

**FACTORS INFLUENCING THE UPTAKE OF HUMAN PAPILLOMAVIRUS
VACCINE IN TANA RIVER COUNTY, KENYA**

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UNIVERSITY.**

SEPTEMBER, 2024

DECLARATION AND RECOMMENDATION

I, the undersigned, declare that this is my original work and has not been previously presented for a degree or any other award in any other university

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Methodist University, on that behalf.

DEDICATION

I dedicate this work to all people living with cancer and those who have survived to tell the tale.

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ABSTRACT

The global disease burden of cervical cancer is unevenly distributed worldwide. It is borne in sub-Saharan Africa where concerning trends in increasing cervical cancer incidence and mortality rates have been reported. Of the 117,316 new cervical cancer cases and 76,745 deaths recorded within the African region in 2022, 5845 cases and 3591 associated deaths were reported from Kenya. Despite the availability of HPV vaccines for primary prevention, the uptake remains low, hindering progress towards cervical cancer elimination. Our study sought to determine the factors that influence the uptake of the HPV vaccine in Tana River County, Kenya since its incorporation in the expanded immunization program in 2019. The aim was to contribute to evidence-based strategies to achieve the target of vaccinating 90% of adolescent girls with the HPV vaccine by age 15 by 2030. Using a community-based cross-sectional descriptive-analytical design, quantitative methods collected data from caregivers of girls aged 9 years to 14 years, with a sample size of 378 derived using the Fisher et al. (1995) formula and proportionate sampling from the three sub-counties. A pre-test study involved 38 community health volunteers with daughters aged 9 years to 14 years. Convenience sampling was employed, and structured questionnaires were used for data collection. The results recorded an uptake of 56.9%. It also revealed significant knowledge gaps: many respondents mistakenly viewed eating khat (61.6%), poor hygiene (73.4%), chronic UTIs (85.6%), and having an IUD (60.8%) as risk factors for cervical cancer. Only 47.9% knew smoking is a risk factor, 31.1% knew HPV affects both men and women, 36.4% correctly identified cervical cancer symptoms, and only 44.0% knew it is curable. Additionally, 47.9% were unaware that the HPV vaccine is most effective before sexual debut. Statistical analyses, employing chi-square tests, unveiled significant relationships between various knowledge indicators and vaccine uptake. Specifically, awareness of cervical cancer as a prevalent issue in Kenya ($p = 0.009$), understanding the preventive role of HPV vaccination ($p < 0.001$), and dispelling misconceptions, such as the vaccine causing infertility ($p = 0.044$), were all associated with higher uptake rates. Furthermore, knowledge of risk factors, such as smoking's link to cervical cancer, ($p = 0.006$), HPV being transmitted through sexual contact ($p = 0.042$), Start of sexual activity early increases the risk of cervical cancer ($p = 0.003$), Having multiple partners increasing the risk of cervical cancer ($p = 0.018$) was also positively correlated with vaccine uptake. Moreover, cultural and religious factors emerged as significant predictors of vaccine uptake. Statistical analyses demonstrated a strong association between cultural beliefs ($p = 0.006$), religious affiliations ($p = 0.016$), and HPV vaccine uptake, highlighting the need for culturally sensitive vaccination campaigns. The findings underscore the necessity of comprehensive education campaigns to improve awareness and dispel myths surrounding cervical cancer and HPV

vaccination, particularly in underserved communities like Tana River County. In conclusion, the study emphasizes the role of education, cultural sensitivity, and community engagement in enhancing HPV vaccine uptake. Recommendations include intensified health education efforts by the Ministry of Health to ensure widespread awareness and acceptance of HPV vaccination as a crucial strategy in cervical cancer prevention.

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LIST OF ABBREVIATIONS

CC: Cervical Cancer

HPV: Human Papilloma Virus

LMICs: Low Middle-Income Countries

WHO: World Health Organisation

MOH: Ministry of Health

EPI: Expanded Immunisation Program

STI: Sexually Transmitted Infection

HIV/AIDS: Human Immunodeficiency Virus

AIDS: Acquired Immune Deficiency Syndrome

CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Cervical cancer is a widespread malignancy that impacts women globally, with a particularly significant burden in low and middle-income countries (LMICs). These nations are responsible for more than 80% of newly diagnosed cases and approximately 90% of all cervical cancer-related deaths. The highest burden of cervical cancer mortality is concentrated in developing countries, where there is insufficient access to adequate screening, vaccination, and optimal treatment options (Nabirye et al., 2020). According to Stelzle et al. (2018), nearly 90% of women who succumb to cervical cancer reside in low-income and middle-income countries, with the highest cancer mortality rates being reported in countries within East Africa on a global scale. The incidence differed significantly across regions, showing a variation of at least 10 times. Eastern Africa exhibited the highest age-standardized incidence rates, with 40 cases per 100,000 women. In Kenya, there is a significant risk of cervical cancer among women aged 15 years and older, with approximately 16.2 million vulnerable. Annually, approximately 5,236 women are diagnosed with cervical cancer, resulting in 3,211 tragic fatalities due to this disease. In Kenya, cervical cancer holds the position of the second most prevalent cancer among women. It follows as the second most commonly diagnosed cancer in women aged 15yrs to 44 years, right after

breast. The general population in Kenya is estimated to have around 9.1% of women harboring cervical HPV-16/18 infection at any given time. Significantly, HPV 18 and HPV 16 account for 63.1% of metastatic cervical cancers in the nation (Catalan Institute of Oncology & International Agency for Research on Cancer [ICO/IARC], 2017).

According to the World Health Organization, prolonged exposure to the Human papillomavirus (HPV) is identified as the primary cause of cervical cancer. The other causes that may increase the probability of getting cervical cancer mentioned include early onset of sexual activity, having unprotected sex, and having multiple sex partners (Robles et al., 2021). Cancer incidence caused by Human papillomavirus (HPV) infections in United States is estimated at approximately 34,800 cases per year and HPV vaccination holds the potential to avert up to 92% of these cancer cases, thus presenting a substantial opportunity for preventive healthcare intervention (Spencer et al., 2020). In East Africa, evidence indicates that within Uganda, HPV is present in 33.6% of women. Furthermore, the annual incidence of HPV-related disease among women is observed at a rate of 44 cases per 100,000 (Nabirye et al., 2020). Annually, 9772 females are newly diagnosed with cervical cancer, resulting in a significant toll of 6695 lives yearly in Tanzania (Nhumba & Sunguya, 2022).

The implementation of Human papillomavirus (HPV) vaccination stands as a pivotal public health approach in the prevention of cervical cancer incidence within the general populace. Research has indicated a remarkable 83%

decrease in HPV 18 and HPV 16 among girls 13 years to 19 years following post-vaccination follow-up. Two primary vaccine types are currently available to combat this challenge: the bivalent vaccine, CervarixTM, engineered to target HPV 18 and 16, Gardasil TM, the 4 valent vaccines is designed to provide immunity against HPV 18, HPV 16, alongside HPV types 6 and 11, which are causative agents of genital warts. Routine vaccination coverage results to fast and significant herd effects of vaccination at the population level in countries that implement this prevention strategy (Drolet et al., 2021). Notwithstanding the established safety, effectiveness, and economical feasibility of the HPV vaccine, a notable disparity persists in its implementation across low- and middle-income nations. As of June 2020, national HPV vaccination initiatives had been initiated in merely 31% of African governments, in contrast to the corresponding figures of 85% in the Americas and 77% in Europe (Bruni et al., 2021). In specific countries like the United Kingdom, currently operational are school-centred programs designed for the distribution of the HPV vaccine (Bruni et al., 2021). In other countries such as the Netherlands, population-based non-school programs have been started.

The uptake of the vaccines has varied widely between countries with factors including safety, and perceived susceptibility to HPV vaccine showing correlates with HPV vaccine uptake. Higher-income nations, such as Scotland, commendable achievements are evident in HPV programs, with an attainment of an 80% coverage rate. However, many low-income countries have had suboptimal coverage, as low as 20% compared to high-income

countries despite them having high incidence rates of cervical cancer (Spayne & Hesketh, 2021). However, it is important to highlight that within low- and middle-income countries (LMICs) i.e. Rwanda and Malawi, substantial coverage achievements have been reached, even surpassing those observed in certain high-income countries (World Health Organisation [WHO], 2022).

Access to HPV vaccines have existed within Kenya's private sector as of 2006. In Kitui county, the Ministry of Health (MOH) conducted an inaugural vaccination initiative between 2013–2015, and 22,500 females aged 9 years and 12 years got Duo doses of HPV vaccination (Karanja, 2022). As highlighted by Karanja Chege, this attainment of a 96% uptake rate served as a crucial indicator, signifying the nation's readiness to initiate the integration of the HPV vaccine into the regular vaccination routine. Rollout began by prioritizing 10-year-old females and a plan to expand the coverage gradually as more doses become available. Utilization of the first dosage of the HPV vaccine witnessed a notable improvement, rising from 25% in 2019 to 33% by 2020. Conversely, follow-up data for the same year indicated a turnout for the second dose, with just over 110,000 girls, accounting for a coverage rate of approximately 16%(Karanja-chege, 2022). In November 2021, through the National Vaccine and Immunisation program, MOH initiated the Periodic Intensification of Routine Immunization (PIRI) campaign. A notable emphasis of this initiative was directed towards enhancing HPV vaccine coverage among preadolescents, with a lofty goal of reaching a coverage rate of 70% (MOH, 2021).

Shegog et al. (2022) posit that the achievement of effective vaccination compliance hinges upon the acknowledgment and endorsement of this imperative by pertinent stakeholders. In the Kenyan context, the perceptions of communities concerning HPV vaccination are intertwined with a discernible lack of trust in novel vaccination approaches, limited understanding of both HPV infections and the vaccination process, and inadequate dissemination of information attributed to fragmented training among relevant stakeholders. In the context of Kitui, Kenya, despite the presence of apparent low levels of knowledge, the community displayed a favourable response towards the HPV vaccine, notwithstanding certain obstacles such as girls' absenteeism, challenges related to school accessibility, and concerns regarding potential side effects (Masika et al., 2015).

A research study carried out in Gonder town, Ethiopia, unveiled a correlation between the acceptance of HPV vaccination and factors such as cervical cancer knowledge, familiarity with the HPV vaccine, and the disposition towards HPV vaccination. (Alene et al., 2020). Another study by (Kolek et al., 2022) in Kenya also demonstrated that a comprehensive understanding of the vaccine exhibited a positive correlation with the willingness to vaccinate their daughters. It was also noted that there was a negative linkage between acceptance of vaccination and factors such as lower levels of maternal education and younger maternal age. A comprehension of the determinants impacting HPV vaccine utilization is imperative to ensure the efficacy of the HPV vaccination programs and the establishment of a widely embraced

primary prevention strategy against cervical cancer (Sitaresmi et al., 2020).

1.1 Statement of the Problem

Despite Kenya integrating the HPV vaccine into Kenya's expanded immunization program in 2019, along with its free distribution, the adoption of the vaccine has persisted at a notably low level in many parts of the country with national average estimates at 33 % for the primary dose and 16 % for the last dose as of 2020 which is far below the national target of 70% (MOH, 2021). Tana River County continues to record poor uptake with only 3383 girls having received the last dose. Of the three sub-counties, Tana North has the lowest number of girls receiving the last dose i.e. 199, followed by Tana Delta sub-county at 1225 and Tana River at 1959.

Challenges exist in the delivery of the vaccine to 9yrs-14-year-olds who are the recommended population for HPV vaccinations by the WHO. Routine immunizations in national campaigns focus on children below 5 years and delivering HPV vaccines to these new age group necessitates an alternative approach of health interventions. The utilization of the HPV vaccine is poor therefore the study aims to evaluate the determinants of its uptake in Tana River County Kenya.

1.2 General Objective

To establish the factors that influence the uptake of the HPV vaccine in Tana River County.

1.3 Specific objectives.

- i. To estimate the uptake of the HPV vaccine in Tana River County, Kenya.
- ii. To assess the knowledge and perceptions about cervical cancer, HPV, and HPV vaccine in Tana River County, Kenya.
- iii. To determine social, and cultural factors influencing the uptake of HPV vaccine in Tana River county, Kenya.
- iv. To explore the health system factors that influence the uptake of the HPV vaccine in Tana River County, Kenya.

1.4 Research Questions.

- i. What is the uptake of HPV vaccine uptake in Tana River County, Kenya?
- ii. Do knowledge and perceptions about cervical cancer, HPV and HPV vaccine influence the uptake of HPV vaccine in Tana River county, Kenya?
- iii. Do social-cultural factors influence the uptake of the HPV vaccine in Tana River County, Kenya?
- iv. To what extent do health system factors influence the uptake of the HPV vaccine in Tana River county, Kenya?

1.5 Justification of the study

HPV vaccine is a relatively new vaccine and limited research has been carried out in Kenya specifically Tana River County on this vaccine targeting STI.

Studies show that addressing the determinants that influence the utilization of the HPV vaccine is a key strategy for improving HPV vaccination rates (Karanja-chege, 2022; Kolek et al., 2022; Shegog et al., 2022). It is imperative to therefore conduct an empirical study to study affecting the utilization of the HPV vaccine to achieve the stated vaccination goal of 90% by 2030 and eliminate cervical cancer.

1.6 Limitations of the Study

The research was carried out in a resource-limited rural area of a Low and Middle-income country and therefore the findings may be applicable in communities with similar settings. The study was also limited to one county in Kenya with different socioeconomic and sociodemographic challenges, therefore a country perspective will not be measured, yet HPV vaccination is a national Concern. In addition, the use of convenience sampling for the pre-test with community health volunteers may have introduced selection bias, limiting the study's representation of the broader population. Those selected might have more knowledge or access to health information compared to the general population.

1.7 Delimitation of the Study

The research participants were solely parents of girls aged between 9 years – and 14 years which is the recommended group for the HPV vaccination. It excludes other groups such as healthcare providers and school teachers who might influence the uptake of the HPV vaccine. Moreover, this study

predominantly examined individual factors through quantitative methods, overlooking the qualitative dimension needed to explore community issues in depth fully.

