to identify barriers and motivators for the uptake of the HPV vaccine, and for use of Pap tests among young immigrant Korean women, and a female doctor spokesperson was thus incorporated into their MScreening messaging service.

It is important for the intervention to be targeted specifically towards the participants and not their tutors because reaching out to the VYAs through a third party silences their voices and takes away their agency (Toolkits, 2020). This is confirmed in a systematic review by Fu et al. (2014) which looked at the effectiveness of 15 studies of HPV vaccination educational interventions, 8 were delivered directly to the adolescents or young adults, and 7 were directed towards their parents. The studies showed a more positive change in attitude towards the HPV vaccine in the younger population, than the studies that involved the parents. They suggested that the possible reason for this could be that adolescents/ younger people could be more receptive to educational interventions because the study populations were typically still in school or varsity (Fu et al., 2014). Whatever the reason for the difference, evidently, young people are receptive to information about their health, and a third party could potentially be a barrier.

When designing for this age group, it is important to understand what the best ways to reach them would be. The preferences for the different communication modalities, texting, video calling, and voice call were different for all three age brackets as shown by Table 4.11. The 9-10 age bracket equally preferred voice and video calls, while the 11 to 12 and 13 to 14 age group strongly preferred text messaging. This could be due to the older pupils likely having higher literacy levels for texting, than the younger ones. These findings do however suggest that the mHealth solution should incorporate all three of these communication modalities, to cater for all the age brackets. The participants were asked which features they would like

to borrow from their favourite applications, and one participant said that they would like "to communicate with people who can advise about things such as HPV", and mentioned Whatsapp, while another mentioned Facebook messenger. This finding supports the incorporation of a chatbot into the site for an instant messaging service.

The question about what type of application the participants used the most was posed in the survey to ascertain the top three activities for which young people use their phones (Table 4.10). The most frequent activity was social networking, with 50% of respondents mentioning this activity, followed by educational applications with 23.8% of respondents selecting this option, followed closely by 21.4% of respondents saying they use their phones mostly for games and entertainment. The higher age brackets showed a higher preference for social media in Table 4.12, than the 9-10 age group. Table 4.13 shows a decrease in preference with increased age. During the focus group discussion, when the participants were asked what features from their favourite applications they would like to incorporate into the site, there was also a high demand for visuals, and they mentioned that an advantage that the website has over being taught by tutors is that they can see visuals. There was great interest in having entertainment features within the website, which include music, dramatizations, dancing, games, quizzes, videos, and cartoons.

Gamification of education is a developing approach for increasing learners' motivation and engagement by inducing experiences similar to those of games in educational contexts. Gamification in education is thought to mimic the immersive experience of games when learning, with the aim of changing behaviours and attitudes in learning, supporting self-guided study, encouraging participatory and collaborative learning, and to ensure that assessments and assignments are easier, done to completion and are more effective (Caponetto et al., 2014).

In terms of content to add in the site, it may be useful to add content to prepare the participants for the pain of the injection. Table 4.15 and Figure 4.1 show that 63% of participants were scared prior to their first HPV shot, while only 12.5% of the participants

who had more than one shot, were scared prior to their second shot. This drop in fear may be due to knowing what to expect.

Developing an app suggests that the topic requires constant engagement, however it is highly unlikely that the app will be constantly used. A better solution (to start off with) would be a mobisite tailored for the comprehension of the age group with features and an interface that would be appealing to them. The website can include a video outlining the most important facts that they need to know about HPV and games/quizzes to reiterate what they have learnt. This site can be tested among the target population and iterated, and maybe with more iterations a need for an app will be established. However for now, an app would have been particularly useful if they had to keep up with the scheduling for the follow-up vaccine shots, however since the immunization is school-based they are unlikely to miss their shots.

5.5. Study limitations

The use of convenience sampling and also a small sample of only 43 participants, means that the views of Ikamva Labantwana Bethu pupils from the survey and focus group discussions cannot be generalized to the wider population of Cape Town public schools, although the findings may be transferable across the different contexts. In order to provide generalizable information about the attitudes, behaviours, and preferences of the target population towards an educational HPV mHealth platform, as well as their HPV knowledge, a survey of a nationally representative randomized sample of youth would have to be conducted. These results do however provide some useful insights on the profile of VYAs in a low-to-middle-income socio-economic setting, and it particularly revealed the barriers and enablers of young people's use of cell phones to access health-related information and services.

Another consideration is that consent and assent were intended to be obtained by the student researcher directly from parents and learners. However due to poor attendance of the parents' meeting, the consent forms had to be sent home with the learners. The assent form did not give background on HPV and its vaccine, as this would have compromised the results of the survey, since there was a section that tested the HPV knowledge of the participants, however the information sheet attached to the consent form had all the

information. This could have compromised the results, but it was clear that the learners did not read them, because none of them were able to fill out the HPV section of the questionnaire.

A subject that this study does not cover is how privacy and confidentiality will be ensured with this mHealth solution and what the participant's feelings are when it comes to privacy and confidentiality in mHealth. With the Protection of Personal Information Act (POPIA) of South Africa being fully enacted in July 2020, it is important to ensure that the design of the mHealth solution incorporates privacy policy statements that are written in a language that is accessible to the VYA group, there are access control measures in place to ensure that information is kept safe and secure, and there is clarity on any information sharing that may occur with third parties. Confidentiality is particulary important in a health context as users may not seek care or share sensitive information if they do not feel secure (Galvin and DeMuro, 2020). With this solution this becomes particularly important for the chatbot, as sensitive information may be shared by the participants when they seek information and advice.

5.6. Conclusion

This research revealed the knowledge gaps within the vaccine recipients and showed the ability of the study participants to comprehend information related to their health, provided the information explained in a relevant and appropriate manner which is not threatening. The need for suitable campaigning and education targeted at the vaccine recipient group was also demonstrated, as the lack of HPV knowledge among participants who have been vaccinated was very high. The lack of knowledge was addressed by the conceptual design of an HPV educational mHealth solution, which can be developed, tested, and tailored accordingly in different communities. It could then be adopted as a nationwide campaigning and educational tool. This study will also create awareness for the need of youth directed health strategies, and the importance of educating young people about HPV and sexual health in general.

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APPENDICES

This section contains the information sheets and consent forms for parents/guardians (English and Xhosa), information sheets and assent forms for participants (English and Xhosa) and questionnaire for participants (English/Xhosa). It also contains the materials used by the government for social mobilization during the HPV vaccine roll-out.

Appendix A: English information sheet and informed consent for parents/ legal guardians

FACULTY OF HEALTH SCIENCES: HREC REF:281/2019

CREATING A MOBILE HEALTH CONCEPTUAL DESIGN TO EDUCATE FEMALE SCHOLARS OF CAPE TOWN ABOUT HPV AND ITS VACCINE

Dear Parent/ ***Legal guardian***

My name is **Kedebone Oliver** and I am a postgraduate student at the University of Cape Town (UCT). I am doing research on using mobile technology (mobile phones, tablets etc.) to educate female scholars in Cape Town about the human papillomavirus (HPV) and its vaccine. I would like to invite your child to participate in this research study, as they are/ have been the government's targets for the HPV vaccine.

HPV is a viral infection passed on by skin-to-skin contact, especially sexual contact. It is the most common sexual infection, and in 90% of the cases, it is harmless and goes away without treatment. In the 10% of the cases in which it continues, it can cause genital warts or cancer. Cervical cancer is a cancer that occurs in women (especially middle-aged and older women). It is a cancer of the lower part of the womb, which is caused by HPV infection 90% of the time. Fortunately, there is a vaccine that protects against some of the types of HPV which cause cancer. In South Africa this vaccine is provided by the government in public schools, to grade four female learners who are 9 years old or older. HPV infection occurs in girls and boys, but only the girls receive the vaccine because only women can get cervical cancer.

As you may know, your child had been invited to receive the HPV vaccine at their school. I believe that your child has the right to be well educated about HPV and its vaccine. I would like to create a mobile

health (mHealth) platform from which they can learn about this virus and its vaccine. mHealth is when health services are given by using mobile technologies (such as cell phones and tablets) to make sure that more people are able to receive these services, as most people have cell phones and tablets. mHealth platforms need to be designed based on research findings to ensure that they are suitable for the people that will use them. I thus require the assistance of your child to advise me on the type of mobile technology that will work best for them.

What is the purpose of the research?

The study hopes to result in the conceptual design (a guideline for what the final tool should be like) of a mobile technology, which will help in educating young female scholars about the human papillomavirus, and its vaccine. Education is important because it can encourage preventative measures, and can be empowering.

What will participation in this study involve?

Participation will firstly involve your child completing a questionnaire that will be about the following:

1. Your child's access to mobile technology -whether they have a cell phone or tablet and how they use it, and what they use it for.
2. Their experience with the HPV vaccine -whether they have received it and, when and how they felt when they did.
3. How they prefer to learn about HPV and sexual health - how they are currently learning about it, and how they would like to learn.
4. It will also test their knowledge about HPV and its vaccine.