1.8 Significance of the Study

This study aimed to fill the utilization of the HPV vaccine gap by evaluating the barriers and facilitators to vaccine uptake in this demographic. Addressing this knowledge gap is crucial, as limited research has been conducted on HPV vaccine uptake in Kenya, especially in Tana River County. The results provide valuable insights for healthcare providers and policymakers, contributing to the development of targeted interventions to enhance vaccination rates, achieve the national goal of 90% coverage by 2030, and work towards eliminating cervical cancer. By generating new knowledge and potentially developing a model for understanding vaccine utilization, this research offers actionable insights to improve public health outcomes in underserved regions.

1.9 Assumptions of the Study.

There is an ongoing HPV vaccination. It also assumes that respondents provided honest responses during the collection of the data on the aspects influencing the acceptability of HPV vaccine uptake.

1.10 Operational definition terms.

HPV uptake: A daughter who has ever received at least one HPV vaccine.

Knowledge: Familiarity, awareness, or understanding of cervical cancer and HPV vaccines and their importance in public health.

Prevention: The act of protection from HPV-related infection as the leading cause of cervical cancer.

Vaccination: Administering a vaccine to activate a person's immune system to build a long-term defense against a harmful pathogen such as HPV which leads to cervical cancer.

Vaccination Program: Coordinated health initiative intended to deliver vaccination to communities, control the transmission of contagious pathogens, and safeguard public well-being.

Perception: pre-conceived understanding or interpretation of the HPV vaccine.

Parent: mother or father of a person or an animal, or someone who looks after an adolescent girl in the same way that a parent does.

Self-efficacy: The idea that relates to a person's belief in their capability to carry out the behaviors needed to complete a specific goal.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter presents an extensive overview of the current literature concerning the factors that impact the uptake of the human papillomavirus (HPV) vaccine in Tana River County, Kenya. It discusses the epidemiology of HPV and cervical cancer, the uptake of the HPV vaccine, examines the caregiver's knowledge and perceptions about HPV and the HPV vaccine, social, and cultural factors influencing vaccine uptake, as well as health system factors affecting the uptake. The review aims to identify research gaps and provide a theoretical and conceptual framework for the proposed study.

2.1 Human Papilloma Virus and Cervical Cancer Epidemiology

Within the domain of Human papillomavirus, there exists a diversity of over 100 serotypes, of which 14 of them demonstrate the potential to induce oncogenic effects. These virulent viruses are transmitted through sexual contact and account for the majority of anogenital cancers in both women and men. The non-malignant variants precipitate the development of both cutaneous and mucosal warts, which encompass a spectrum inclusive of sexually transmitted anogenital and oropharyngeal warts (Karanja-chege, 2022). Chepkemai and Jerotich (2023) examined that nearly 99% of cervical cancer cases are attributable to high-risk Human Papillomavirus (HPV)

infection, a sexually transmitted pathogen.

The research indicates that the virus is more prevalent among specific groups, including women living with HIV, immunocompromised individuals, those with co-infections of other sexually transmitted infections (STIs), those receiving immunosuppressive medications, those smoking, and children who have experienced sexual abuse (World Health Organisation, 2022) Numerous HPV genotypes have been associated with the development of cervical cancer. Within the sphere of cervical cancer's etiology, HPV genotypes, particularly HPV 18 and 16, collectively account for a substantial 70% of causative attributions to this malignancy (Burmeister et al., 2022).

The evolution of cervical cancer encompasses distinctive phases. In its inception, the cervical epithelium becomes susceptible to high-risk HPV infection, with ensuing prospects for regression or advancement through the emergence of precancerous lesions. Subsequent to this, a phase of dysplasia materializes, culminating in the eventual invasion of neighbouring tissues by the altered cellular constituents (Arbyn et al., 2018). The transition of HPV infection to invasive cancer is postulated to span 10 years (Arbyn et al., 2018).

Cervical cancer is linked with a spectrum of physiological and physical morbidities that profoundly undermine the holistic quality of life. It leads to a decline in physical well-being and compromises emotional, economic, and social interactions challenging the existing systems of support (Arbyn et al., 2018). Treatment-induced adverse effects include chronic radiation enteritis

and vaginal bleeding. The decline in sexual functionality contributes to disharmony within marital relationships, diminishes partner support, and gives rise to experiences of pain, depression, anxiety, and even contemplation of suicide. Additionally, it leads to disturbances in sleep patterns as well as impairment in cognitive concentration (Arbyn et al., 2018).

Globally, cervical cancer ranks fourth most common cancer in women. In 2022, 660,000 new cases were estimated, leading to 350,000 deaths, with over 85% of the affected being young, uneducated women in the poorest nations. Unfortunately, numerous among these mothers are caregivers to young children, whose prospects for survival are tragically hindered by their premature death. The incidence in low and middle-income countries is almost double, with mortality rates three times higher than those observed in middle-income countries. In the African region, cervical cancer claims the second highest frequency among commonly diagnosed cancers. The recorded data for the year 2020 indicates an estimated incidence of around 117,316 cases, and 76,745 deaths (Sung et al., 2021). In 2020, Kenya recorded 5,236 cervical cancer incidences, positioning it as the second most prevalent malignancy following breast cancer (Chepkemai & Jerotich, 2023). Cervical HPV is most prevalent amongst the demographic of women within Sub-Saharan Africa, at a rate of 24%. Following closely are Latin America and the Caribbean at 16% with South East Asia and Eastern Europe at 14% (Sung et al., 2021).

2.1.1 HPV prevention

As projected by the World Health Organisation, the negative burden of cervical cancer is set to increase, potentially reaching 700,000 cases and resulting in 400,000 deaths by the year 2030. This projection suggests a 21% surge in cases and a 27% rise in deaths especially in women from low- and middle-income nations (World Health Organisation, 2022). Strategic interventions such as HPV vaccination, cervical cancer screening programs, and comprehensive management of HPV infections and cervical malignancies stand as paramount, cost-effective measures in the campaign against cervical cancer. Nevertheless, up to now, these measures have not been extensively adopted in regions with the highest burden, such as sub-Saharan Africa.

The first HPV vaccine received licensing in 2006. From 2006 to 2017, more than 100 million adolescent girls received at least one dose of the HPV vaccine, with 95% of recipients from high-income countries. The accessibility of HPV vaccination has improved over the years, as evidenced by more than 65% of vaccinated girls in 2019 from developing nations. Nevertheless, by 2020, the HPV vaccine had been integrated into the national immunization schedules of less than 30% of developing countries in stark contrast to the over 85% coverage of developed countries.

Disparities are also similar to those observed in the implementation of cervical cancer screening programs, (World Bank, 2023). In terms of accessibility of cervical cancer management services, the discrepancies are also wide. Approximately 30% of low-income countries report having

pathology services, radiotherapy, chemotherapy, and cancer surgery widely accessible in the public sector, compared to over 90% of the developed countries (World Bank, 2023).

Improving access to HPV vaccination, cervical cancer screening and treatment are top priorities for the elimination of cervical cancer as highlighted in the 90-70-90 targets by the WHO. These measures align cohesively with the implementation of Sustainable Development Goals, particularly Goal 3, which focuses on ensuring healthy lives and promoting well-being for all at all ages, and Goal 5, which aims to achieve gender equality, not forgetting the Immunization Agenda 2030, and the global strategy for women, children, and adolescents health 2030.

2.1.2 HPV Vaccines

The bivalent HPV vaccine (Cervarix, 2vHPV), quadrivalent HPV vaccine (Gardasil, 4vHPV) and 9 valent HPV vaccine (Gardasil 9, 9vHPV) are the licensed HPV vaccines that protect against HPV types 18 and 16 by the US, Food and drug administration FDA (Centre for Disease Control and Prevention [CDC], 2019). A comparative study by Bergman et al., ascertained that immunological reactions elicited in young females by two-dose schedule of HPV vaccines exhibited a comparable reaction with a three-dose schedule. The quadrivalent HPV vaccine showed increased effectiveness in preventing the occurrence of external genital lesions and genital warts in men.

In women, the nonavalent and quadrivalent HPV vaccines showed comparable levels of preventing vulva, cervical and vaginal precancerous lesions as well as malignancies (Bergman et al., 2019). In a different study, aimed at comparing the impact of a single HPV vaccine shot among 9yrs–14 years girls in Tanzania with those from historical cohorts, the researchers ascertained that providing a single dose of HPV vaccine dose to the target girls yields significant protection against persistent HPV infection. Their analysis led to the inference that implementing a vaccination schedule consisting of just one dose would not only result in cost savings but also streamline the process of vaccine distribution, thus enhancing the overall accessibility to the vaccine (Baisley et al., 2022).

2.2 HPV Vaccination Program

HPV vaccines have been accessible since 2006 and were endorsed by the World Health Organization (WHO) in 2009. As of 2016, estimations indicated that HPV vaccination programs had encompassed merely 12% of young adolescent females on a global scale. By 2014, a mere 6% of girls aged 10 to 20 had received vaccination within this demographic (Bruni et al., 2021). Embedded within the WHO Cervical Cancer Elimination strategy are specified targets for amplifying coverage by the year 2030. These aspirations are expanding HPV vaccination to encompass 90% of adolescent girls, establishing biennial screening for cervical cancer for 70% of the population, and ensuring that treatment for pre-invasive lesions and invasive cancer attains a 90% coverage rate.

In 2014, the HPV vaccination coverage among young women aged 10 to 20 exhibited regional variations, with rates standing at 35.9% in Oceania, 35.6% in North America, 31.1% throughout Europe, 19% within Latin America and the Caribbean, 1.2% within Africa and 1.1% across Asia (Addisu et al., 2023). As the years unfolded, more countries adopted the Vaccination Model, and by 2019, 120 countries were implementing it. However, the global extent of vaccine administration for the primary dose among girls by the age of 15 remained stagnant at 20% in the year 2019. This trend regressed further, dwindling to a mere 15% by the year 2021.

Australia was among the very first countries to start the vaccination program. In 2007, they implemented the National HPV vaccination program administered in schools. Gardasil, a quadrivalent prophylactic vaccine was given to adolescent girls. Subsequently, in 2013, males were incorporated into the vaccination programs. According to Cancer Australia (2019), 80.2% of 15-year-old females and 75.9% of males had effectively received all recommended doses of the HPV vaccine by 2017. Currently, more than 80% of adolescents in Australia have been fully vaccinated against HPV.

In countries such as the USA and parts of Europe, vaccine coverage is relatively high. For instance, in the United States, approximately 54% of adolescents were up-to-date with the HPV vaccine series as of 2020 (Muthukrishnan et al., 2022). European countries like the United Kingdom also report high coverage rates due to robust school-based vaccination programs (Drolet et al., 2021). In India, HPV vaccine coverage is low, with

studies indicating less than 10% coverage in many regions due to limited awareness and socio-cultural barriers (Bruni et al., 2021). In Brazil, HPV vaccination coverage for girls aged 9-14 years was about 79% for the first dose but dropped to approximately 49% for the complete series in 2019 (Medeiros et al., 2020). In Sub Saharan African countries, the completion rate still stands at a modest 20% as indicated by (Lubeya et al., 2022). This can largely be attributed to implementation obstacles that hinder achieving comprehensive coverage.

2.2.1 HPV Vaccination Program in Kenya

In Kenya, the Human Papillomavirus (HPV) vaccination program has been implemented as part of the national immunization schedule to prevent HPV-related diseases. According to the Kenya National Immunization Coverage Survey (KICS) conducted in 2019, the overall HPV vaccination coverage among adolescent girls aged 10-14 years was estimated to be 61% for the first HPV vaccine and 31 % for the second vaccine (MoH, 2021). The program has made significant strides in addressing the burden of HPV-related diseases.

According to the MOH (2021), the national HPV vaccine coverage among eligible girls stands at 83%. However, vaccination coverage varies across different counties. For instance, Kajiado County recorded the highest coverage at 71.3%, followed by Nairobi County at 58.2%, while Tana River County reported a lower coverage rate of 30.5% (MoH, 2021). This is however low coverage compared to the 80 % coverage target by the MOH.

This suggests the need for targeted interventions to improve vaccine uptake in the region.

Previous research has identified several factors contributing to the variation in coverage. For instance, Njuguna et al. (2020) found that caregiver knowledge and perceptions significantly influenced vaccine acceptance in Kenya. Cultural beliefs and misconceptions about the vaccine, including its association with promiscuity, have posed challenges to vaccine uptake (Ayissi et al., 2012). Additionally, health service-related factors, such as access to healthcare facilities and provider recommendations, play a crucial role in vaccine acceptance. LaMontagne et al. (2011) highlighted the importance of healthcare provider communication and education in positively influencing caregiver decision-making.

2.3 Kenya National Guidelines on HPV vaccine

The guidelines for HPV vaccination in Kenya target girls aged 9-14, before their first sexual experience. The recommended method is to implement a school-based program for girls in classes 4-8, aligning with free primary education. Out-of-school girls will be reached through various methods like in reach and outreach initiatives. While catch-up vaccination is allowed for older non-sexually active girls, booster shots aren't advised due to insufficient efficacy data during policy development.

A study by Friedman et al. (2014), in Western Kenya highlighted low awareness of cervical cancer, with fear and stigma surrounding its

association with genital organs. However, there's considerable acceptance of the vaccine when endorsed and promoted by trusted sources. To successfully introduce vaccination in Kenya, it's essential to raise awareness about cervical cancer to reduce stigma and ensure confidence in vaccine safety and effectiveness. The study indicates Kenyans' willingness to prioritize their daughters' and their own health by embracing primary prevention measures against cervical cancer.