The information from the questionnaires will be used to design a mockup (this will just be a representation of what the tool could be and do- "first draft") mobile health teaching tool, which will be presented to your child (if they are willing) in a focus group discussion. The focus group discussions will be a group meeting with your child and their peers; where we will be talking about the design that I come up with. They will be asked to give their opinion and feedback about the design; and their feedback will be used to inform the final design.

Who can participate in this study?

The study will include 9–14-year-old female learners in grade 4-7, who are members of Ikamva Labantwana Bethu (ILB) in Crossroads. Only the learners who have been given permission by their parents or ***legal guardians,*** by returning a signed informed consent form will be allowed to participate. The learners will also be asked to give their permission through signing an assent form.

How many people will take part in the study?

I would like to survey at least 50 female scholars. I am hoping to have at least one focus group discussion per grade.

How long will the study last?

This study will be ongoing for about 12 months. However, your child will only be asked to complete a questionnaire once, and will be invited for a focus group discussion sometime after the questionnaire. After the focus group discussion, your child will not be asked to participate in anything else.

How long will completing the questionnaire and the focus group discussion take?

The questionnaire should take about 20-40 minutes to complete, and the focus group discussion should take between 30- 90 minutes.

Will you or your child receive payment or a reward for your child taking part in the study?

You and your child will not be paid for your child's participation.

What are the potential risks associated with the study?

There are no known risks related to participating in this study for your child.

Does your child have to participate in the study?

Participation in the study is voluntary. You may exercise your right to withdraw from the study at any time.

Are there any benefits for your child being in the study?

The study offers no direct benefit to you or your child. The results will be used to confirm that there is a need for a mobile health tool that educates pre-teens about HPV. The results will also provide guidance on what the best content and design feature for this technology would be, based on the target population's needs and preferences.

How will the privacy of your child be protected?

Your child will not be asked to write their name on their questionnaire and will not be asked to identify him/herself in the focus group discussion, in order to protect their privacy and identity. This consent form and their assent forms (which will be given to your child) will be filed and locked away

somewhere that only the investigators of this study have access. The information your child shares with me will not even be shared with you, their tutors, ILB director and teachers.

The focus group discussion will be audio recorded. The transcriber (person who types up audio files) and the investigators of this study will be the only people with access to the focus group discussion recordings. The recordings will be kept on a password-protected mobile device. The transcriber will be required to sign a non-disclosure agreement before beginning to transcribe the audio.

What happens if you have complaints or concerns about the study?

If you are not satisfied in the manner in which the study was conducted, you are welcome to contact the following members of staff:

Supervisor/Principal investigator: Dr. Jill Fortuin (021 406 6571) | jill.fortuin@uct.ac.za

Co-supervisor: Professor Tania Douglas (021 650 3093) |tania.douglas@uct.ac.za

Physical address of all members of research team:

Level 7 Anatomy Building

Health Sciences Faculty

University of Cape Town

Anzio Rd

Observatory, 7925

Cape Town

Tel: 021 406 6541

Who reviewed or approved this study?

This study has been reviewed and approved by the Human Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town.

If you require any further information regarding the rights of your child as a research participant, or have complaints regarding this research, you may contact Prof Marc Blockman, the Chairperson of the

Health Sciences Research Ethics Committee at the University of Cape Town. The contact information for the HREC is as follows:

Human Research Ethics Committee

Faculty of Health Sciences, University of Cape Town

E52-54, Old Main Building

Groote Schuur Hospital

Observatory, 7925

South Africa

Tel: 021 406 6626

Fax: 021 406 6411

Email: lames.emjedi@uct.ac.za

You should use our ethical clearance reference number in your correspondence: **HREC REF: 281/2019**

Yours Sincerely

Kedebone Oliver

0738762303 I Email- OLVKED001@myuct.ac.za

Should you wish to for your child participate in this research, please fill in the following:

Your child_____is being invited to volunteer to be in a research study. Please read this form and ask any questions you may have before agreeing to be in the study.

Consent to participate in a research study: To voluntarily agree for your child to take part in this study, you must sign on the line below. If you choose for your child to participate, you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered.

Please tick in the following box if you agree to the researcher audio recording the focus group discussion with your child. You may request this recording to be destroyed at any time. This recording will be destroyed at the end of this study. ☐

Signature of Parent/*Legal Guardian* of the Volunteer: **Date:**

Printed Name of Parent/*Legal Guardian* of the Volunteer: **Time:**

Signature of Witness (When applicable): **Date:**

Printed Name of Witness: **Time:**

Signature of Person Obtaining Consent: **Date:**

Printed Name of Person Obtaining Consent: **Time:**

Appendix B: Xhosa information sheet and informed consent for parents/ legal guardians

IFOMU YOLWAZI KUNYE NOKUNIKISA NGEMVUME KOMZALI / OKANYE OBAMBELA UMZALI

ICALA LOBUGCISA LWEZEMPILO: HREC REF:281/2019

ULWAKHIWO LOBUCHWEPHESHE KWEZOBUGCISA BEZEMPILO KULUNGISELELWA UKUFUNDISA ABAFUNDI ABASELULA KWELI LEKAPA NGEHPV KUNYE NESITHINTELO SAYO

Mzali othandekayo

Igama lam ndingu **Kedebone Oliver,** ndingumfundi wase Yunivesithi yaseKapa (UCT) osisthwalandwe. Ndenza uphando lokufundisa abafundi abangamantombazana aba lapha eNtshona Koloni ngeHuman Papilloma Virus (HPV), nokugonyelwa kwawo ngokusebenzisa ubuchwepheshe befowuni (umzekelo; nombolo kanomyayi, ithebulethi yeselula/ tablet and cellphone). Ndinqwenela ukumema umntwana wakho ukuba athabathe inxaxheba koluphando kuba urhulumente ejolise ugonyo okanye uthintelo lwe HPV kubo.

Nje ngoba uyazi ukuba umntwana wakho ebe meyiwe ukuba afumane ukugonywa eskolweni sakhe. Ndikholelwa ukuba umntwana wakho unelungelo lokufundiswa nge HPV nokugonyelwa lwayo. Ndi ngathanda ukwenza isicwangciso sezempilo esiphezulu (mobile health/mHealth) apho bazofunda khona ngale ntsholongwane nokugonywa. mHealth ku xa iinkonzo zempilo zinikezwa ngo kusebenzisa ubuchwepheshe beselula (umzekelo: nombolo kanomyayi ne thebulethi zeselula) ukuqinisekisa ukuba uninzi lwa bantu luyazi fumana ezinkonzo kuba uninzi lwabantu lunazo iselula. Amaqonga ka mHealth afuna ukuyilwa esekelwe kwiziphumo zophando ukuqinisekisa ukuba zibafanele abantu abazo zisebenzisa. Ku ngako ndicela uncedo lomntwana wakho ukuba andicebise ukuba lo luphi uhlobo lwe lobuchwepheshe eli zosebenza kakuhle.

Yintoni injongo zoluphando?

Ngoluphando sinethemba sizakufumana isisombululo noyilo kunye nenkqubo entsha yokusetyenziswa kubuchwepheshe lonomyayi, elizonceda ekufundiseni abafundi ba mantombazane nge HPV nokugonywa kwayo. Imfundo ibalulekile ngoba ikhuthaza amanyathelo okhuselo futhi iyakuxhobisa

Ukuthatha inxaxheba ko luphando kubandakanya ntoni?

Ukuthatha inxaxheba koluphando kuzoqala ngokuba umntwana wakho acgwalise ifomu enemibuzo ezoba malunga nokulandelayo:

1. Ukufikelela komntwana wakho kubuchwepheshe lwezefowuni – ukuba unayo iselula/nomyayi okanye ithebulethi yeselula, kwaye uyisebenzisa njani, entwenini.
2. Amava akhe ngogonyo lwe HPV- ukuba uke wagonywa kwaye wagonywa nini, njani kwaye waziva njani emva koko.
3. Ukuba angathanda ukufunda nge HPV kunye ngezempilo zesondo, kwaye ngoluphi na uhlobo – ukuba okwa ngoku bafunda njani kwaye bangathanda ukufunda njani.
4. Izovavanya nolwazi lwakhe ngayo i-HPV no kugonyelwa kwayo.

Ulwazi olu sizolufumana kwezi fomu zemibuzo luzosetyeziswa ekuyilweni unxwala (le izoba ngumfanekiso wokuba esisixhobo sizoba njani kwaye singenzani – “qulunqa kuqala”) esisixhobo sokufundisa ngo kwezempilo, ezoboniswa umntwana wakho (uba uyavuma) kwi ngxoxo yeqela lokugxila. Ingxoxo yeqela lokugxila izoba ngumhlangano weqela nomtwana wakho neentanga zakhe apho sizobe sithetha ngoyilo eli ndize nalo. Bazocelwa ukuba baphawule ngoluvo lwabo kwaye banikeze nge ngxelo yabo ngoluyilo, ingxelo yabo izothathwa isetyenziswe kuyilo lokugqibela lwe sisixhobo.

Ngubani ongathatha inxaxheba kwesisifundo/ uphando?

Oluphando luzakubandakanya abafundi abangamantombazana be aba minyaka asithoba ukuya kwalishumi elinesine, abakwamabangaesine ukuya kwasixhenxe esikolo, abanga malunga eIkamva Labantwana Bethu (ILB) eCrossroads. Abafundi abanikwe imvume ngabazali babo kuphela, ngokubuyisa ifomu yemvume elisayiniweyo. Nabafundi bazocelwa ukuba banikeze ngemvume ngokusayina ifomu lwesiqinisekiso.

Ngabantu abangaphi abazothatha inxaxheba ko luphando?

Ndingathanda ukuphanda abafundi abangamantombazana angumashumi amahlanu (50). Ndinqwenela nokuba nengxoxo yeqela lokugxila kunye nebanga nabanga lesikolo.

Oluphando luzothatha ixesha elingakanani?

Uphando luzaqhubeka phantsi kwe nyanga ezilishumi elinesini (12 months). Kodwa umntwana wakho uzokucelwa ukuba aphendula imibuzo, kanye kwaye emva koko amenyelwe ingxoxo yeqela lokugxila emva kwethuba elithile emveni kokuphendula imibuzo. Emva kwe ngxoxo yeqela lokugxila, umntwana wakho akazophinda acelwe ukuba athathe inxaxheba kwenye into.

Ukugcwalisa ifomu yemibuzo nengxoxo yeqela lokugxila zizothatha ixesha elingakanani?

Imibuzo ingathatha imizuzu engamashumi amabini ukuya kumashumi amane (20-40 minutes) ukuba iphendulwe. Ingxoxo yeqela lokugxila yona ingathatha imizuzu engamashumi amathathu (30-90 minutes).

Wena mzali okanye umntana wakho nizakubhatalwa na, okanye niphiwe umvuzo ngokuba umntana wakho ethatha inxaxheba koluphando?

Wena nomtwana wakho anizokubhatalwa/ kuhlawulwa ngokuba umntwana wakho ethathe inxaxheba koluphando.

Ngeyiphi imingcipheko enxulumene noluphando?

Ayikho imingcipheko eyaziwayo enxulumene nokuthatha inxaxheba koluphando emntwaneni wakho.

Kukhona na umntwana wakho azo kuzuza ekuthatheni inxaxheba koluphando?

Uphando aluna mvuzo obhekene nawe ngqo okanye umtwana wakho. Iziphumo zoluphando zizo ezi zosibonisa ukuba ikhona na imfuneko lwesisixhobo sezempilo esihambayo (mobile) esizofundisa abatsha nge HPV. Iziphumo zizonikeza ngokhokhelo nolwazi lokuba ngeyiphi indlela eyiyeyona ihamba phambili yoqulatho nophawu loyilo lwale okanye ubuchwepheshe, ingxelo isekelwe kwizidingo nokhetho lwesininzi sabantu.

Ingaba umntwana wakho ukhuselekile na, kwaye ubuyena bufihlakele okanye busekhosini na?

Umntwana wakho akazukucelwa ukuba abhale igama lakhe kwiphepha le mibuzo kwaye akazukucelwa ukuba azazise kwi ngxoxo yeqela lokugxila ukuze kukhuselwe ubumfihlo nokwaziwa kwakhe. Ifomu zemvume ezizakusayinwa ne yesiqinisekiso (ezizanikwa umntwana wakho) zizakuthathwa zibekwe zitshixelwe endaweni apho kwazi umphandi woluphando khona kuphela. Ulwazi umtwana wakho azokwabelana nam ngalo aluzukwabiwana nawe mzali ngalo, abefundisi (tutors no teacher) okanye umlawuli we ILB.

Ingaba kunyanzelekile ukuba umntwana wakho athathe inxaxheba koluphando

Oluphando alusosinyazelisa kuwe okanye kumntana wakho. Ungarhoxa nangowuphi umzuzu xa unqwenela ukwenza njalo.

Ingxoxo yeqela lokugxila izakwenziwa/ iqulunqwe nkwimitshini yokumamela. Umbhalisi (lo uzokubhala akumameleyo kulemetshini) nomphandi woluphando, ngabo bodwa abantu abazofikelela kwezirekhodi. Ezirekhodi zizogcinwa kwi selula, enenombolo yokuvula ebucala

engaziwa mntu-wumbi (password). Umbhalisi uzocelwa ukuba asayine isivumelwano sokungavezi phambi kokuba abhale ezirekhodi.

Kuza kwenzekani uba unezikhalazo okanye uyaxhalaba ngo luphando?

Ukuba awanelisekanga ngohlobo oluphando lwenzeka ngalo, wamkelekile ukuba uqhagamshelane na la malunguezisebenzi:

Umphathi wophando: Dr Jill Fortuin (021 406 6571) jill.fortuin@uct.ac.za.

Umphathi wequmrhu: Professor Tania Douglas (021 650 3093) Tania.douglas@uct.ac.za

Idilesi yomzimba lwawo wonke amalungu ophando:

Level 7 Anatomy Building

Health Sciences Faculty

University of Cape Town

Anzio Rd

Observatory 7925

Cape Town

Tel: 021 406 6541

Ngubani ohlaziye okanye ovume oluphando?

Oluphando luhlaziywe kwaye lwa vunywa ngabe Komiti lwezophando lokuziphatha kwabantu (Human Research Ethics Committee – HREC) lo buchule be nzulu lwazi zempilo kwi Yunivesithi yaseKapa (UCT) (Faculty of Health Sciences, University of Cape Town).

Ukuba ufuna ulwazi ngakumbi ngama lungelo akho nje ngomntu obethathe inxaxhebi ko luphando, okanye unezikhalazo ngoluphando, unga qhagamshelana no Prof. Marc Blockman, usihlalo we Komiti lwezophando lo kuziphatha kwabantu kwi Yunivesithi yaseKapa. Iincukacha zoqhagamshelwano ze **HREC zithi: 281/2019**

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Kunyanzelekile ukuba usebenzise inombolo yerefurensi yokuziphatha xa wenza unxibelelwano nathi: HREC REF 281/2019

Owakho ngoku nyanisekileyo

Kedebone Oliver

073 876 2303|Email – OLVKED001@myuct.ac.za

Ukuba unqwenela umntwana wakho athathe inxaxheba koluphando, ndicela ugcwalise oku kulandelayo:

Umntwana wakho_____uyamenywa avolontiye ekuthatheni inxaxheba kuphando. Ndicela ufunde le fomu ubuze imibuzo ukuba unayo ngaphambi kokuba uvume ukuthatha inxaxheba.

Uvumelwano lokuthatha inxaxheba: Ukuvuma ngokhululekileyo unganyanzelwanga ukuba umntwana wakho athathe inxaxheba koluphando, ndizocela ukuba usayine kumgca osezantsi. Ukuba awuvumi umntwana wakho athabathe inxaxheba, uvumelekile ukurhoxa naliphi na ixesha onqwenela ngalo. Ngokusayina le fomu awuphisi ngamalungelo akho asemthethweni. Ukusayina kwakho ngezantsi kuchaza ukuba ukufundile okanye ufundelwe konke okuqulathwe yilefomu,nemingcipheko kunye nokuhle okuhamba nako, kwaye uxolile waphenduleka kwimibuzo obunayo.

Ndicela utikishe kule bhokisi incinci ingezantsi xa ungenangxaki yokuba umphandi angasebenzisa kwaye ayishicilele incoko nengxoxo eyakube iphakathi komntwana wakho nabanye abafundi. Uyakwazi ukucela ukuba ushicilelo olo lulahlwe okanye lonakaliswe. Sihleli sizokululahla okanye ulonakalisa olushicilelo ukugqiba kwethu ukusebenzisa ulwazi kulo.

Ukusayina kukamzali okanye obambele umzali: **Umhla:**

Igama lomzali okanye obambele umzali libhalwe libonakale **Ixesha:**

Ukusayina kwengqina (ukuba kunyanzelekile) **Umhla:**

Igama lengqina libhalwe libonakale **Ixesha:**

Ukusayini kukamphandi **Umhla:**

Igama lomphandi libhalwe libonakale **Ixesha:**

Appendix C: English information sheet and informed assent for participants

FACULTY OF HEALTH SCIENCES: HREC REF:281/2019

CREATING A MOBILE HEALTH CONCEPTUAL DESIGN TO EDUCATE FEMALE SCHOLARS OF CAPE TOWN ABOUT HPV AND ITS VACCINE

Dear Participant

My name is **Kedebone Oliver** and I am a postgraduate student at the University of Cape Town (UCT). I am doing research on using mobile technology (mobile phones, tablets etc.) to educate female scholars in Cape Town about the human papillomavirus (HPV). I would like to invite you to take part in this research study, as the government is focussing on your age group for HPV prevention.

I believe that you have the right to be well educated about HPV. I would like to design a mobile health (mHealth) tool from which you can learn about this virus. mHealth is when health services are given by using mobile technologies (such as cell phones and tablets) to make sure that more people are able to receive these services, as most people have cell phones and tablets. mHealth tools need to be designed based on research findings to make sure that they are suitable for the people that will use them. I thus require your assistance in guiding and advising me on the type of mobile technology that will work best for you.