2.4 Caregiver Knowledge and Perceptions about HPV and HPV Vaccine

2.4.1 Caregiver Knowledge and HPV Vaccine Uptake

Literature suggests that caregiver knowledge and perceptions play a crucial role in the uptake of the HPV vaccine. In many Asian countries, there is a significant gap in knowledge regarding cervical cancer and the HPV vaccine. A study in Malaysia found that less than half of the women surveyed were aware of the HPV vaccine, highlighting the need for improved educational efforts (You et al., 2020). A study in USA revealed that many parents were unaware of the vaccine's ability to prevent multiple types of cancer, indicating a need for continued education (Muthukrishnan et al., 2022). In sub-Saharan Africa, including Kenya, knowledge about cervical cancer and the HPV vaccine is critically low. A significant proportion of women in Kenya had never heard of HPV or the vaccine, demonstrating the critical need for educational interventions (Nyambe et al., 2023).

Studies by Ng'ang'a et al. (2018) and Sawaya et al. (2019) have indicated that

inadequate knowledge about HPV, its transmission, and the benefits of vaccination can lead to vaccine hesitancy or refusal. In a comparative study by Mburu et al. (2019), cohorts exhibited an awareness of certain risk factors associated with the acquisition of Human Papillomavirus (HPV), notably early initiation of sexual activity, engagement in multiple sexual partnerships, association with partners having multiple sexual relationships, and tobacco use. Comprehension regarding treatment and screening methods for cervical cancer remained deficient among populations, where pervasive deficits exist concerning HPV awareness including its transmission, pathogenicity, preventive strategies, and cervical cancer implications (Panobianco et al., 2013; Srinath et al., 2023).

Previous investigations have raised parental concerns that HPV vaccination prevents sexually transmitted infections, potentially fostering risky sexual behaviors (Lee et al., 2014). Further scrutiny into the correlation between HPV vaccination and unsafe sexual actions revealed no substantiated correlation, with HPV vaccination (Mullins et al., 2016). Concurrently, studies conducted in Western Uganda corroborated that HPV vaccination, along with awareness and perceived sexual risk, failed to forecast intentions of sexual behaviors emphasizing the influential role of parental involvement and communication in potentially deferring sexual debut (Zheng et al., 2021). This is crucial, as premature initiation of sexual activity and early onset of pregnancy have been unequivocally linked to cervical cancer development (Louie et al., 2009).

Ng'ang'a et al. (2018) conducted a study in Kenya and found that caregivers generally had low knowledge about HPV and its associated risks. Misconceptions and myths were prevalent, leading to concerns about vaccine safety and efficacy. Similarly, a study by Njuguna et al. (2020) emphasized the need for accurate information dissemination to caregivers, as misconceptions and lack of knowledge significantly influenced their vaccine acceptance. Empowering parents through education has proven to be an effective strategy in boosting vaccine acceptance. This is achieved by enhancing their knowledge and cultivating positive perspectives on vaccination.

Implementation of a school-based HPV vaccination program targeting girls aged 9–14yrs led to an increased uptake of the HPV vaccine in Hong Kong (Lee et al., 2014). In a study to assess the impact of parenteral knowledge of HPV uptake in Kenya, 35.1% of the female study participants showed inadequate knowledge since they were uninformed about the vaccine's intent of preventing HPV (Kolek et al., 2022). Masika et al. 2015 study in Kitui County found that teachers exhibited a high level of acceptance towards the vaccine, with a rate of 90%. However, their level of knowledge was moderate (46.6%) and those with greater knowledge were more inclined to endorse the vaccine than the less informed ($p = <0.001$) (Masika et al., 2015).

2.4.2 Caregiver Perception

A study by Marlow et al. (2019) identified various factors, such as perceived vaccine effectiveness, concerns about side effects, and perceived severity of

HPV-related diseases, that influenced caregivers' decision-making process. In the USA and Europe, perceptions of the HPV vaccine are generally positive but can be influenced by misinformation. Concerns about vaccine safety and side effects are common barriers (Muthukrishnan et al., 2022).

In sub-Saharan Africa, perceptions are shaped by cultural beliefs and misconceptions. For example, some communities in Kenya view the HPV vaccine with suspicion, associating it with infertility or other health risks (Nyblade et al., 2017). In Asia, cultural attitudes towards vaccines vary. In India, traditional beliefs and a lack of trust in the healthcare system hinder vaccine acceptance (Bruni et al., 2021). Despite better awareness, social media and misinformation still impact public perception in countries like Brazil (Medeiros et al., 2020).

Cultural and religious beliefs were also found to influence perceptions, as highlighted by Ayissi et al. (2012), who reported that some caregivers associated the HPV vaccine with promiscuity, influencing vaccine acceptance. Caregivers' misconceptions, such as vaccine safety and effectiveness concerns, also influence their decision-making process. In a study, 37.9% of caregivers had a negative perception regarding the vaccine's effectiveness. 76% attributed their hesitancy to concerns about safety, while 48% believed their child was not old enough thus preferred sex education (Kolek et al., 2022)

2.5 Social cultural factors that Influence the Uptake of HPV Vaccine

Several studies have identified cultural beliefs and practices as barriers to vaccine acceptance. For instance, In North America and Europe, socio-cultural factors such as socioeconomic status and educational background significantly influence vaccine uptake. Higher education and income levels in the USA are associated with higher vaccination rates (Muthukrishnan et al., 2022). In sub-Saharan Africa, including Kenya, cultural norms and gender roles significantly impact health behaviours whereby Male-dominated decision-making and traditional beliefs about illness and prevention can limit vaccine acceptance (Wamai et al., 2012).

In Asia and South America, similar socio-cultural barriers exist in that a study conducted in India revealed that Gender dynamics and patriarchal norms can restrict women's access to health services (Bruni et al., 2021). Moreover, Ayissi et al. (2012) found that in some Kenyan communities, the HPV vaccine was associated with a belief that it might lead to promiscuity, leading to resistance and hesitancy. Similarly, Njuguna et al. (2020) highlighted the influence of cultural beliefs and misconceptions about the vaccine on acceptance rates. They found that caregivers' perceptions of the vaccine being unnecessary or irrelevant to their cultural context hindered vaccine uptake. Ebrahimi et al. (2023) reported that recommendations from friends, family, or healthcare providers positively influenced vaccine acceptance.

On family support, the father's opinion on vaccination has been considered important. Although mothers are often the caregivers and in charge of health

decisions, fathers' consent is important and if they disagree, mothers would follow their decision (Chan et al., 2023). Conversely, the stigma surrounding HPV and vaccination in conservative communities acted as a barrier (Ayissi et al., 2012). Chan et al. (2023) highlighted in a qualitative study that religious teachings among Muslim participants affected their perception of whether their daughters were given the HPV vaccine especially because it is linked to sexual activities.

2.6 Health system factors that influence the uptake of the HPV vaccine.

Health system factors such as infrastructure, healthcare worker training, and vaccine supply chains play a crucial role in vaccination coverage worldwide. High-income countries generally have well-established systems, whereas low - and middle-income countries face significant challenges. In Kenya, inadequate healthcare infrastructure, limited supply chains, and insufficiently trained healthcare workers impede vaccine delivery (Bosch-Capblanch et al., 2017). The integration of HPV vaccination into routine health services is also limited (Vermandere et al., 2014).

In Asia, countries like India struggle with similar health system issues. Rural healthcare access and supply chain disruptions are significant barriers (Bruni et al., 2021). Countries like Brazil have relatively better infrastructure but face regional disparities that affect vaccine distribution (Medeiros et al., 2020). A quantitative study in Uganda by Nabirye et al. (2020) showed certain health system factors associated with higher uptake of the HPV vaccine. For instance, individuals who had extra childhood vaccines were twice as

expected to accept the HPV vaccine compared to those who hadn't (with a relative risk of 1.8 and a confidence interval of 1.05–3.01). Similarly, individuals who received the HPV vaccine from outreach clinics were seven times more likely to take it compared to those who didn't (with a relative risk of 7.4 and a confidence interval of 3.6–15.15).

Moreover, individuals who had gotten information about the side effects of the HPV vaccine were eleven times more likely to uptake it (with a relative risk of 10.6 and a confidence interval of 5.5–20.57). Those who received the vaccine alongside other services were six times more likely to uptake it compared to those who didn't (with an unadjusted probability ratio of 5.8 and a confidence interval of 3.4–9.7). Additionally, adolescents who had multiple options for where to receive the HPV vaccine were seven times more likely to uptake it (with an unadjusted probability ratio of 7.1 and a confidence interval of 3.5–14.18), while those who knew where to report side effects were three times more likely to uptake it (with a relative risk of 3.0 and a confidence interval of 1.7–5.1).

A qualitative study in the USA among African American communities reported that recommendations from healthcare providers play a crucial role in promoting HPV vaccination. Furthermore, the research underscored that medical mistrust among African American parents posed a barrier to the HPV vaccination of their children (Jin et al., 2023). In the Kenyan context, limited research specifically focuses on health service-related factors influencing HPV vaccine uptake, particularly in Tana River County. This

indicates a notable research gap that warrants attention to developing targeted interventions.

A study by Ng'ang'a et al. (2018) conducted in Kenya highlighted the importance of healthcare provider recommendations and communication in positively influencing caregiver decision-making regarding the HPV vaccine. Positive and supportive interactions between healthcare providers and caregivers have been associated with higher vaccine acceptance rates.

However, the specific challenges and gaps in healthcare service delivery related to HPV vaccination in Kenyan counties, including Tana River, remain understudied. Furthermore, factors such as vaccine accessibility, affordability, and availability of healthcare infrastructure significantly influence vaccine uptake. In Eldoret, Kenya, proximity to the hospital was identified as a statistically significant risk factor ($P: 0.01$) associated with non-completion of all three HPV vaccine doses in primary school girls distance to the hospital was a statistically significant risk factor for non-completion ($P: 0.01$) of the three HPV doses by primary school girls (Mabeya et al., 2018).

In a qualitative study in Mbale Uganda several health system barriers were identified. These included limited funding, prevalent vaccine-related myths, unclear communication about the target recipients, and challenges in transporting the vaccine to the intended community. Facilitators of vaccine uptake were as follows: 56.2% of respondents reported a lack of understanding from healthcare providers as a cause of low vaccine uptake.

Uptake of vaccines was positively linked to several factors: obtaining vaccines from outreach clinics ($p = 0.02$), having a range of options for vaccination ($p = 0.02$), receiving information about potential side effects ($p = 0.024$), and receiving the vaccine alongside other services ($p = 0.024$) (Nabirye et al., 2020).

2.7 The Health Belief Model

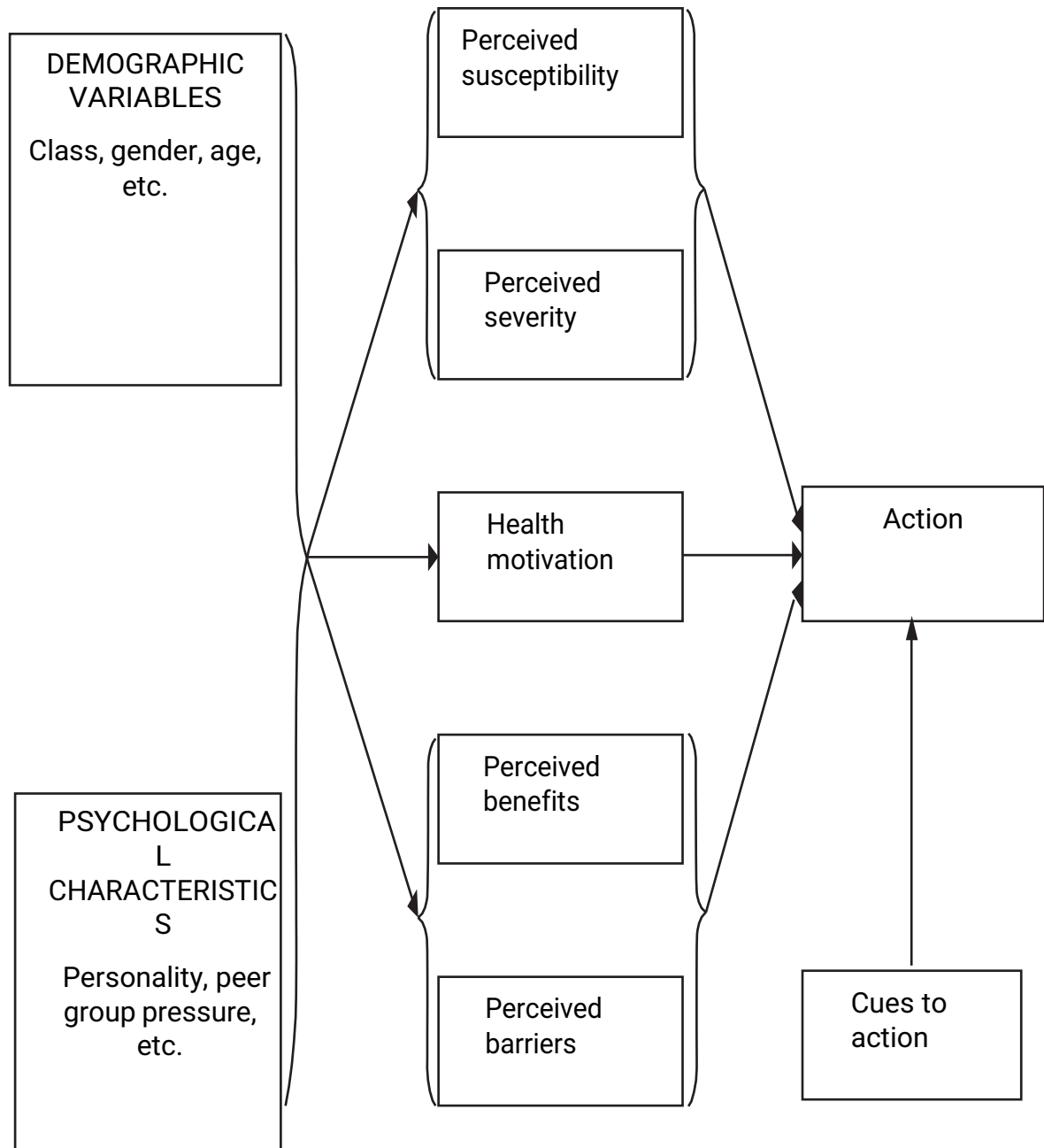
Studies on vaccine acceptability leverage health behavior theories that consider various factors, such as perceived barriers, beliefs, and attitudes, which are thought to be influential in determining the likelihood of a particular action (Shapiro et al., 2018). Delving into the constructs of these theories allows us to discern the drivers behind vaccine acceptance and hesitancy which can then be integrated into vaccination strategies. The 'Health Belief Model' (HBM) serves as an illustrative instance, being a widely utilized framework for identifying drivers of vaccination behaviour (Abraham & Sheeran, 2014).