What is the purpose of the research?

The study hopes to result in the conceptual design (which is a guideline for what the final tool should be like) of a mobile technology, which will help in educating young female scholars about the human papillomavirus. Education is important because it can encourage preventative measures, and can be empowering.

What will participation in this study involve?

Participation will firstly involve you completing a questionnaire. The questionnaire will be about the following:

1. Your access to mobile technology - whether you have a cell phone or tablet and how you use it, and what you use it for.
2. Your experience with HPV vaccination -whether you have received it, when and how you felt when you did.
3. How you like learning about HPV and sexual health, and it will also test how much you know about HPV.

The information from the questionnaires will be used to design a mockup (this will just be a representation of what the tool could be and do- "first draft") mobile health teaching tool, which will be presented to you (if you are willing) in a focus group discussion. The focus group discussions will be a group meeting with you and your peers; where we will be talking about the design that I come up with. You will be asked to give your opinion and feedback about the design; and your feedback will be used to inform the final design.

Who can participate in this study?

The study will include 9–14-year-old female learners in grade 4-7, who are members of Ikamva Labantwana Bethu (ILB) in Crossroads. Only the learners who have been given permission by their parents or legal guardians**,** by returning a signed consent form will be allowed to participate. The learners will also be asked to give their permission through signing an assent form.

How many people will take part in the study?

I would like to survey at least 50 female scholars. I am hoping to have at least one focus group discussion per grade.

How long will the study last?

This study will be ongoing for about 12 months. However, you will only be asked to complete a questionnaire once and will be invited for a focus group discussion sometime after the questionnaire. After the focus group discussion, you will not be asked to participate in anything else.

How long will completing the questionnaire and the focus group discussion take?

The questionnaire should take about 20-40 minutes to complete, and the focus group discussion should take between 30- 90 minutes.

Will you receive payment or a reward for taking part in the study?

You will not be paid for your participation in the study.

What are the potential risks associated with the study?

There are no known risks related to participating in this study.

Do you have to participate in the study?

Participation in the study is voluntary. You may exercise your right to withdraw from the study at any time.

Are there any benefits for you being in the study?

The study offers no direct benefit to you. The findings will be used to confirm that there is a need for a mobile health tool that educates pre-teens about HPV. The results will also provide guidance on what the best content and design feature for this technology would be; based on the feedback I receive from you and your peers.

How will your privacy be protected?

Your will not be asked to write your name on your questionnaire and will not be asked to identify yourself in the focus group discussion, in order to protect your privacy and identity. This assent form and the consent forms from you parent/ legal guardian will be filed and locked away somewhere that only the investigators of this study have access. The information you share with me will not even be shared with your parents, tutors, ILB director and teachers.

The focus group discussion will be audio recorded. The transcriber (person who types up audio files) and the investigators of this study will be the only people with access to the focus group discussion recordings. The recordings will be kept on a password-protected mobile device. The transcriber will be required to sign a non-disclosure agreement before beginning to transcribe the audio.

What happens if you have complaints or concerns about the study?

If you are not satisfied in the manner in which the study was conducted, you are welcome to contact the following members of staff:

Supervisor/Principal investigator: Dr. Jill Fortuin (021 406 6571) | jill.fortuin@uct.ac.za

Co-supervisor: Professor Tania Douglas (021 650 3093) |tania.douglas@uct.ac.za

Physical address of all members of research team:

Level 7 Anatomy Building

Health Sciences Faculty

University of Cape Town

Anzio Rd

Observatory, 7925

Cape Town

Tel: 021 406 6541

Who reviewed or approved this study?

This study has been reviewed and approved by the Human Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town.

If you require any further information regarding your rights as a research participant, or have complaints regarding this research, you may contact Prof Marc Blockman, the Chairperson of the Health Sciences Research Ethics Committee at the University of Cape Town. The contact information for the HREC is as follows:

Human Research Ethics Committee

Faculty of Health Sciences, University of Cape Town

E52-54, Old Main Building

Groote Schuur Hospital

Observatory, 7925

South Africa

Tel: 021 406 6626

Fax: 021 406 6411

Email: lames.emjedi@uct.ac.za

You should use our ethical clearance reference number in your correspondence: **HREC REF: 281/2019**

Yours Sincerely

Kedebone Oliver

0738762303 I Email- OLVKED001@myuct.ac.za

Should you wish to participate in this research, please fill in the following:

You_____are being invited to volunteer to be in a research study. Please read this form and ask any questions you may have before agreeing to be in the study.

Assent to participate in a research study: To voluntarily agree to take part in this study, you must sign on the line below. If you choose to participate, you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered.

Please tick in the following box if you agree to the researcher audio recording the focus group discussion. You may request this recording to be destroyed at any time. This recording will be destroyed at the end of this study. ☐

Signature of Volunteer: **Date:**

Printed Name of Volunteer: **Time:**

Signature of Witness (When applicable): **Date:**

Printed Name of Witness: **Time:**

Signature of Person Obtaining Consent: **Date:**

Printed Name of Person Obtaining Consent: **Time:**

Appendix D: Xhosa information sheet and informed assent for participants

IFOMU YOLWAZI KUNYE NOKUNIKISA NGEMVUME YOMXHAXEBI

ICALA LOBUGCISA LWEZEMPILO: HREC REF:281/2019

ULWAKHIWO LOBUCHWEPHESHE KWEZOBUGCISA BEZEMPILO KULUNGISELELWA UKUFUNDISA ABAFUNDI ABASELULA KWELI LEKAPA NGEHPV KUNYE NESITHINTELO SAYO

Nxaxhebi ethandekayo

Igama lam ngu Kedebone Oliver, ndingumfundi osisthwalandwe wakwi Yunivesithi yase Kapa (UCT). Ndenza uphando lokusebenzisa ubuchwepheshe befowuni (nje. Inombolo kanomyayi [ifowuni], ithabulethi yeselula) ukuze sifundise abantu besifazane (amantombazana) abangabafundi eKapa ngevayirasi ekuthiwa yi Human Papillomavirus (HPV). Ndinqwenela ukumema ukuba uthathe ingxaxheba koluphando, kuba uthintelo lwe HPV urhulumente ulugxininise kwiqela lenu le minyaka.

Ndikholelwa ukuba unelungelo lokufundiswa kakuhle nge HPV. Ndinqwenela ukuyila isixhobo zempilo ngo kwe fowuni(mHealth) ozothi ufunde kuzo ngale vayirasi. imHealth ku xa iinkonzo zempilo zinikezwa ngokusebenzisa ubuchwepheshe befowuni (nje. Selula okanye ithebulethi) ukuqiniseka ukuba uninzi lwabantu luyazifumana ezinkonzo, kuba abantu abaninzi banazo iifowuni ne thebulethi. Izixhobo ze mHealth zifuna ukuyilwa ngokusekelwe kweziphumo zophando ukuqinisekisa ukuba zifanele abantu abazokuzi sebenzisa. Ngoko ndidinga uncedo lwakho eku ndikhokheleni nokundicebisa ukuba loluphi uhlobo lobuchwepheshe bezifowuni olungakusebenzela ngcono.

Yintoni injongo zo luphando?

Injongo zesi zoluphando kuba nesiphumo soyilo lwengqiqo (elizakuba si sikhokhelo sokuba isixhobo sokugqibela sizoba njani) lochwepheshe befowuni, eli zokunceda ekufundiseni oselula nge HPV. Imfundo ibalulekile ngoba ikhuthaza amanyathelo okhuselo kwaye iya kuxhobisa.

Ukuthatha inxaxheba ko luphando kubandakanya ntoni?

Okokuqla, ukuthatha inxaxheba kubandakanya ukuba ugcwalise imibuzo. Imibuzo izokuba malunga nokulandelayo:

1. Ukufikelela kwakho kuchwepheshe lwe zefowuni – ukuba uneselula okanye ithabulethi yeselula kwakhona uyisebenzisa njani, kwaye uyisebenzisa entweni.
2. Amava akho ngokugonywa – ukuba ukhe wagonywa , wagonyelwa phi, kwaye waziva njani ngoku bekusenziwa.
3. Ukuba ungathanda njani ukufunda nge HPV ne zempilo zosondo, kwaye lemibuzo izokuphinda ivavanye ulwazi lwakho nge HPV.

Ngubani ongathatha inxaxheba koluphando?

Oluphando luzo bandakanya abafundi abangamantombazane abane minyaka eyi9-14 aba kwa mabanga e4-7 esikolo, kwaye aba ngamalungu eIkamva Labantwana Bethu (ILB) eCrossroads. Ngabafundi abanikwe imvume, ngo kubuyisa ifomu yemvume elisayiniwe ngabazali babo bodwa abazo vunyelwa ukuba bathathe inxaxheba. Ababafundi bazokuphinda bacelwe ukuba banikezele imvume ngo kusayina ifomu lwesiqinisekiso.

Bangaphi abantu abazokuthatha inxaxheba koluphando?

Ndinqwenela ukusurveya abafundi bamantombazane aba ngaba 50. Ndinqwenela nokuba nengxoxo enye yeqela lokugxila ngabanga linye lesikolo.