The initial Health Belief Model (HBM) suggests that for an individual to undertake a specific action (such as vaccinating their daughter), they would need to: acknowledge the disease as at least 'moderately serious', recognize their susceptibility to the disease, understand the positive outcomes of pre-emptive action, and not perceive significant barriers impeding the action. As per the theory, the probability of taking action is higher when perceived advantages surpass perceived disadvantages (Abraham & Sheeran, 2014).

Furthermore, the Health Belief Model (HBM) is frequently augmented to include two additional constructs: self-efficacy, which refers to the belief in one's capability to execute the behavior, and cues to action (CTA), denoting the specific stimuli required to initiate the decision-making process (*see below*).

Figure 2.1

Health belief Model



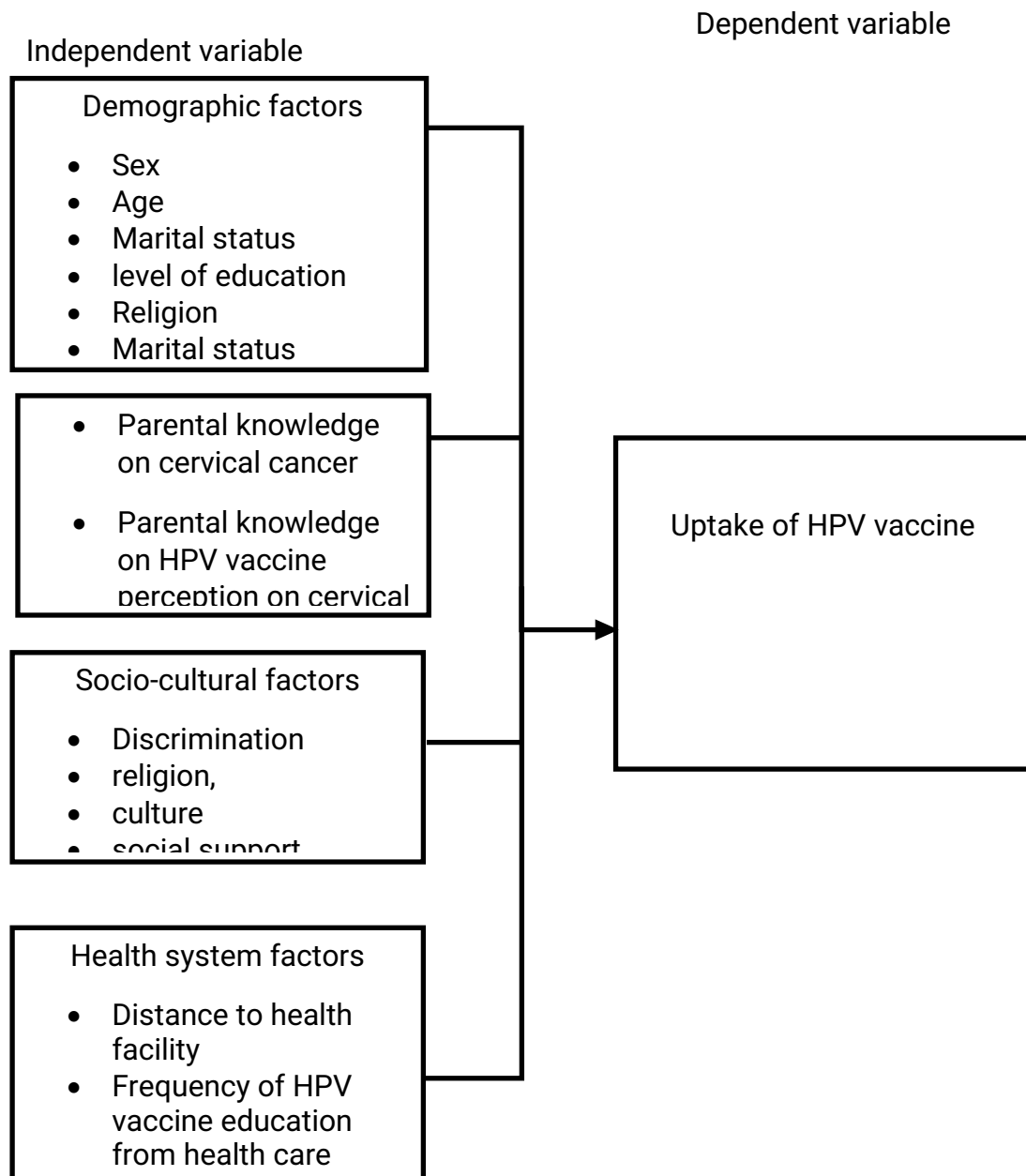
The model is adopted for use in this study though it has some limitations.

This model does not consider that caregivers (parents) might be the ones

making the decision to vaccinate. Additionally, it overlooks factors such as beliefs, attitudes, and other individual determinants that influence a person's willingness to accept the vaccination. The model neglects the influence economic or environmental factors that could either hinder or facilitate the implementation of the HPV vaccination strategy. It presupposes that there is uniform access to information about the HPV vaccine and cervical cancer for all individuals. It is therefore modified to comprehensively evaluate the factors influencing the utilisation of the human papillomavirus vaccine in this study. Caregiver knowledge, demographic, Sociocultural factors, and health system factors are the independent variables while the vaccine uptake is the dependent variable.

Figure 2.2

Conceptual framework



CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This section expounds on the methodological framework employed in the study. It describes the study's location, research design, target population, sampling methodologies, rationale for sample size determination, instruments for data collection, approaches to data collection, operational definitions of variables, techniques for data analysis, and ethical considerations.

3.1 Location of the Study

The research was conducted in Tana River County which is among the arid and semi-arid regions in Kenya. The county has an estimated population of 341080 with 171183 being female. It has an area of 37950 km². The county borders: Kitui County to the west, Garissa County to the Northeast, Isiolo County to the north, Lamu County to the southeast, and Kilifi County to the south (Kenya National Bureau of Statistics[KNBS], 2019). Tana River County is characterized by limited resources and has a mixture of cultural and rural contexts. The Pokomos and Ormas are the dominant ethnic groups. The inhabitants are mainly pastoralists and farmers. Following the vaccine's introduction in the county in 2019, there is a paucity of data about its

utilization and efficiency.

3.2 Research Design

The research embraced a cross-sectional descriptive-analytical design where quantitative methods were used to explore the factors that influence the uptake of the HPV vaccine. The study has a descriptive design that allowed the overall collection of data on the socio-demographic, socio-cultural, health system, and uptake of the HPV vaccine at present. It is analytical because it explains and discusses the relationships between the uptake of the HPV vaccine as the dependent variable and the independent variables such as socio-demographic, socio-cultural, and health system factors. The quantitative approach was used as it is specific and provides clarity. Other studies, for example, a study in Uganda by Nakayita et al . (2023) have used this approach.

3.3 Target Population

Parents with daughters aged 9 years- 14 years residing in Tana River County. The specified age group of the daughters was selected because they are the recommended population for the HPV vaccine as stipulated in the Kenya National Cancer guidelines. Parents were relevant in providing information on knowledge and perception, socio-cultural issues, and health system concerns and usually give consent pre-vaccination.

3.4 Sampling Technique

The study included all the three sub-counties. To get a sample size from each sub county, proportionate sampling was used. Convenience sampling was employed to get the respondents.

Table 3.0

Number of girls aged 9 yrs-14 yrs distribution in Tana River county, Kenya.

Sub-county	Number of girls aged 9-14 years
Tana Delta	9736
Tana North	9770
Tana River	7886
Total	27392

3.4.1 Sample Size

The sample size for the research was determined using the Fisher et al. (1995) formula, which is applicable for populations exceeding 10,000.

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

Where;

n- Sample size

Z- Statistic for a level of confidence (95% level of confidence, Z value is 1.962)

p- Estimate of HPV vaccine proportion uptake in the target population.

(Assuming 0%, p =0.5)

d- Precision level of statistical significance (5%, d=0.05)

Therefore, from the above equation, a total of 384 respondents will be selected for the study.

However, since the population N is known, sample size estimation is adjusted as below for the finite population.

$$n_f = \frac{n}{1 + \frac{n}{N}} = \frac{384}{1 + \frac{384}{27392}} = 378$$

3.4.2 Distribution of Study Participants

Table 3.1

Distribution of study participants per sub-county

Sub-county	Total population	Proportion respondents	Sampled population
Tana Delta	9736	$9736/27392 \times 378$	134
Tana North	9770	$9770/27392 \times 378$	135
Tana River	7886	$7886/27392 \times 378$	109
Total	27392		378

Convenience sampling was used to get respondents. The research assistants who were the community health promoters identified, approached and collected data from parents with daughters aged 9yrs to 14 years. The method was appropriate as the community health promoters are already

familiar with the location and the parents.

3.5 Inclusion Criteria

The study participants included parents who have daughters between 9yrs-14 yrs.

3.6 Exclusion Criteria

Parents who had daughters below 9 years and above 14 years at the time of data collection.

3.7 Data Collection Instruments

The data collection tool used was a structured questionnaire. The questionnaire was adapted from and modified from a study conducted in Brazil (Sousa et al., 2018). Questions from previous studies were incorporated. It had structured questions with sub-sections including socio-demographics, knowledge on cervical cancer, knowledge on HPV vaccine, perception of cervical cancer and HPV vaccine, and social, cultural, and health systems-related factors.

3.8 Validity and Reliability of Research Instruments

The community health volunteers were adequately trained and recruited as research assistants. Research questions were standardized in Swahili. Pretesting was done on the 38 community health volunteers who were parents with daughters between the ages of 9yrs-14 yrs to check the time

taken, consistency, and appropriateness of the questions in bringing out the required data. After pretesting the questionnaire amendments were done.

3.9 Data Collection Procedure

Community health volunteers were recruited as research assistants. They were adequately trained. The community health volunteers did a community-based study where they went to households with daughters aged 9 yrs-14 yrs. Respondents meeting inclusion criteria participated in face-to-face interviews upon providing their consent through signed forms.

3.10 Methods of Data Analysis

Following cleaning, the datasets were organized and coded using Excel. Statistical analysis was conducted utilizing the Statistical Package for the Social Sciences (SPSS version 27). For the descriptive statistics, the study analyzed percentages and frequencies. After the analysis was done tables were presented using frequency forms and narrations. For the inferential statistics, percentages and frequencies were used. Chi-square tests assessed significant differences between the independent and dependent variables at a 95% confidence interval and p-values less than or equal to 0.05 were considered significant.

3.11 Ethical considerations

Permission to undertake this study was obtained from Kenya Methodist University's Scientific Ethical Review Committee, the Ministry of Higher

Education through the National Commission for Science, Technology and Innovation, and the Tana River County Health Ethical Committee. At the community level, permission was obtained from the area chief and village heads. Community health promoters consented to assist in the data collection and the assigned tasks. Informed consent was taken from study participants.

Consent forms were available in Swahili. The questionnaires were also translated into Swahili. The respondents were assured of freedom to exit at any particular point during the study. The questionnaires did not bear any respondent's details i.e. names and phone numbers for confidentiality and anonymity purposes. To further protect the data, it was stored in storage cabinets with locks with only the researcher having access to it. All the research assistants were also adequately trained on ethical aspects and the administration of the questionnaires.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter discusses the findings of the study, and descriptive and analytical analysis of the results. 378 questionnaires were administered to guardians of daughters aged 9 years to 14 years. Duly completed questionnaires were evaluated. Out of these, 357 questionnaires, i.e. 94.4% of them, met the criteria and were considered satisfactory and meaningful according to Mugenda and Mugenda (2003), who states that a response rate of 50% is deemed adequate for analysis and reporting, 60% is considered acceptable, and 70% or higher is regarded as excellent.

Table 4.0

Response rate

Sub-county	Sampled Participants	Actual respondents
Tana Delta	134	125
Tana North	109	109
Tana River	135	123
Total	378	357

4.1 Reliability Results

The study conducted pre-test whereby the 38 respondents were issued with pre-test questionnaires to respond to. Their responses enabled the study to examine the Cronbach alpha coefficient as shown in Table 2.

Table 4.1

Reliability results

Research Instruments	Pilot Population	Cronbach Alpha
Questionnaires	38	0.793

According to Table 4.1 , the Cronbach alpha was 0.793 revealing that the questionnaires were reliable since the coefficient was more than 0.07.

4.2 Socio-Demographic distribution

This research study mainly targeted caregivers of girls aged between 9yrs-14yrs. Majority of the participants were female (90.2%).

They were also of different age groups varying from 18 years to above 50 years. Those 18- 29 years were 60 (16.8%), 30-39years were the majority with 122(34.25%), then 40 yrs to 49 years 107 (30%), and lastly those above 50 yrs were 68 (19.0%)

For the Marital status of the caregivers those who were single were 48(13.4%), widowed/widower 49 (13.7%), divorced 57 (16.0%), married in polygamous relationships 60 (16.8%) and the majority being those married in monogamous relationships at 143 (40.0%)

The education level reported for the caregivers with the highest selection was those with no formal education 137 (38.3%) followed by those with a primary education 131 (36.7%), then those with a secondary education, 66 (18.5%), those who have completed college education 17 (4.8%) and lastly those who have completed university education 6 (1.7%).

The majority of the caregivers were self-employed 271 (76.0%) with farming, pastoralism, and small business owners like shopkeepers as the main economic activities, followed by those with no employment, 23 (6.4%) who identified as mostly housewives and lastly, those with formal employment were 23 (6.4%).