Luzothatha ixesha elingakanani oluphando?

Oluphando luzoqhubekeka phantsi kwe nyanga ezi 12. Kodwa wena uzokucelwa ukuba ukuphendule imibuzo kanye, ube ke sewu menyelwa ingxoxo yeqela lokugxila emva kwethuba elithile emveni kokuba uphendule imibuzo. Emva kwe ngxoxo yeqela lokugxila awuzophinde ucelwe ukuba uthathe ingxaxheba kwenye into.

Kuzokuthatha ixesha elingakanani ukugcwalisa ifomu yemibuzo nengxoxo yeqela lokugxila?

Imibuzo ingakuthatha imizuzu eyi 20-40 ukuba uyiphendule, ingxoxo yeqela lokugxila yona ingathatha imizuzu eyi 30-90.

Uzakubhatalwa okanye uphiwe umvuzo ngokuthatha ingxaxheba ko luphando na?

Awuzokubhatalwa ngokuthatha ingxaxheba ko luphando.

Ngeyiphi imingcipheko enxulumene no luphando?

Akukho mingcipheko eyaziwayo edibene nokuthatha inxaxheba koluphando.

Ukhona na umvuzo ekuthatheni inxaxheba koluphando?

Oluphando aluna mvuzo obhekene nawe ngqo. Iziphumo zoluphando zizo ezi zizosibonisa ukuba sikhona na isidingo sesixhobo sezempilo sefowuni (mobile) sikhona esizokufundisa abatsha ngevayirasi i-HPV. Iziphumo zizokusikhokela ukuze sazi ukuba yeyiphi eyona indlela ehamba phambili yoqulatho nophawu loyilo lwa le teknoloji, ingxelo isekelwe endiyifumana kuwe noontanga bakho.

Ubunikazi bakho neenkcukaca zakho zizoku khuselwa njani?

Awuzocelwa ukuba ubhale igama lakho kwiphepha le mibuzo, kwaye awuzocelwa ukuba uzazise kwi ngxoxo yeqela lokugxila ukuze sikwazi ukukhusela ubunikazi bakho. Iifomu zemvume ezizoku sayinwa ngumzali wakho okanye umgcini wakho zizoku thathwa zitshixelwe endaweni apho zizofikeleleka kwabaphandi boluphando bodwa. Ulwazi owabelana ngalo nam alu zokwabiwa nabazali bakho, nootitshala (tutors no teacher) okanye umlawuli we ILB.

Ingxoxo yeqela lokugxila iza ku rekhodiwa ngokomsindo. Unobhala (lo ozobhala amafayile omsindo) nabaphandi boluphando ngabo bodwa abantu abazofikelela kwezirekhodi. La ma rekhodi azogcinwa kwi selula etixiweyo ngenombolo yokuvula (password). Unobhala uzocelwa ukuba asayine isivumelwano sokungachazi iinkcukaca zerekhodi phambi kokuba abhale la ma rekhodi.

Kuzo kwenzekani uba unesikhalazo okanye uyaxhalaba ngo luphando?

Uba awanelisekanga ngohlobo oluphando luqhubeke ngalo wamkelekile ukuba uqhagamshelane na la malungu ezisebenzi:

Umphathi wophando: Dr. Jill Fortuin (021 406 6571) jill.fortuin@uct.ac.za

Umphathi wequmrha: Professor Tania Douglas (021 650 3093) Tania.douglas@uct.ac.za

Idilesi lomzimba lwawo womke amalungu ophando:

Level 7 Anatomy Building

Health Sciences Faculty

University of Cape Town

Anzio Rd

Observatory 7925

Cape Town

Tel: 021 406 6541

Oluphando lihlaziywe okanye livunywe ngubani?

Oluphando luhlaziywe kwaye lwa vunywa ngabe Komiti lwezophando lokuziphatha kwabantu (Human Research Ethics Committee- HREC) yakwiYunivesithi yase Kapa (Faculty of Health Sciences, University of Cape Town)

Ukuba ufuna ulwazi ngakumbi ngama lungelo akho nje nga ngxaxhebi yo luphando, okanye unezikhalazo ngoluphando, unga qhagamshelana no Prof. Marc Blockman, usihlalo we Komiti lwezophando lo kuziphatha kwabantu kwi Yunivesithi yase Kapa. Ingcukacha zoqhagamshelwano ze HREC zithi:

Human Research Ethics Committee

Faculty of Health Sciences, University of Cape Town

E52-54, Old Main Building

Groote Schuur Hospital

Observatory 7925

South Africa

Tel: 021 406 6626

Fax: 021 406 6411

Kunyanzelekile ukuba usebenzise inombolo yerefurensi yokuziphatha xa wenza unxibelelwano nathi: **HREC REF: 281/2019**

Owakho ngoku nyanisekileyo

Kedebone Oliver

073 876 2303| Email- OLVKED001@myuct.ac.za

Ukuba ufuna ukuthatha inxaxheba koluphando sicela ugcwalise apha:

Wena _____ uyamenywa ukuba uvolontiye ukuba ko luphando.

uyacelwa ukuba ufunde le fomu, kwaye ubuze nayiphi na imibuzo ongaba nayo phambi koba uvume ukuba ko luphando.

Imvume yokuthatha ingxaxheba ko luphando. Xa uvolontiya ukuthatha inxaxheba koluphando, kumele usayine kulomgca ongase zantsi. Uba ukhetha ukuthatha inxaxheba ungarhoxa na kweliphi na ixesha. Awunikezeli ngamalungelo akho asemthethweni xa usayina eli fomu. Umtyikityo wakho apha ezantsi ubonisa ukuba ufundile okanye ufundelwe yonke le fomu ye mvume, kuquka iingozi ne nzuzo kwaye yonke imibuzo yakho iphendulwe.

Ndicela uphawule kwi bhokisi ezilandelayo uba uyavuma ukuba umphandi a rekhode ingxoxo yeqela lokugxila. Ungacela elorekhodi litshabalaliswe na ngeliphi na ixesha. Eli rekhodi lizoku tshabalaliswa ekupheleleni ko luphando.

☐

Umtyikityo we volontiya: **Umhla:**

Igama le volontiya: **Ixesha:**

Umtyikityo wengqina (xa kusebenza): **Umhla:**

Igama le gqina: **Ixesha:**

Umtyikityo lomntu unikwa imvume: **Umhla:**

Igama lomntu onikwa imvume: **Ixesha:**

Appendix E: English questionnaire

QUESTIONNAIRE FOR FEMALE LEARNERS

*You may tick more than one option for the square boxes, and can only tick one option for the ovals.

1. Demographic details

1.1. How old are you this year (2019)?
Mark only one oval.

- ◯ 9-10
- ◯ 11-12
- ◯ 13-14

1.2. What is your gender?
Mark only one oval.

- ◯ Female
- ◯ Male

1.3. Where do you currently stay?
Mark only one oval.

- ◯ Crossroads
- ◯ Phillipi
- ◯ Gugulethu
- ◯ Nyanga
- ◯ Other: _____

1.4. Which school do you attend?

_____

1.5. What grade are you currently doing?
Mark only one oval.

- ◯ Grade 4
- ◯ Grade 5
- ◯ Grade 6
- ◯ Grade 7
- ◯ Other: _____

2. Mobile technology access

2.1. Do you own a cellphone/ tablet or laptop?
Mark only one oval.

- ◯ Yes
- ◯ No

2.1.1 If yes, what model and make is it (e.g Samsung J5)

_____

2.1.2 If no, do you have friends or family that allow you to use their phones/ tablets/laptops?

Mark only one oval.

- ◯ Yes
- ◯ No

*If you answered "No" for both 2.1 and 2.1.2 please skip to number 2.7.

2.2. How many hours a day do you spend using a cellphone/tablet/ laptop?

Mark only one oval.

- ◯ less than 1 hour
- ◯ Less than 3 hours
- ◯ Less than 5 hours
- ◯ More than 5 hours

2.3 Name three applications (e.g. Facebook, Whatsapp, Candy crush) that you use the most. Please list them in order of the most frequently used to the least used)?

_____

_____

_____

_____

_____

2.4 Which communication tool do you use the most on a cellphone/ tablet?

Mark only one oval.

- ◯ Voice call
- ◯ Text
- ◯ Video call

2.5 How much airtime do you buy per week?

Mark only one oval.

- ◯ Less than R12
- ◯ R12>R30
- ◯ R30>R50
- ◯ More than R50

2.6 Where do you mostly buy airtime?

Mark only one oval.

- ◯ Shop
- ◯ Someone else buys it for me
- ◯ Cellphone banking (USSD)
- ◯ Internet banking/banking app
- ◯ Other

2.7 Do you have access to a computer?

Mark only one oval.

- ◯ Yes
- ◯ No

2.8 Where do you have access to a computer?

Check all that apply.

- ☐ School
- ☐ Ikamva
- ☐ Community library
- ☐ Internet cafe
- ☐ At home
- ☐ I do not have access to a computer
- ☐ Other: _____

2.9 Do you have access to WIFI?

Mark only one oval.

- ◯ Yes
- ◯ No

2.10 Where do you have access to WIFI?

Mark only one oval.