In terms of their daily income, those with an income below ksh 300 were the majority at 231(64.7%) followed by those earning ksh 300-ksh500 at 97 (27.2%) and lastly, those earning above ksh 500 were 29 (8.1%).

Table 4.2

Demographic distribution of the participants

Demographic distribution		Frequency (%)
Sex	Male	35(9.8)
	Female	322(90.2)
Age	18-29	60(16.8)
	30-39 yrs	122(34.2)
	40-49 years	107(30.0)
	above 50	68(19.0)
Marital status	single (not married	48(13.4)
	Widowed	49(13.7)
	Divorced	57(16.0)
	married polygamous	60(16.8)
	married monogamous	143(40.1)
Education level	No formal education	137(38.3)
	Completed primary school	131(36.7)
	Completed secondary	66(18.5)

	school	
	completed college	17(4.8)
	completed degree	6(1.7)
Religion	Islam	160(44.8)
	Christian	194(54.3)
	Others	3(0.9)
Occupation	Formal employment	23(6.4)
	self-employment	271(76.0)
	No employment	63(17.6)
Income in ksh	Below 300	231(64.7)
	300-500	97(27.2)
	Above ksh 500	29(8.1)

Notes: n=357

4.3 HPV vaccine uptake.

The first objective of the study was to estimate the uptake of the HPV vaccine. The findings recorded an uptake of 56.9% which represented slightly more than half of the respondents. The results were higher than the findings in Tanzania, where the National Health survey indicated that the coverage was at 49.0% (Mphuru et al., 2022), the demographic health survey in Uganda at 22.0% (Isabirye et al., 2020), and an urban study in Ethiopia (Addisu et al., 2023). The results were also slightly lower compared to a study in Ethiopia in North Shoa Zone whose uptake level was at 66.5% (Kassa, 2020) and that of Rwanda at 93.2% (Binagwaho et al., 2012). The differences might have been due to different socio-cultural attitudes. WHO recommends a target of 90% of vaccinated girls and the findings were lower.

The respondents provided their vaccination cards. The majority of the girls

had received two doses of the HPV vaccine 132 (37.0%) while 71 (19.9%) had only received one dose of the vaccine. Most girls had received the vaccine in school 157 (77.3%) while 46 (22.7%) had gotten the vaccine from the hospitals.

Table 4.3

Uptake of the HPV vaccine as per sub county

Sub-county	Not vaccinated (%)	One vaccine	Two vaccines
Tana Delta	52(33.8%)	25(35.2%)	33(25.0%)
Tana North	56 (36.3%)	20(28.2%)	34(25.8%)
Tana River	46(29.9%)	26(36.6%)	65(49.2%)
	154(100%)	71(100%)	132(100%)

Notes: n=357

Table 4.3

Where she got the vaccine

		Frequency
Where did she get the vaccine	school	157(77.0%)
	hospital	46(22.7%)
	Total	203(100.0%)

Notes: n=357

4.4 Knowledge of cervical cancer.

The second objective of the study was to assess the knowledge and perceptions about cervical cancer, HPV, and HPV vaccine in Tana River County. 326 respondents, i.e. 91.2% had heard of cervical cancer.

On the general knowledge, 317 (88.8%) were aware that in Kenya, CC is a major death cause among women. On the transmission pathways, 67.2% (240) mentioned that HPV is not transmitted through physical contact. 67.2% (240) of them were aware that sexual intercourse might transmit HPV infection. Higher than a study by Samrawit et al. (2023) in which only 28.1% of the respondents knew that it is transmitted through sexual contact.

In terms of the risk factors, 111 (31.1%) were aware that HPV affects both men and women. Encouragingly, almost $\frac{2}{3}$ of the respondents (237(66.4%) knew that early sexual debut increases the risk of HPV infection, higher than Samrawit et al. (2023) at 25.2%. 251 (70.4%) were aware that having multiple sexual companions increases the risk of HPV. 56.0% i.e 200 of them mentioned that HIV/AIDS increases the likelihood of acquiring HPV.

In terms of the knowledge of the risk factors, slightly less than half of the respondents, i.e. 171, (47.9%) knew that smoking is a risk factor. Only 137 (38.4%) of the respondents knew that eating khat is not a risk factor with the majority of them 220(61.6%) sighting that it is a risk factor. Only 140 (39.2%) stated that having an IUD isn't a Cervical cancer risk. 234 (65.6%) were aware of multiple sexual partners being a cervical cancer risk factor. The majority of the respondents 262 (73.4%) associated poor hygiene as a risk factor while only 95 (26.6%) didn't. On chronic UTIs being a risk factor for cervical cancer, a vast majority of 306(85.6%) believed that it is a risk factor with only 51 (14.4%) correctly answering the statement.

On symptom profiles, 130 respondents, i.e. (36.4%) correctly identified that

cervical cancer does causes symptoms, and half of the respondents 180 (50.4%) knew that the development of cervical cancer spans 10 -15 years among women.157 (44.0%) of them knew that cervical cancer is curable.257 (72.0%) respondents recognized VIA and Pap smears as screening methods of cervical cancer and 271(76.0%) knew that cervical cancer can be prevented by the HPV vaccine.

Table 4.4

Responses on the knowledge on cervical cancer

		TRUE	False	Not sure
General knowledge	cervical cancer is a major cause of cancer among women	317(88.8)	11(3.1)	29(8.1)
	HPV causes cervical cancer	202(56.6)	89 (25.0)	66 (18.4)
Cause and transmission	HPV is transmitted through physical contact	51(14.3)	240(67.3)	66(18.4)
	HPV is transmitted through sexual intercourse	240(67.3)	54(15.0)	63(17.7)
	HPV affects women only	154(43.1)	114(31.9)	89(25.0)
Risk Factors	Smoking increases the risk of cervical cancer	171(47.9)	117(32.8)	69(19.3)
	Poor genital hygiene increases the risk of cervical cancer	200(56.0)	91(25.5)	66(18.5)
	Chronic UTIs increase the risk of cervical cancer	237(66.4)	54(15.2)	66(18.4)
	Eating Khat increases the risk of cervical cancer	103(28.8)	137(38.4)	117(32.8)
	Having an IUD increases the risk of cervical cancer	117(32.8)	134(37.6)	106((29.6)
	Start of sexual activity early increases the risk of HPV infection	237(66.4)	54(15.1)	66(18.5)
	Having Multiple sexual partners increases the risk of cervical cancer	234(65.6)	57(16.0)	66(18.5)
	Having a partner with multiple sexual partners increases the risk of getting HPV infection	231(64.7)	66(18.5)	60(16.8)

HIV /AIDS increases the risk of HPV .	199(55.7)	69(19.4)	89(24.9)
HPV takes 10-15 years to develop into cervical cancer	180(50.4)	40(11.2)	137(38.4)
Cervical cancer has no visible signs and symptoms	134(37.5)	129(36.1)	94(26.4))
cervical cancer has no cure and treatment	123(34.4)	157(44.0)	77(21.6)
cervical cancer screening through pap smear and VIA is a preventive measure of cervical cancer	257(72.0)	69(19.2)	31(8.8)
HPV vaccine prevents against cervical cancer	271(76.0)	23(6.4)	63(17.6)

Notes: n=357

4.5 Knowledge of HPV vaccine

311 (87.1%) study participants were aware of the HPV vaccine, a higher percentage than reported in the study by Tilahun et al. (2023), where only 29.6% had heard of the HPV vaccine, in a study in Uganda by Mabeya et al. (2018) with 70.6% awareness, and another one in Indonesia by Endarti et al. (2018), in which only 44% had heard about the HPV vaccine.

Table 4.5

Hearing about the HPV vaccine

	Frequency	Percent
Ever heard of the HPV vaccine? Yes	311	87.1
No	46	12.9
Total	357	100.0

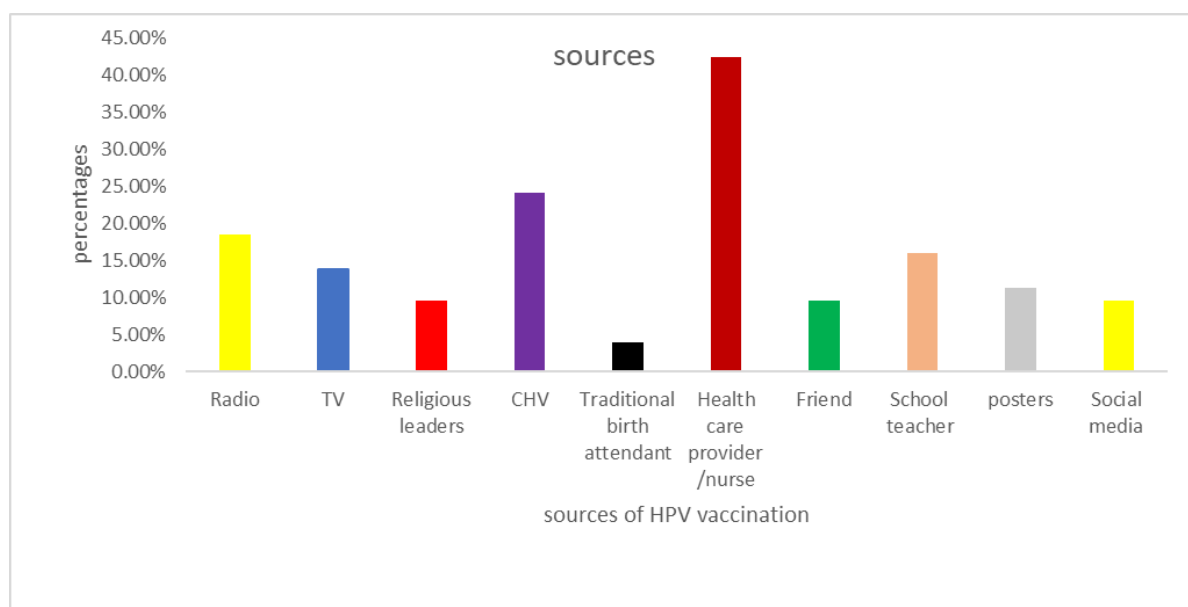
Notes: n=357

In terms of the information provider of HPV vaccine, primary source of HPV vaccine was from a health care nurse 42.3%(151), 24.1% (86) from the community health volunteer, the radio 66 (18.4%), school teacher 57 (16.0%),

television 49 (13.7%), poster 40 (11.2%), religious leader 34 (9.5%), friend or family 34 (9.5%), social media 34(9.5%) and lastly from the traditional birth attendant 14 (4.0%)

Figure 4.1

Source of HPV vaccination



72.0%, 257 respondents correctly identified the statement that HPV vaccine is not given to girls below 5 years. A vast majority of the respondents knew

that HPV vaccine prevents HPV infection (286, 80.1%) and cervical cancer, (271, 75.9%). 186(52.1%) respondents knew that those not already engaged in sexual intercourse should be given the HPV vaccine higher than the 25.6% in Uganda, who knew that the HPV vaccine is effective if given to those who are sexually inactive (Bitariho et al., 2023)

Only 214 respondents (59.9%) knew that the HPV vaccine is not given to boys in Kenya.

Table 4.6*Responses to HPV Vaccine Knowledge*

Statements	Yes	No	Not sure
HPV vaccine can be given to girls below 5 years	34 (9.5%)	257 (72.0%)	66(18.5%)
HPV vaccine prevents against cervical cancer	271(75.9%)	31 (8.7%)	55(15.4%)
HPV vaccine is effective if given prior to the first sexual encounter	186(52.1%)	69(19.3%)	102 (28.6%)
HPV vaccine can be given to those who are sexually active	140(39.2%)	140(39.2%)	77 (21.6%)
HPV vaccine can be given to boys for free in Kenya.	49(13.7%)	214(59.9%)	94 (26.4%)

Notes:n=357

4.6 Perception towards the HPV vaccine.

More than half of the respondents agreed that their daughters are susceptible to HPV infection and cervical cancer showing perceived susceptibility 58.0% (207/357). 60.2% (215/257) disagreed that the HPV vaccine is harmful to the health of their daughters and this shows the parents trusted the health benefits of the vaccine and hence did not have safety concerns. More than half of the respondents (17.6%, 208/357) agreed that the HPV vaccine can lead to infertility. This finding contrasts with the study by Tilahun et al. (2023), which reported that 24.7% of respondents believed the HPV vaccine causes infertility.

Table 4.7*Perception Statements*

Perception statements	Agree	Disagree	Neutral
My daughter is at risk of HPV infection and cervical cancer	207(58.0%)	91 (25.5%)	59 (16.5%)
HPV vaccine is harmful to the health	71(19.9%)	215(60.2%)	71(19.9%)
HPV vaccine causes infertility	63(17.6%)	208 (58.3%)	86(24.1%)

Notes: n=357

4.7 Socio-cultural factors

The second objective was to determine whether social and cultural factors influence the uptake of HPV vaccine in Tana River County. On religion, slightly half of the respondents ascribed to the Christian faith 194 (54.3%), then Muslims 160 (44.8%), and those who reported being neither Christian nor Muslim were 3 (0.9%). However, when asked if religion discourages the use of HPV vaccines only 67.2% (240) disagreed that it doesn't discourage.

76.8% (274/357) of respondents said that their culture does not discourage the use of the HPV vaccine. The majority of the respondents 76.0% (271/357) stated that no family or friend or neighbor has ever discouraged them from ensuring their daughter's access to the HPV vaccine. Lastly, 87.1% (311/357) of respondents mentioned that there is no discrimination against those who have received the HPV vaccine.

Table 4.8

Socio-cultural variables

Social cultural variables	Yes	No
Does your religion discourage the use of HPV vaccines religion	117(32.8%)	240(67.2%)
Does your culture discourage the use of the HPV vaccine	83 (23.2%)	274(76.8%)
Has any family member, friends, or neighbors discouraged you from using the HPV vaccine	86(24.) %	271(76.0%)
Is there any form of discrimination or social stigma towards HPV or HPV vaccination?	46 (12.9%)	311(87.1%)

Notes: n=357

4.8 Health system factors affecting the uptake of the HPV vaccine.

The third objective was to explore the health system factors that influence the uptake of the HPV vaccine in Tana River County. Upon often hearing about the HPV vaccines from a healthcare provider, only 14.3% (51 out of 357) of respondents strongly agreed that they often hear about the HPV vaccines. This suggests that parents feel there is not enough promotion of the vaccine.

When asked whether they believe that HPV vaccines are available all the time in the local dispensary only 21.3% (76/357) strongly agreed with the statement. The low percentage of respondents who are confident that the HPV vaccines are always available indicates a possible perceived barrier to vaccination. 36.1% (129 out of 357) mentioned that their daughters can easily get the HPV vaccines for free at the local facility, indicating a moderate level of self-efficacy in accessing the vaccine.

Only 31.0% (111/357) had strong confidence in the statement that the healthcare worker at the local facility is very knowledgeable about cervical cancer, HPV, and HPV vaccines. Trust in health workers' knowledge has been shown as a key factor in influencing the uptake of the HPV vaccine. For instance, a study carried out in Kenya by Umutesi et al. (2023), highlighted that caregivers' confidence in the expertise of the medical professionals was a key factor in their decision to vaccinate their children against HPV. Similarly, another study in Uganda by Nabirye et al. (2020) found that adolescents' and parents' perceptions of healthcare workers' knowledge about HPV and

cervical cancer were pivotal in their acceptance of the vaccine.

Table 4.9

Responses to Health System Factors Questions

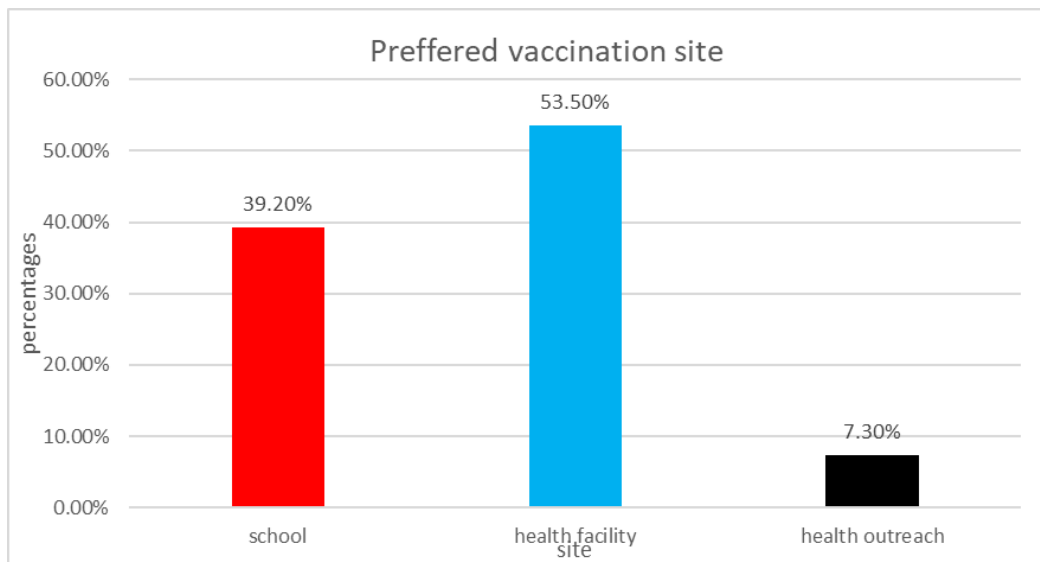
	Strongly disagree	Disagree	Neutral	agree	strongly agree
I often hear about HPV vaccines from CHVs/nurses	60(16.8%)	83(23.2%)	83(23.2%)	80(22.4%)	51(14.3%)
HPV vaccines are available all the time in the local dispensary	83(23.2%)	43(12.0%)	66(18.5%)	89(25.0%)	76(21.3%)
My daughter can easily get the HPV vaccine for free in the local facility	37(10.4%)	40(11.2%)	71 (19.9%)	80(22.4%)	129(36.1%)
Healthcare worker is very knowledgeable about Cervical cancer, HPV, and HPV vaccines	31(8.7%)	40(11.2%)	86(24.1%)	89(25.0%)	111(31.0%)

Notes: n=357

When asked about the preferred HPV vaccination site, more than half (53.5%, 191/357) of the respondents preferred the health facility as their choice. 39.2% (140/357) chose the school while only 7.3% (26/357) chose medical outreaches as their choice.

Figure 4.2

Preferred vaccination site



4.9 Association between Socio-demographic characteristics and HPV vaccine uptake.

The uptake of HPV vaccine showed no significant relationship with gender($p=0.910$). Findings also demonstrated, that there wasn't a significant association between age range, level of education, occupation, or income level with HPV vaccine uptake. In other studies, like that done by Beyen et al. (2022) in Ethiopia, parents' level of education has shown a significant relationship with the uptake of the HPV vaccine. Our findings differed as majority of the participants did not have any secondary education yet their daughters were vaccinated. Nevertheless, the results were similar to a study by Ratnasamy and Chagpar (2022), where education levels among persons

of Indian ancestry in the United States did not influence the uptake of the HPV vaccine ($p=0.2310$). Also, a study by Meshach et al. (2024) found no association between education and HPV vaccination among Nigerian parents of adolescent girls ($p=0.913$).

There was no significant association observed regarding income level. These findings align with the research carried out in Ethiopia by Kassa (2020), which similarly found no influence of income level on the uptake. However, they are different from a study in Malaysia, where income levels did show a significant association (Jalani et al., 2016). In Malaysia, the 3-dose regimen of HPV vaccination costs 360 USD at private health institutions, while in Kenya, HPV vaccination is free.

The analysis revealed a significant relationship between marital status and HPV vaccine uptake ($p=0.012$, $df=4$), indicating that married individuals were more likely to vaccinate their daughters compared to unmarried individuals. However, a study conducted by Elenwo et al. (2023) in the USA found no significant disparity in vaccination rates between married and never-married mothers. These differences could stem from variances in societal norms and healthcare access, influencing utilization behaviors accordingly.

Table 4.10

Association between sociodemographic factors with HPV vaccine uptake

		Vaccinated (n=203)	Not vaccinated (n=154)	df	P value	Chi- square value
Sex	Male	20 (9.9%)	14 (9.3%)	1	0.910	0.013
	Female	183(90.1%)	140 (90.7%)			
Age range	18-29	23 (11.3%)	34 (22.1%)			

Education level	30-39	66 (32.5%)	57 (37.0%)	3	0.201	4.634
	40-49	66 (32.5%)	43 (27.9%)			
	above 50	48 (23.7%)	20 (13.0%)			
	No formal education	83 (40.9%)	54 (35.1%)	4	0.558	3.001
	Completed Primary	73 (36.0%)	57 (37%)			
	Completed Secondary	37 (18.2%)	28 (18.2%)			
	Completed college	10 (4.9%)	9 (5.8%)			
Marital status	completed university	0 (0%)	6 (3.9 %)			
	single	11 (5.4%)	37 (24.0%)	4	0.012	12.923
	Widowed	34 (16.7%)	14 (9.1%)			
	Divorced	37 (18.2%)	20 (13.0%)			
	married	26 (12.8%)	34 (22.1%)			
Religion	polygamous married	95 (46.9%)	49 (31.8%)			
	monogamous					
	Islam	89 (43.8%)	71 (46.1 %)	4	0.558	1.476
Occupation	Christian	114(56.2%)	80 (51.9%)			
	Others	0 (0%)	3 (2.0%)			
	Formal employment	14 (6.9%)	9 (5.8%)	2	0.103	4.551
Income	self-employed	166 (81.8%)	105 (68.2%)			
	No employment	23 (11.3%)	40 (26.0%)			
	Below ksh 300	132 (65.0%)	100 (64.9%)	2	0.632	0.916
	ksh 300- ksh 500	52 (25.6%)	46 (29.9%)			
	Above ksh 500	19 (9.4%)	8 (5.2%)			

Notes: p-values derived from Chi- Square test; p-values are significant at $p < 0.05$; n=357

4.10 Association between Knowledge level on CC and HPV vaccine uptake

On ever hearing about cervical cancer, there was a significant association ($p=0.038$) between those who had their daughters vaccinated and those not vaccinated. Our study is similar to a Kenyan study in Eldoret by Mburu et al. (2019) in which there was also a significant relation with $p < 0.001$.

There was also a correlation between parents of those vaccinated and

parents of those not vaccinated on knowing that cervical cancer is a major cause of cancer among women in Kenya $p=0.009$.

In recognizing transmission pathways for HPV. Specifically, 74.3% (151/203) of vaccinated adolescents correctly identified sexual contact as the primary mode of transmission, compared to only 57.1% (88 out of 154) of unvaccinated adolescents. This difference was statistically significant with a p-value of 0.042. The findings were similar to a study by Mburu et al. (2019), who also found an association with a p-value of <0.0001 .

On awareness of risk factors for cervical cancer, it was found that there was a statistical association between being aware of the link between early sexual debut with cervical cancer ($p=0.003$). Moreover, both parents of the vaccinated and unvaccinated adolescents demonstrated similar awareness regarding other risk factors such as smoking, having multiple sexual partners, and having a partner with multiple sexual partners, indicating comparable recognition of these predisposing factors for cervical cancer across the two cohorts.

Lastly there was also a significant relationship in knowing that the HPV vaccine prevents against cervical cancer ($p=<0.001$).

Table 4.11

Association between knowledge on cervical cancer and the uptake of the HPV vaccine

	Vaccinated (n=203)	Not vaccinated (n=154)	df	P value	Chi square value
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Have you ever heard of cervical cancer	yes	194 (95.6%)	131 (85.1%)	1	0.038	4.286
	No	9(4.4%)	23 (14.9%)			
Cervical cancer is a major cause of cancer among women in Kenya	TRUE	194(95.6%)	120 (77.9%)	2	0.009	9.407
	FALSE	3(1.5%)	11 (7.2%)			
	Not sure	6 (2.9%)	23 (14.9%)			
HPV causes cervical cancer	TRUE	123(60.6%)	80(51.9%)	2	0.622	0.95
	FALSE	46(22.7%)	43(27.9%)			
	Not sure	34(16.7%)	31(20.2%)			
HPV is transmitted through physical contact	TRUE	29(14.3%)	23(14.9%)	2	0.664	0.818
	FALSE	132(65.0%)	108(70.2%)			
	Not sure	42(20.7%)	23(14.9%)			
HPV is transmitted through sexual intercourse	TRUE	151(74.3%)	88(57.1%)	2	0.042	6.328
	FALSE	18(8.9%)	37(24.0%)			
	Not sure	34 (16.8%)	29(18.9%)			
HPV affects women only	TRUE	92(45.3%)	63(40.9%)	2	0.797	0.455
	FALSE	60(29.6%)	54(35.1%)			
	Not sure	51(25.1%)	37(24.0%)			
Smoking increases the risk of cervical cancer	TRUE	117(57.6%)	51 (33.1%)	2	0.006	10.304
	FALSE	63(31.1%)	54 (35.1%)			
	Not sure	23 (11.3%)	49 (31.8%)			
Eating Khat increases the risk of cervical cancer	TRUE	74 (36.5%)	28 (18.2%)	2	0.065	5.453
	FALSE	74 (36.5%)	63 (40.9%)			
	Not sure	55 (27.0%)	63 (40.9%)			
Getting an IUD increases the risk of cervical cancer	TRUE	66 (32.5%)	51 (33.1%)	2	0.184	3.391
	FALSE	89 (43.8%)	46 (29.9%)			
	Not sure	48 (23.7%)	57 (37.0%)			
Multiple sexual partners increase the risk of cervical cancer	TRUE	140 (69.0%)	91(59.1%)	2	0.103	2.774
	FALSE	34 (16.7%)	23(14.9%)			
	Not	29 (14.3%)	40 (26.0%)			

	sure					
Start of sexual activity early	TRUE	140(69.0%)	97(63.0%)			
	FALSE	34(16.7%)	20(13.0%)	2	0.003	2.146
increases the risk of cervical cancer	Not sure	29(14.3%)	37(24.0%)			
Having a partner with multiple sexual partners increases the risk of cervical cancer	TRUE	136(67.0%)	97(63.0%)			
	FALSE	34(16.7%)	31(20.1%)	2	0.882	0.251
	Not sure	33 (16.3%)	26(16.9%)			
Having multiple partners increases the risk of cervical cancer	TRUE	143(70.4%)	108(70.1%)			
	FALSE	20(9.9%)	14(9.1%)	2	0.018	0.991
	Not sure	40(19.7%)	32(20.8%)			
Poor hygiene causes cervical cancer	TRUE	126 (62.1%)	74 (48.0%)			
	FALSE	52 (25.6%)	40 (26.0%)	2	0.137	3.977
	Not sure	25(12.3%)	40 (26.0%)			
Chronic UTIs increase the risk of cervical cancer	TRUE	149(73.4%)	88(57.1%)			
	FALSE	26(12.8%)	28(18.2%)	2	0.173	3.51
	Not sure	28(13.8%)	38(24.7%)			
Having HIV/AIDS increases the risk of CC	TRUE	114(56.2%)	86(55.8%)			
	FALSE	43(21.2%)	26(16.9%)	2	0.719	
	Not sure	46(22.6%)	42(27.3%)			0.661
HPV takes 10-15 years to develop into cervical cancer	TRUE	100(49.3%)	80(51.9%)			
	FALSE	29(14.3%)	11(7.1%)	2	0.497	1.396
	Not sure	74(36.4%)	63(41.0)			
Cervical cancer has no visible signs and symptoms	TRUE	86(42.2)	49(31.8)			
	FALSE	71(35.2)	57(37.0)	2	0.484	2.45
	Not sure	46(22.5)	48(31.2)			
Cervical cancer has no cure and treatment	TRUE	71(35.0%)	51(33.1%)			
	FALSE	89(43.8%)	68(44.2%)	2	0.974	0.053
	Not sure	43(21.2%)	35(22.7%)			
CC screening through pap smear	TRUE	154(75.9%)	103(66.9%)	2	0.116	4.307
	FALSE	40(19.7%)	28(18.2%)			

and VIA is a preventive measure against cervical cancer	Not sure	9(4.4%)	23(14.9%)			
HPV vaccine prevents against cervical cancer	TRUE	186(91.6%)	86(55.8%)			
	FALSE	11(5.4%)	11(7.1%)	2	<0.001	25.787
	Not sure	6(3.0%)	57(37.1%)			

Notes: p-values derived from Chi- Square test; p-values are significant at $p < 0.05$; $n = 357$

4.11 Association between HPV vaccine knowledge level with uptake of HPV vaccine.

On hearing about the HPV vaccines, there was a significant relationship with the uptake $p < 0.001$. Our data analysis echoes the results from research in Hawaii by Dela et al. (2020), in which hearing about the HPV vaccine was associated with the uptake of the HPV vaccine.