- ◯ School
- ◯ Community library
- ◯ Internet cafe
- ◯ At home
- ◯ Ikamva
- ◯ I do not have have access to WIFI
- ◯ Other: _____

3. Human papillomavirus (HPV) knowledge

Please select the most correct answer. please do not guess if you do not know the answer- choose the "I don't know" option)

3.1 Do you know what HPV is?

Mark only one oval.

- Yes
- No

***If you chose "No" in question 3.1, please skip to number 4.**

3.2 Is HPV a sexually transmitted infection?

Mark only one oval.

- Yes
- No
- I don't know

3.3 Is there a cure for HPV?

Mark only one oval.

- Yes
- No
- I don't know

3.4 Is there a vaccine for HPV?

Mark only one oval.

- Yes
- No
- I don't know

3.5 How many types of HPV are there?

Mark only one oval.

- 1
- Over 100
- I don't know

3.6 Does the HPV vaccine prevent infection from all types of HPV

Mark only one oval.

- Yes
- No
- I don't know

3.7 How can HPV infection be prevented

Mark only one oval.

- Sexual abstinence
- Condoms
- Vaccine
- All the above
- I don't know

3.8 Which one of these diseases can be caused by HPV?

Mark only one oval.

- ◯ Genital warts?
- ◯ Cervical cancer
- ◯ Penile, vulvar and anal cancer
- ◯ Head and neck cancer
- ◯ All the above
- ◯ I don't know

3.9 Both men and women can be infected with HPV

Mark only one oval.

- ◯ True
- ◯ False
- ◯ I don't know

3.10 Why is the HPV vaccine given to girls only?

Mark only one oval.

- ◯ HPV only causes disease in girls
- ◯ It is used as preventative measure for cervical cancer
- ◯ I don't know

4.HPV vaccine

*Ask the facilitator to explain to you about HPV and the HPV vaccine when you get to this section

4.1 Have you ever been vaccinated for HPV?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

If you select "No" in 4.1, please skip to section 5.

4.2 Where did you receive the vaccine?

Mark only one oval.

- ◯ School
- ◯ Community clinic
- ◯ Private clinic/practice
- ◯ Other: _____

4.3 How many times were you vaccinated/ injected for HPV?

Mark only one oval.

- ◯ Once
- ◯ Twice
- ◯ Three times

4.4 Did you experience any side effects after you were injected?
Mark only one oval.

- Yes
- No

4.4.1 If yes, please specify

_____

4.5 Were you scared when you received the HPV vaccine for the first time?
Mark only one oval.

- Yes
- No

4.5.1 If yes, why were you scared?

_____

4.6. Were you scared when you received the vaccine for the second/ third time?
Mark only one oval.

- Yes
- No

4.6.1 If yes, why were you scared?

_____

4.7 How old were you when you received the first injection of the HPV vaccine?
Mark only one oval.

- 8 years
- 9 years
- 10 years
- 11 years

4.8 How many months did you wait before you went for your second HPV vaccine injection?

_____

5. Learning preference

5.1 Would you like to learn more about HPV
Mark only one oval.

- Yes
- No

5.2 Do you think you know enough about HPV?

Mark only one oval.

- Yes
- No
- I don't know

5.3 Do you think you know enough about sexual health?

Mark only one oval.

- Yes
- No
- I don't know

5.4 Where do you learn the most about HPV or sexual health?

Mark only one oval.

- Parents or other family members
- Media (TV, radio, newspapers, magazines)
- Peers and friends
- School teachers and tutors
- Social media (Facebook, Twitter, Whatsapp etc.)
- Website (CANSA, hpv.co.za, government websites)
- Health care professionals

5.5 Where would you prefer to learn about HPV and sexual health?

Mark only one oval.

- Parents or other family members
- Media (TV, radio, newspapers, magazines)
- Peers and friends
- School teachers and tutors
- Social media (Facebook, Twitter, Whatsapp etc.)
- Website (CANSA, hpv.co.za, government websites)
- Health care professionals

5.6 Which method is easiest for you to learn about HPV and sexual health?

Mark only one oval.

- Interactive (talking and listening)
- Reading
- Visual (videos and pictures)

THANK YOU FOR PARTICIPATING IN THIS SURVEY

Appendix F: Xhosa questionnaire

Imibuzo yophando lwabafundi

1. Iincukacha zomthathi nxanxheba:

1.1 Uneminyaka emingaphi kulomnyaka? (2019)
9 10 11 12 13 14

1.2 Isini sakho:
Inkwenkwe intombazana esinye

1.3 Uhlala ndawoni/phi?
Crossroads Phillipi Gugulethu Nyanga

1.3.1. Ukuba uhlala kwenye indawo ngaphandle kwezi zikhankanyiweyo

ngentla, chaza ukuba uhlala ndawoni?

……

1.4 Ufunda kwesiphi isikolo?

……..

1.5 Ufunda kweliphi ibanga esikolweni?

Ibanga 4 Ibanga 5 Ibanga 6 Ibanga 7

1.5.1. Ukuba awukho kulamabanga akhankanyiweyo ngentla, chaza ibanga lakho?

……..

2. Ufikeleleko lobuchwepheshe bonomyayi

2.1 Ingaba unawo na unomyayi okanye ithabhulethi?
Ewe Hayi

2.2.1 Ukuba unawo, chaza umhlobo nokwenziwa kwawo?

……..

2.2.2 Ukuba awunawo, ingaba unabo abahlobo okanye amalungu osapho akuboleka unomyayi okanye ithabhulethi yabo ukuze uyisebenzise?

Ewe Hayi

Ukuba uthe “HAYI” kwimibuzo 2.1 kunye no 2.1.2; ndicela utsibe uye kumbuzo 2.7

2.2. Zingaphi iiyure ozisebenzisayo kunomyayi okanye kwithabhuleti ngemini?

>1 kweyure/ 1>3 kweeyure ezintathu/ 3>5 kweeyure ezintlanu/ ngaphezu kweeyure ezintlanu

2.3 Chaza iinkqubo zibentathu (umzekelo, Facebook, Email, Fitbit okanye ezemidlalo njalo njalo) ozisebenzisa rhoqo kunomyayi ngokulandelelana kwamaxesha ozisebenzisa ngawo.

……

……..

……..

2.4. Yeyiphi indlela oyisebenzisa rhoqo/kakhulu yokunxibelelana kunomyayi okanye kwithabhuleti yakho?

Ukuthetha emnxebeni/ ukubhala umyalezo omfutshane/ inkqubo kaWhatsapp (umnxeba okanye umyalezo)

2.5. Usebenzisa umoya okanye imali engakanani ngeveki?

>R12 R12>R30 R30>R50 Okanye ngaphezu kwe R50

2.6. Amaxesha amaninzi uwuthenga ndawoni umoya kanomyayi?

a. Evenkileni
b. Ndithengelwa ngomnye umntu
c. Ndiyithenga kwibhanga ngonomyayi wam
d. Ndiyithenga ngokusebenzisa ubuchwepheshe bebhanga kunye nokusebenzisa inthanethi.
e. Enye indlela yokuthenga umoya.

2.7. Ingaba unayo indlela yokufikelela kwikhomputa?

Ewe/ Hayi

2.8. Uyifumana ndawoni indlela yokusebenzisa ikhomputa?

a. Esikolweni
b. E Ikamva
c. Kwithala lweencwadi lomphakathi
d. Kwivenkile yobuchwepheshe nolwazi
e. Ekhaya
f. Kwenye indawo
g. Andinayo indawo endifumana kuyo indlela yokusebenzisa ikhomputa

2.9. Unayo indlela yokufumana iWIFI?

Ewe / Hayi

2.10. Uyifumana ndawoni indlela youkusebenzisa iWIFI?

a. Esikolweni
b. Kwithala lweencwadi lomphakathi
c. Kwivenkile yobuchwepheshe nolwazi
d. Ekhaya
e. Kwenye indawo. Chaza…….
f. Andinayo indawo endifumana kuyo indlela yokusebenzisa IWIFI

3. Ulwazi lwe Human papillomavirus (HPV)

(Khetha eyona mpendulo esondeleyo. Ukuba awuyazi impendulo kwaye uyathandabuza – khetha impendulo ethi "ANDIYAZI" kwimpendulo ezikhoyo)

3.1. Wakhe weva ngeHPV ngaphambili?

Ewe / Hayi

Ukuba ukhethe u "Hayi" kumbuzo 3.1, ndicela utsibe uye kumbuzo 4.