There was a significant association between HPV vaccine being given to girls below 5 years with the uptake of the vaccine ($P = 0.005$). Respondents who correctly knew the age recommendation for the HPV vaccine had a higher vaccination rate compared to those who didn't. Those who were unsure about the statement had a vaccination rate higher than those who believed the statement to be true but lower than those who correctly knew the statement. This indicates a potential correlation between uncertainty or lack of knowledge and lower vaccination uptake.

There was also a significant relationship between HPV vaccine being effective in preventing cervical cancer ($p = 0.0012$). Among those who correctly identified that the HPV vaccine prevents cervical cancer, a

significantly higher percentage (84.7%) were vaccinated compared to those who incorrectly answered (8.4%) or were unsure (6.9%).

Also, there is a significant relationship between vaccine prevention against cervical cancer $p < 0.001$. Among parents of vaccinated children, a larger proportion of 65% correctly responded to the question regarding the need for the vaccine to be given prior to the first sexual encounter. In contrast, among those who were not vaccinated, a lower percentage correctly answered the same question (35.1%). Incorrect Knowledge and uncertainty was also noted in that, there were respondents in both vaccinated and non-vaccinated groups who either answered the question wrongly or were unsure. In the vaccinated group, 19.7% gave incorrect answers, and 15.3% were unsure. In the non-vaccinated group, 18.2% gave incorrect answers, and 46.7% were unsure. This suggests the requirement for improved outreach and informational campaigns about the HPV vaccine, especially for parents whose daughters have not yet taken the vaccine.

These findings underscore the importance of accurate knowledge and awareness campaigns in influencing HPV vaccine uptake rates. Addressing misconceptions, uncertainties, and the limited information regarding the vaccine, particularly about its age recommendation, effectiveness against cervical cancer, and timing of administration, is essential for enhancing HPV vaccination rates and alleviating the burden of HPV-related illnesses, particularly cervical cancer.

Table 4.12

Association between knowledge on the HPV vaccine with the uptake of the HPV vaccine

Statements		vaccinated	Not vaccinated	DF	P value	Chi-square value
Ever heard of HPV vaccines?	Yes	197(97.0%)	114(74.0%)	1	<0.001	14.675
	No	6 (3.0%)	40(26.0%)			
HPV vaccine can be given to girls below 5 years	TRUE	14(6.9%)	20(13.0%)	2	0.005	10.447
	FALSE	169(83.2%)	88(57.1%)			
	Not sure	20(9.9%)	46(29.9%)			
HPV vaccine is effective in preventing against cervical cancer	TRUE	172(84.7%)	100(64.9%)	2	0.0012	8.783
	FALSE	17(8.4%)	14(9.1%)			
	Not sure	14(6.9%)	40(26.0%)			
HPV vaccine should be given before the first sexual intercourse	TRUE	132(65.0%)	54(35.1%)	2	<0.001	15.297
	FALSE	40(19.7%)	28(18.2%)			
	Not sure	31(15.3%)	72(46.7%)			
HPV vaccine can be given to people who have already engaged in sex	TRUE	83(40.9%)	57(37.0%)	2	0.151	3.786
	FALSE	89(43.8%)	51(33.1%)			
	Not sure	31(15.3%)	46(29.9%)			
HPV vaccine can be given to boys for free in Kenya.	TRUE	29(14.3%)	20(13.0%)	2	0.145	3.86
	FALSE	134(66.0%)	80(51.9%)			
	Not sure	40(19.7%)	54(35.1%)			

Notes: p-values derived from Chi- Square test; p-values are significant at $p < 0.05$; $n = 357$

4.12 Association between perception and HPV Vaccine uptake

Among those who were vaccinated, 15.3% agreed that the HPV vaccine causes infertility, while 68.0% disagreed, and 16.7% were neutral. Among those who were not vaccinated, 20.8% agreed with the statement, 46.1% disagreed, and 33.1% were neutral. A higher percentage of those who were not vaccinated agreed with the statement compared to those who were

vaccinated. Conversely, a lower percentage of vaccinated individuals agreed with the statement, with a larger proportion disagreeing. The p-value of 0.044 indicates statistical significance between the perception that the HPV vaccine causes infertility and the uptake of the vaccine.

Our findings align with a study in Ethiopia by Wubu et al. (2023) and a systematic review in sub-Saharan Africa by Kutz et al. (2023) that found that misconceptions about the HPV vaccine, including fears of infertility, were prevalent. The belief that the HPV vaccine could affect future reproductive health was noted as a barrier to vaccine uptake.

Table 4. 13

Association between perception and the HPV vaccine uptake

Perception statements		Daughter Vaccinated	Daughter Not vaccinated	DF	P value	Chi square values
My daughter is at risk of HPV infection and cervical cancer	Agree	132(65.0%)	77(50.0%)	2	0.163	3.625
	Disagree	49(24.2%)	43(27.9%)			
	Neutral	22(10.8%)	34(22.1%)			
HPV vaccine causes infertility	Agree	31(15.3%)	32(20.8%)	2	0.044	6.25
	Disagree	138(68.0%)	71(46.1%)			
	Neutral	34(16.7%)	51(33.1%)			
HPV vaccine is harmful to the health	Agree	40(19.7%)	31 (20.1%)	2	0.316	2.304
	Disagree	132(65.0%)	83(53.9%)			
	Neutral	31(15.3%)	40(26.0%)			

Notes: p-values derived from Chi- Square test; p-values are significant at $p < 0.05$; n=357

4.13 Association between socio-cultural variables and HPV vaccine uptake.

Findings established culture as a strong predictor of HPV vaccine uptake

($p=0.006$) as there was a statistical significance. In East Africa, a review and meta-analysis done by Agimas et al. (2024), revealed cultural factors significantly influenced HPV vaccine uptake. The study highlighted that traditional beliefs and practices played a vital contribution in the decision about vaccination, aligning with our findings on culture being a robust predictor of HPV vaccine utilisation. In contrast, a research in Kenya by Vermadere et al. (2016), using the Health Belief Model found that while personal beliefs and knowledge about HPV and its vaccine were significant, cultural and religious factors were not strongly associated with vaccine uptake suggesting that other individual and community-level determinants might play a more prominent role in certain contexts

Similarly, our analysis also established a significant association between religion and HPV vaccine uptake($p=0.016$). A Ugandan study by Isabirye et al. (2020), also noted that religious affiliations significantly influenced vaccine uptake. Communities with predominant religious beliefs often shaped perceptions and acceptance of the HPV vaccine, corroborating the findings of a significant relationship between religion and HPV vaccine uptake. However, a USA urban study for Hispanic and Urban parents conducted by Coleman et al. (2024), suggested that religiosity did not affect the choice to be vaccinated against HPV.

On the other hand, there was no statistical association between forms of discrimination and the influence of family and friends on HPV vaccine uptake.

On the influence of family, our findings contrasted with findings from a study

in Nigeria by Agha et al. (2024), in which family and friends influenced vaccination ($p < 0.001$).

Table 4.14

Association between socio cultural factors and HPV vaccine uptake

		Parents of Vaccinated daughter	Parent of the unvaccinated daughter	DF	P value	Chi square value
Culture	yes	29 (14.3%)	54 (35.1%)	1	0.006	7.665
	no	174 (85.7%)	100 (64.9%)			
Religion	yes	49 (23.9%)	68 (44.2%)	1	0.016	5.848
	no	154 (76.1%)	86 (55.8%)			
Family	yes	40 (19.7%)	46 (29.6%)	1	0.199	1.652
	no	163 (80.3%)	108 (70.4%)			
any form of discrimination	yes	26 (12.8%)	20 (13.0%)	1	0.962	0.002
	no	177 (87.2%)	134 (87.0%)			

Notes: p-values derived from Chi- Square test; p-values are significant at $p < 0.05$; $n = 357$

4.14 Association between health system factors and HPV vaccine uptake.

The majority of parents with vaccinated daughters live 15-30 minutes away from the health facility, indicating that this distance might be more convenient for accessing vaccination services. Fewer vaccinated individuals are from areas less than 15 minutes away or more than 30 minutes away. The statistical analysis suggests that the time to reach the closest dispensary did not significantly affect whether their daughters were

vaccinated against HPV. In Ethiopia, a study conducted by Hailu et al. (2023) emphasizing school-based delivery and urban-rural differences did not find a strong correlation between the distance to health facilities and vaccine uptake, aligning with our study findings. However, our study contrasted with a study done by Nakayita et al. (2023) in Uganda, in which proximity to health facilities was significantly associated with vaccine uptake.

There wasn't a significant association between often hearing about HPV vaccines from health care providers with HPV vaccine uptake ($p=0.101$). Our findings contrasted with a study in the USA by Garbutt et al. (2018), on determinants to HPV vaccination in primary care practices that suggested that frequent, clear communication about the vaccine could play a more significant role than indicated.

Availability of the HPV vaccines at the local facility was also not significantly associated ($p=0.647$) with HPV vaccine uptake. Similar to our results, a global study on HPV vaccine implementation in pediatric oncology practices by MacDonald et al. (2023), noted that the mere availability of the vaccine at local facilities was not a significant standalone factor for increasing uptake. This suggests that additional supportive measures are necessary to improve vaccination rates.

There was no statistical association between getting the vaccine for free at the hospital with the uptake of the HPV vaccine ($p=0.724$). Consistent with our findings, research on vaccine attitudes in various communities has shown that offering the vaccine for free did not significantly influence uptake,

highlighting that cost is not the only barrier. For instance, a study in a Hispanic community by found that cultural and informational factors were more influential than cost (Frietze et al., 2023).

Healthcare providers' knowledge of HPV and HPV vaccines was also found to have no significant association with the uptake of the HPV vaccine ($p = 0.320$). While provider knowledge is essential, it must be paired with effective communication strategies to impact vaccination rates significantly and this was also highlighted by a USA study by Garbutt et al. (2018), that while improving provider knowledge through educational modules was beneficial, it did not directly translate to increased vaccine uptake without active engagement and follow-up with patients.

There was also no significant association between the preferred vaccination site with the uptake of the HPV vaccine($p=0.151$) and this is because the implementation of the HPV vaccine has mostly been school-based.

Table 4.15

Association between health system factors with the uptake of the HPV vaccine

		parent of vaccinated daughter	parent of an unvaccinated daughter	Df	P value	Chi-square values
Distance to the health facility in terms of time taken	Less than 15 minutes	29(14.3%)	37(24.0%)	2	0.265	2.657
	15-30 minutes	111(54.7%)	66(42.9%)			
	more than 30 minutes	59(28.9%)	57(37.1%)			

	More than 30 minutes	63(31.0%)	51(33.1%)				
	strongly disagree	23(11.3%)	37(24.0%)				
	disagree	57(28.1%)	26(16.9%)				
I often hear about HPV vaccines from CHVs/nurses	Neutral	49(24.2%)	34(22.1%)	4	0.101	7.755	
	Agree	37(18.2%)	43(27.9%)				
	Strongly agree	37(18.2%)	14(9.1%)				
	Strongly disagree	53 (26.1%)	28(18.2%)				
HPV vaccines are available all the time in the local dispensary	Disagree	23(11.3%)	20(13.0%)	4	0.647	2.484	
	Neutral	34(16.7%)	32(20.8%)				
	Agree	44 (21.7%)	46(29.8%)				
	Strongly Agree	49(24.2%)	28(18.2%)				
	Strongly disagree	23(11.3%)	15(9.7%)				
My daughter can easily get the HPV vaccine for free in the local facility	Disagree	29(14.3%)	11(7.1%)	4	0.724	2.061	
	Neutral	46(22.7%)	34(22.1%)				
	Agree	52(25.6%)	40(26.0%)				
	Strongly agree	53(26.1%)	54(35.1%)				
	strongly disagree	11(5.4%)	20(13.0%)	4	0.32	4.694	
Healthcare workers are very knowledgeable about Cervical	Disagree	23(11.3%)	17(11.0%)				
	Neutral	46(22.7%)	40(26.0%)				
	Agree	63(31.0%)	26(16.9%)				

cancer, HPV, and HPV vaccines	Strongly agree	60(29.6%)	51(33.1%)			
	School	94(46.3%)	46(29.9%)			
	Health facility	97(47.8%)	94(61.0%)			
	Door-to- door outreach	12(5.9%)	14(9.1%)	2	0.15 1	3.782
My preferred vaccination site for my daughter is						

Notes: p-values derived from Chi-Square test; p-values are significant at p<0.05: n=357

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The chapter summarises research findings, conclusions, and recommendations, focusing on our research objectives. It suggests areas for further research on how the HPV vaccine is used in Kenya. It also looks at factors influencing HPV vaccine uptake in Tana River County. The studied factors were the knowledge and perception of CC, HPV infection and HPV vaccine, socio-demographic, social-cultural, and health system factors.

5.1 HPV Vaccine Coverage

The first objective of the study was to estimate the uptake of the HPV vaccine. The findings recorded an uptake of 56.9% which represented slightly more than half of the respondents. Tana North sub county had the highest number of those not vaccinated at 36.3% , followed by Tana Delta at (33.8%) and then Tana River at 29.9%.The uptake was below the 90% threshold by the World Health Organisation.