3.2. Ingaba IHPV yintsholongwane eyosuleleka ngokwabelana ngesondo na?

Ewe Hayi Andiyazi

3.3. Ingaba likhona ichiza elinyanga IHPV?

Ewe Hayi Andiyazi

3.4. Ingaba likhona ichiza elinqanda ukosuleleka kwe HPV?

Ewe Hayi Andiyazi

3.5. Zingaphi iindidi zeHPV ezikhoyo?

Inye Zingaphaya kweKhulu Andiyazi

3.6. Ingaba ukugonywa ngechiza leHPV lunqanda ukosuleleka kuzo zonke iintlobo zeHPV na?

Ewe Hayi Andiyazi

3.7. Ukosuleleka ngentsholongwane ye HPV kunganqandeka njani?

a. Ngokungabelani ngokwesondo kwaphela
b. Ngokusebenzisa idyasi yomkhwenyana
c. Ngokugonywa kwangethuba
d. A,B kunye no C
e. Andiyazi

3.8. Sesiphi isifo esinokubangelwa yi HPV kwezi zilandelayo?

a. Imfazwe yesini (ukukhula okubonakala kwisini)
b. Umhlaza womlomo wesibeleko
c. Umhlaza wePenile kunye nowomchamo
d. Umhlaza wentloko kunye nowentamo.
e. Akukho nanye impendulo kwezi ziphezulu
f. A,B,C kunye D
g. Andiyazi

3.9 Bobabini ubhuti nosisi bayakwazi ukosuleleka yintsholongwane yeHPV

Yinyani Bubuxoki Andiyazi

3.10. Kungoba kutheni ingamantombazana kuphela agonyelwa lentsholongwane yeHPV?

a. IHPV ibanga isifo kumantombazana kuphela
b. Kungoba isetyenziswa njengokunqanda umhlaza womlomo wesibeleko
c. Kungoba amantombazana abalulekile kunamakhwenkwe
d. Andiyazi

4.Ukugonyelwa IHPV

4.1. Ingaba wakhe wagonyelwa IHPV ngaphambili?

Ewe Hayi Andiyazi

*Ukuba ukhethe u “HAYI” kumbuzo 4.1, tsiba uye kumbuzo 5.

4.2. Ingaba wawugonyelwa ndawoni?

a. Esikolweni
b. Kwikliniki yoluntu okanye yomphakathi
c. Kwikliniki yabucala
d. Kwenye indawo. Chaza ……..

4.3. Ingaba wagonywa amaxesha amangaphi?

Kanye Kabini Kathathu

4.4. Ingaba zabakhona iimpawu ezisecaleni ezakuphatha gadalala emveni kokugonywa kwakho?

Ewe Hayi

4.5. Ingaba ubusoyika phambi kokugonywa kwakho okokuqala?

Ewe Hayi

4.5.1. Ukuba uthe “EWE”, chaza ukuba kwakutheni ukuze woyike?

……..

4.6. Ingaba ubusoyika phambi kokugonywa kwakho okwesibini?

4.6.1 Ukuba uthe “EWE”, chaza bekutheni ukuze woyike?

4.7. Ubuneminyaka emingaphi ukugonywa kwakho okokuqala, ugonyelwa IHPV?

8 9 10 11

4.8. Walinda iinyanga ezingaphi ukuze uphinde ugonyelwe intsholongwane yeHPV okwesibini?

5. Ukunqwenela ulwazi

5.1 Ungathanda ukufunda wazi banzi nge HPV?

Ewe Hayi

5.2. Ingaba ucinga unolwazi olubalaseleyo nge HPV?

Ewe Hayi Andiyazi

5.3 Ingaba ucinga unolwazi olwaneleyo ngokwabelana ngezesondo?

Ewe Hayi Andazi

5.4 Ingaba ufunda kubani okanye ndawoni nge HPV okanye ngokwabelana ngezesondo?

a. Kubazali bam okanye kumanye amalungu osapho

b. Kwezosasazo(kumabonakude/kunomatho-tholo), kumaphepha-ndaba njalo njalo.
c. Kubahlobo bam kunye nakontanga bam
d. Kubafundisi ntsapho esikolweni
e. Kumakhasi onxibelelwano (Facebook, Twitter, Whatsapp)
f. Kwiwebhusaythi (CANSA, hpv.co.za, government websites)
g. Kubongi mpilo

5.5. Ungathanda ukufunda banzi njani nge HPV okanye ngokwabelana ngezesondo?

a. Kubazali bam okanye kumanye amalungu osapho
b. Kwezosasazo (kumabonakude/kunomatho-tholo), kumaphepha-ndaba, kwiincwadi-ndaba.
c. Kubahlobo bam kunye nakontanga bam
d. Kumafundisi ntsapho esikolweni
e. Kumakhasi onxibelelwano (Facebook, twitter, Whatsapp njalo njalo)
f. Kweziwebhusayithi (CANSA, hpv.co.za, government websites)
g. Kubongi-mpilo

5.6. Yeyiphi yona ndlela ilula oyikhethayo yokufunda banzi nge HPV nangokwabelana ngezesondo?

a. Ngokuncokola (ukuthetha nokumamela ezinye izimvo ezahlukileyo)
b. Ukufunda ngazo
c. Ukufunda ngazo ngokwemiboniso (imifanekiso okanye iividiyo nakumabonakude)

Appendix G: Screenshot of a Facebook post by the Gauteng Department of Health promoting the HPV vaccine roll-out.

(Gauteng Health Department, 2019)

Appendix H: Article on the Western Cape Department of Health website about the HPV vaccine roll-out.

HPV vaccinations

2020
Department of Health (Western Cape Government)

+ Share

Listen

The Department of Health is serious about improving the health of women. Health campaigns, free services and vaccinations such as the Human Papillomavirus (HPV) vaccination all form part of our efforts to improve the health of all women in the Western Cape.

HPV is responsible for 99% of cervical cancer cases. For this reason, health officials have been visiting public and special schools across the province to administer the HPV vaccinations.

When must my daughter be vaccinated?

To provide the best protection against the HPV, 2 doses of the vaccine need to be administered.

Up until 2019, only Grade 4 learners whose parents and caregivers signed consent forms received the HPV vaccinations.

In 2019, health teams visited a total of 1 112 schools and achieved an 85% first dose cover of HPV vaccinations. The National Advisory Group on Immunisation (NAGI) recommended changing the target to Grade 5 learners in 2020.

The first round of the campaign took place during February and March 2020. The second round of the campaign will be from 11 August until 18 September 2020.

Girls in Grade 5 over the age of 9-years with the necessary consent, who did not receive the HPV vaccine in 2019, will have a second opportunity to be vaccinated.

Why is the HPV vaccination necessary?

HPV is the virus that causes cervical cancer. Cervical cancer is the second most prevalent cancer among women after breast cancer. Over 99% of all cervical cancers are caused by persistent infection of high risk types of HPV.

(Western Cape Government, 2017)

Appendix I: Screenshot of a Twitter post by the National Department of Health promoting the HPV vaccine roll-out.

(Department of Health, 2017b)

Appendix J: Factsheet distributed by the South African Department of Health and Department of Basic Education to inform about the HPV Vaccination Campaign

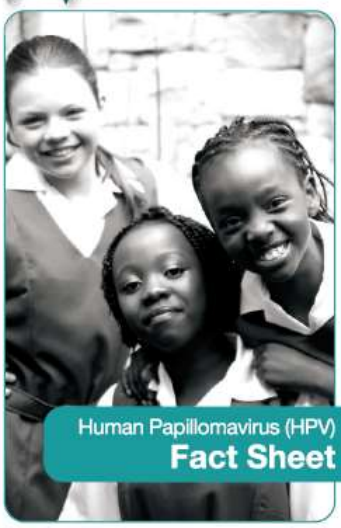
PROTECTING YOUNG GIRLS, FUTURE WOMEN OF SOUTH AFRICA

For any queries please contact us on:
HPV Helpline - 080 001 2322
HPV email - hpv@health.gov.za
DoH website - www.doh.gov.za

Printed by Aspen and GSK

References available on request

PREVENT Cervical Cancer



Human Papillomavirus (HPV) Fact Sheet

Basic Education
Health

STATISTICS on CERVICAL CANCER and HPV INFECTION

- The incidence of cervical cancer in **South Africa** is reported to be between **22,8 and 27 per 100 000 women,** as compared to the **global average** of **15,8**
- In **2008** there were **5 743 NEW CASES** reported with **3 027 associated deaths** in South Africa
- **99%** of **cervical cancers** are caused by **Human Papillomavirus (HPV)**
- Approximately **7 in 10 people** will have **HPV** at some point in their lives
- Of the more than **100 strains** of HPV, **two strains of HPV (HPV-16 and HPV-18)** are found to cause at least **70% of all cervical cancer cases**
- **HPV-16 and HPV-18** strains are **vaccine-preventable**

Human Papillomavirus (HPV)

- Is a very **common infectious agent**
- Has **no visible symptoms**
- Is responsible for **most cases** of cervical cancer
- Is transmitted during sexual activity

Cervical Cancer

- In **South Africa** cervical cancer is the **second most common cancer** among women
- Is a cancer that affects the lower part of the womb **(cervix)**
- **Only affects women**
- If not detected at an early stage is **difficult to treat** and **often results in death**

HPV Vaccine

- **Prevents cervical cancer**
- Is **most effective** if given at a young age (9 years and older)
- Is **safe** and **effective**
- Has been used in **many countries**
- Requires **2 doses** (6 months apart)
- **Is recommended** by the **World Health Organisation** for girls before they are exposed to HPV
- Introduction presents an opportunity for **South Africa** to make **long term health benefits**

HPV Vaccine CANNOT

- **Treat or cure cervical cancer**
- **Prevent or treat human immunodeficiency (HIV) infection**
- **Prevent or end pregnancy** – HPV vaccine is **NOT** a method of family planning
- Affect a girl's **ability** to have **children** in the **future**

Appendix K: Xhosa consent forms distributed to the parents of the learners to sign prior to their child receiving the vaccine

Basic Education
Health

Uxwebhu olunika imvume* yokugonyelwa intsholongwane yomhlaza i-Human Papillomavirus (HPV)

ISebe lezeMpilo lisebenzisana neSebe lezeMfundo esiSiseko namanye amaqabane baza kuqalisa ngenkqubo yokugonyela iHuman Papillomavirus (HPV) njengenxalenye yenkqubo eHlangeneyo yeSikolo nezeMpilo (ISHP) Inkqubo yokugonyelwa i-HPV ijolise ekunciphiseni inani labantu abahlaselwa ngumhlaza womlomo wesibeleko kweli lizwe. Umhlaza womlomo wesibeleko ngomnye wezona ntlobo zomhlaza zixhaphakileyo kwabasetyhini kwaye abasetyhini abaninzi bayasweleka ngenxa yawo. I-HPV, eyintsholongwane eyosulela ngokwabelana ngesondo, ngoyena nobangela womhlaza womlomo wesibeleko. Ukosuleleka yile ntsholongwane kungathintelwa ukuba amantombazana amancinane agonyelwa i-HPV esemancinane nto leyo iza kunciphisa amathuba abo okuhlaselwa ngumhlaza womlomo wesibeleko xa bebadala.

Ichiza lokugonya i-HPV linikwa onke amantombazana akwiBanga le-4 aneminyaka eli-9 nangaphezulu. Ichiza lokugonya i-HPV linikezelwa ngamathamo amabini, ithamo lokuqala liza kunikezelwa kweyoKwindla/ kuTshazimpunzi (Matshi/Epreli) lize ithamo lesibini linikezelwe kweyoMsintsi/kweyeDwarha (Septemba/ Oktobha), iinyanga ezi-6 emva kwethamo lokuqala.Ukuthatha inxaxheba kule nkqubo yokugonyelwa i-HPV ukwenza **ngokuzithandela** kwaye ubomi bangasese nobumfihlo beenkcukacha zentombi yakho ziza kugcinwa zilihlebo. Abazali/ abakhathalela abantwana/ abagcini-bantwana bamantombazana afunda iBanga le-4 baza kucelwa ukuba batyikitye olu xwebhu lwemvume. Kukho nolwazi oluthe vetshe ngenkqubo yokugonyela i-HPV kwelinye icala leli phepha. Qhagamshelana nenqununu yesikolo okanye ikliniki yasekuhlaleni ukuba ufuna naluphi na ulwazi olongezelelekileyo.

Nceda uqaphele ukuba ugonyo lwe-HPV alukwazi kunikezelwa kumantombazana angaphantsi kweminyaka eli-9, okanye ukuba ebegula kakhulu kutshanje okanye agula kakhulu ngomhla wokugonya. Ugonyo lwe-HPV alusayi kunikezelwa kumantombazana akhulelweyo okanye lawo asele elufumene olu gonyo.
Nceda uzalise uze utyikitye olu xwebhu lwemvume lungezantsi, unike iinkcukacha ngezempilo yomntwana wakho kwelinye icala uze ulubuyisele esikolweni.

***Imvume** = oku kuthetha ukunikezela ngemvume yokuba umntwana wakho athathe inxaxheba kule nkqubo yogonyo
**Amantombazana angaphezulu kweminyaka eli-12 nangaphezulu anganikezela imvume ngokutyikitya kwindawo elungiselelwe oko

Krazula apha

Iphetshana lempendulo lechiza lokugonyelwa intsholongwane yomhlaza i-HPV :

Nceda uzalise amacala omabini eli candelo uze ulibuyisele esikolweni

Igama lomfundi: _____ Ifani: _____

Inombolo yesazisi _____ Somfundi: _____

Igama lesikolo: _____ Ibanga : _____

_____ Ndinika/Andiyiniki imvume yokuba

(Igama nefani yomntwana) **(cima okungeyenelelekanga)**

_____ afumane amathamo amabini echiza lokugonya i-HPV .

(Igama lentombi/ lomntwana)

Ndiyakuqonda ukuba ukuthatha inxaxheba kwinkqubo yokugonyelwa i-HPV kungokuzithandela.

_____ **Utyikityo lomzali/ lokhathalela umntwana**

Umhla: _____

_____ ****Amantombazana angaphezulu kweminyaka eli-12 anganika imvume ngokutyikitya apha**

Inombolo yeselula.:_____

Amanqaku athile malunga nogonyo lwentsholongwane yomhlaza i-HPV

1. **Eli chiza lokugonya likhuselekile** kwaye linomngcipheko ongephi kwintombazana.
2. Ichiza lokugonya liza kunikezelwa ngenaliti ngumongikazi oza kundwendwla esikolweni.
3. Inaliti enechiza lokugonya iza kuhlatywa kwingalo engasentla.
4. Uza kukuva ukuncuntswa yinaliti.
5. Emva kokugonywa ingalo ingaqaqamba kancinane kwaye ibe bomvu.
6. Musa ukuqaba nantoni na engalweni ukuphepha ukungcola no-kosuleleka
7. Kukho ithuba elincinane lokuba unganomkhuhlane, intloko ebuhlungu, isiyezi, okanye uzive ngathi uza kufa isiqaqa.
8. Ukuba nayiphi na kwezi ngxaki iyaqatsela yiya kwikliniki ekufut-shane nawe okanye esibhedlele kwaye uphathe ikhadi lakho loku-gonyelwa intsholongwane yomhlaza i-HPV.
9. Kwakhona, xelela inqununu yakho okanye utitshala weklasi yakho ngeso sehlo kwakamsinyane emva kokubuyela esikolweni.
10. Lonke ulwazi olunikezeleyo luza kugcinwa luyimfihlo.

Krazula apha

Nceda uzalise neli candelo **Imbali ngezonyango**	Ingaba kwixesha elidlulileyo intombi yakho ikhe yagula okanye yanayo nayiphi na ingxaki emva kogonyo? (Umzekelo ukwaliwa lichiza lokugonya
Ingaba kwixesha elidlulileyo intombi yakho ikhe yagula okanye yanayo nayiphi na ingxaki emva kogonyo? (Umzekelo ukwaliwa lichiza loku-gonya	Yakho / Ikhe
Ukuba impendulo ngu-ewe, cacisa ukuba kwenzeka ntoni:	
Ingaba intombi yakho inengxaki yokopha ixesha elide? (Oko kukuthi ukuba usikwe/uhlatywe yinto ukopha kuthatha ixesha elide phambi ko-kuba kuyeke phambi kokubakuyekee bleeding to stop)	Yakhi / Ikhe
Ukuba impendulo ngu-ewe, nceda ucacise:	

Appendix L: Focus group discussion guide questions

Part 1: Introduction and ice-breaker

1. Randomly identify 5-7 girls per grade who have consent and assent forms and take to a separate room
2. Give them name badges with Pseudonames
3. Introduce yourself, and your study and the focus group discussion

Group 1

Background about HPV

WHO: Sexual health is a state of physical, mental and social well-being in relation to sexuality. It requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence.

The definition I would give them: Understanding your body (puberty and menstruation), understanding the dangers that come with sex, and how to protect yourself against them.

Part 2: Questions about questionnaire

Section 5

Question 5.5- A lot of you said you want to learn from school teachers and tutors, why is that?

Very few said that they would like to learn from a website, Why is that?

Section 2

Question 2.1: Smartphone question: Who knows what a smartphone is.

Explain what it is: Internet & app usage

Who owns one?

Who has access to one?

How much access?

If this mHealth tool was to be developed, would you agree that you would be able to access it (phone and computer)?

Question 2.3 asks you to rank the things you use your phone for mostly: Social media, Games and Entertainment, Accessories, Educational. What elements of these do you think we can borrow from your favourite platforms and incorporate into the site?

Section 5: A lot text, but prefer to learn interactively

Voice call: Interactive

Text: Interactive and reading

Video call: Interactive and visual

What would interactive look like for you on this website.

What would you like to interact about?

Question 2.9-WIFI access: I asked whether you have access, but not how much access you have. Would you be able to quantify it for me?

Section 3

Question 3.1: Nobody knew anything about HPV- Tell me why not? Did anyone explain to you what it is before you received the vaccine?

Tell them what it is- ask them what is important to include in the site?

What do they think about the idea that learning about HPV would make them more likely to be sexually active? (Maybe don't ask them so directly)

How does HPV relate to HIV?

Will the HPV vaccine protect you from other sexually transmitted diseases? Do you know any other ones?

Section 4

Experience with the vaccine

All of you had been vaccinated.

Almost all of you were scared the first time, but very few of you were scared the second time. Why is that?

Some of you had side effects, was that scary for you? Would you have been less scared if someone had told you that this is normal?

Show the Vaccine Nation site

Get feedback