5.2. Influence of Socio-demographic Characteristics on HPV Vaccine Uptake.

(90.2%) of participants were female with respondents from different age groups between 18 years and above 50 years. Those within the reproductive age range were 81%.

Moreover, 56.9% were married either in polygamous or monogamous relationships. Only 25% of respondents had completed a secondary-level education . 76.0% were self-employed with farming, pastoralism, and small business owners like shopkeepers as the main economic activities. The results also showed that in terms of their daily income, those with an income below ksh 300 were the majority at 76.0%.

From the chi-square results, there was no significant relationship between gender and HPV vaccine uptake. The findings also demonstrated that there was no significant association between age range, occupation, education level, or income level with the HPV vaccine uptake.

Previous research has demonstrated a significant relationship between parents' education level and HPV vaccine uptake. As per this research, 75% of participants didn't have secondary education yet their daughters were vaccinated. Non-governmental organisations influence Tana River County hence sensitization activities ensure that all people regardless of education level are aware of different diseases including cervical cancer.

HPV vaccination is free in Kenya therefore level of income did not influence the HPV vaccine uptake. Only marital status had a statistically significant relationship with HPV vaccine uptake.

5.3 Influence of knowledge and perception on cervical cancer and HPV vaccine.

5.3.1 Cervical Cancer Knowledge.

Our study highlights crucial insights into the awareness and perceptions of cervical cancer (CC) and HPV vaccination among respondents in Kenya. The high level of general awareness, with 91.2% of respondents having heard of cervical cancer and more than 80% recognizing it as a leading cause of death among women, is encouraging. This foundational knowledge is essential for developing effective prevention strategies.

The understanding of HPV as a causative agent for cervical cancer, with more than half of the respondents aware of this connection, is a positive indicator. Additionally, knowledge about the primary transmission route of HPV through sexual contact and the recognition of early sexual debut and multiple sexual partners as significant risk factors were fairly understood by most respondents, vital information that can drive behavior change and preventive measures.

However, the study also revealed significant gaps and misconceptions. For instance, a majority believed that eating khat is a risk factor for cervical cancer, highlighting a need for targeted educational interventions to dispel myths. Similarly, the association of poor hygiene and chronic UTIs with cervical cancer by many respondents points to areas requiring more accurate public health messaging.

One of the more concerning findings was the misconception about the risks associated with intrauterine devices (IUDs), with 62.4% of respondents incorrectly linking IUD use to an elevated risk of cervical cancer. This misconception could undermine the acceptance of effective family planning methods, necessitating clear and accurate information dissemination to correct these beliefs. Awareness of the symptomatic profile of cervical cancer was low, with only 36.4% correctly identifying that cervical cancer causes symptoms. Moreover, the knowledge about the curability of cervical cancer was insufficient, with more than half i.e 63.9% unaware that it is curable, indicating an urgent need for comprehensive educational campaigns.

Encouragingly, there was a high level of awareness about preventive measures, including screening and HPV vaccination. The correlation between vaccination uptake and awareness of cervical cancer emphasizes the importance of parental knowledge in making informed health decisions for their children.

Furthermore, the disparity in understanding HPV transmission pathways between parents of vaccinated and unvaccinated adolescents underscores the critical role of targeted education in promoting accurate knowledge about disease transmission. This reflects the need for ongoing educational efforts to bridge knowledge gaps and improve vaccine uptake.

In summary, our study underscores the vital role of comprehensive education in enhancing cervical cancer prevention efforts. Accurate information dissemination and targeted interventions are essential to correct

misconceptions, promote informed decision-making, and ultimately increase the uptake of HPV vaccination. These measures are crucial to reducing the burden of cervical cancer and improving public health outcomes in Kenya.

5.3.2 HPV vaccine.

The majority of the study participants i.e. 87.1% had heard of the HPV vaccine. On the age criteria, 72% of the respondents correctly identified that the HPV vaccine is excluded for girls below the age of 5. Furthermore, the analysis revealed that only 52.1% showed comprehension regarding the advantages and effectiveness of the HPV vaccine in preventing cervical cancer and HPV infection.

Only 52.1% of the respondents were aware that the vaccine is intended for individuals who have not engaged in sexual intercourse which indicated a reasonable level of understanding of the importance of HPV vaccination before sexual debut. There was a knowledge gap regarding the vaccination of boys as only 59.9% of the respondents were aware that the HPV vaccine is not provided to boys in Kenya for free.

A significant association between the HPV vaccine being given to girls below 5 years with the uptake of the vaccine was also recorded with the p-value as 0.005. Respondents who correctly knew the age recommendation for the HPV vaccine had a higher vaccination rate compared to those who didn't. Those who were unsure about the statement had a vaccination rate higher than those who believed the statement to be true but lower than those who correctly knew the statement. This indicates a potential correlation between uncertainty or lack of knowledge and lower vaccination uptake.

There was also a significant relationship between HPV vaccine prevention

against cervical cancer $p=0.0012$. Among those who accurately recognized that the HPV vaccine prevents cervical cancer, a considerably larger proportion (84.7%) were vaccinated compared to those who answered incorrectly (8.4%) or were uncertain at 6.9%.

Also, there is a significant relationship between knowledge on the administration of the vaccine and uptake. Among those who were vaccinated, a higher percentage correctly answered the question about the vaccine needing to be administered prior to the first sexual intercourse (65%). In contrast, among those whose daughters were not vaccinated, a lower percentage correctly answered the same question (35.1%). Incorrect Knowledge and Uncertainty were also noted in that, there were respondents in both vaccinated and non-vaccinated groups who either answered the question wrongly or were unsure. In the vaccinated group, 19.7% gave incorrect answers, and 15.3% were unsure. In the non-vaccinated group, 18.2% gave incorrect answers, and 46.7% were unsure. This suggests a need for improved education and awareness campaigns regarding the HPV vaccine, particularly targeting those who have not yet received the vaccine.

Addressing misconceptions, uncertainties, and inadequate knowledge about the vaccine, particularly regarding its age recommendation, effectiveness against cervical cancer, and timing of administration, is important for improving its utilization and reducing the disease burden of cervical cancer.

5.3.3 Perception Towards HPV Vaccines

Our study highlights critical insights into perceptions of HPV infection susceptibility and vaccine safety among respondents in Kenya. Only 58.0% of the respondents acknowledged the susceptibility of their daughters to HPV infection, indicating a significant level of awareness about the potential risks associated with HPV.

A particularly encouraging finding is the positive perception of the HPV vaccine's safety. 60.2% of respondents disagreed with the statement that the HPV vaccine is harmful to their daughters' health suggesting a favorable attitude towards the vaccine. However, only 58.3% of the respondents rejected the notion that the vaccine can lead to infertility. This shows there is a need to change attitudes and rectify the negative misconceptions surrounding the safety of the HPV vaccine.

However, the study also identified a significant concern that requires targeted intervention. The perception that the HPV vaccine causes infertility had a p-value of 0.044, indicating a statistically significant association with vaccine uptake. This misconception can pose a substantial barrier to vaccination efforts. The World Health Organization has emphasized that misinformation, including myths about infertility, can hinder HPV vaccination programs. However, in many regions, educational campaigns have been effective in mitigating these concerns, showing that with proper information, these fears can be significantly reduced. This indicates that while infertility fears do exist, they can be overcome with targeted educational efforts. Therefore, it is imperative to implement targeted education campaigns to

dispel myths and address specific concerns about infertility related to the HPV vaccine. These campaigns should be tailored to the local context and cultural beliefs to be most effective.

In conclusion, while the overall perception of the HPV vaccine's safety is positive, targeted educational efforts are necessary to correct specific misconceptions. By addressing these concerns directly, public health initiatives can enhance the acceptance and uptake of the HPV vaccine, thereby reducing the risk of HPV-related cervical cancer. Comprehensive education and community engagement are essential components in promoting informed health decisions and improving vaccination coverage.

5.4 Socio-cultural factors affecting the uptake of the HPV vaccine.

Slightly half of the respondents, i.e 54.3% ascribed to the Christian faith, then Muslims at 44.8%, and a very small percentage reported neither Christian nor Muslim. When asked if religion discourages the use of HPV vaccines, 67.2% of the respondents disagreed.

Similarly, the majority of respondents , i.e 76.8% expressed that their culture does not discourage HPV vaccine uptake, and few reported familial or societal pressure against vaccination. Discrimination against individuals who have received the HPV vaccine was reported to be minimal, suggesting an accepting social environment regarding vaccination.

Significantly, the study found a strong association between culture and HPV vaccine uptake, highlighting the influence of cultural factors on vaccination

decisions. Religion emerged as another significant predictor of HPV vaccine uptake, underscoring the impact of religious beliefs on vaccination attitudes.

These findings align with research conducted in other regions, particularly in Asia, where cultural and religious beliefs strongly influence attitudes toward HPV vaccination. In many Asian countries, including Malaysia, Indonesia and India, conservative attitudes toward sex education and strict religious teachings contribute to hesitancy around HPV vaccination. Concerns about the vaccine potentially encouraging sexual activity before marriage are common among parents with strong religious beliefs, particularly in Muslim-majority countries.

To address these concerns and increase HPV vaccine acceptance, healthcare providers must engage with hesitant parents, providing accurate information and addressing misconceptions. Multisectoral approaches including those that involve religious leaders in vaccination initiatives can also help alleviate concerns and increase vaccine acceptance among communities with strong religious affiliations.

This study highlights how cultural, religious, and societal influences influence attitudes toward HPV vaccination. It stresses the importance of tailored interventions to enhance vaccine uptake and overcome barriers to vaccination within diverse cultural settings.

5.5 Health systems factors influencing HPV vaccine uptake.

Despite a relatively low proportion of respondents strongly agreeing that they often hear about HPV vaccines from healthcare providers, no statistically significant association was found between the frequency of receiving information and vaccine uptake. This suggests that while communication efforts from healthcare providers may be limited, they do not significantly impact vaccine uptake.

Similarly, the availability of HPV vaccines at local facilities, as perceived by respondents, showed no significant association with HPV vaccine uptake. Furthermore, provision of HPV vaccines for free at local facilities also lacked a significant association with vaccine uptake.

Finally, the perceived knowledge of healthcare workers regarding HPV and HPV vaccines showed no significant association with vaccine uptake suggesting that while confidence in healthcare providers' knowledge may vary among respondents, it does not necessarily impact their decision to vaccinate. When asked about the preferred HPV vaccination site, more than half of the participants preferred a health facility, followed by the school, and a few of them chose medical outreaches.

Factors such as frequency of communication from healthcare providers, perceived availability of the vaccine, provision of the vaccine for free, and healthcare provider knowledge alone may not be significant determinants of HPV vaccine uptake among respondents. Additional factors such as culture,

religion, parental knowledge and perception could have had a greater impact on vaccination behaviour.

5.6 Conclusions Based on the study objectives.

There is an association between awareness of cervical cancer and the HPV vaccine and HPV vaccine uptake, highlighting the essential role of education in encouraging vaccination. These findings emphasize the significance of comprehensive education campaigns to improve knowledge and dispel myths surrounding cervical cancer, ultimately enhancing the utilization of preventive measures such as vaccination and screening. Culture and religion are significant predictors of HPV vaccine uptake and they strongly shape the attitude towards HPV vaccination in diverse cultural contexts. Frequency of communication from medical professionals, perceived availability of the vaccine, provision of the vaccine for free, and healthcare provider knowledge may not be significant determinants of HPV vaccine uptake among respondents therefore factors beyond these may play a more substantial role in influencing HPV vaccine uptake.

5.7 Recommendations

The study recommends the following:

1. Tana River County Department of Health services should conduct targeted health education on cervical cancer, HPV infection, and HPV vaccine through outreaches to ensure no young girl is left behind.

2. The research was conducted in Tana River County. It could be replicated in other arid and semi-arid parts of Kenya so as to make more robust conclusions about the utilization of HPV vaccines in similar areas.
3. There is also a need for further research on factors influencing HPV screening to strengthen the 90-70-90 strategy by the World Health Organisation.
4. There is a need for further research on health system factors and their influence on HPV vaccination uptake.

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APPENDICES

APPENDIX I: CONSENT FORM TEMPLATE

Research Title: Factors influencing the uptake of HPV vaccine in Tana River County, Kenya

Principal Investigator: Laureen Wamaitha

PHT-3-3012-1-2022

Kenya Methodist University,

Department of medical and Health Sciences,

P.O. Box 45240-00100,

Nairobi, Kenya.

1. Introduction

This Consent Form contains information about the research named above. To be sure that you are informed about being in this research, we are asking you to read (or have read to you) this Consent Form. You will also be asked to sign it (or make your mark in front of a witness). We will give you a copy of this form. This consent form might contain some words that are unfamiliar to you. Please ask us to explain anything you may not understand.

2. Reason for the Research

You are being asked to take part in a research study, and you are required to fill up a questionnaire regarding your knowledge about factors influencing the uptake of the HPV vaccine. Before making any decision whether or not to take apart, please read the following information. If you are not clear about

anything, please do not hesitate to contact the researcher.

3. General Information about Research

This questionnaire is a part of my Master of Public Health (MPH) research project to assess the factors of HPV Vaccination. It has sections that will cover the background information and study objectives. The sections includes demographic information, coverage, Knowledge of HPV and the vaccine, perception, socio economic and socio-cultural and health system factors in the county. The research questions are prepared in order to find answers to general questions about hepatitis B.

4. Your Part in the Research

If you agree to join the study, the researcher shall discuss with you questions about factors influencing the uptake of HPV. The researcher has written down questions as a guide to the conversation, and, if you agree, the researcher shall take notes. Only a number will be used to label the information without reference to any of your details. The interview will take place in a private place of your choice where there will be no interruptions or any chance of anyone eavesdropping into our conversation. No one else but you and the researcher will be present. The interview session may take about 10 MINUTES of your time. If you do not wish to answer any of the questions posed during the interview, you may say so and the researcher will move onto the next question. of this study.

5. Possible Risks

The researcher does understand that it is not easy to talk about certain issues related to reproductive health since it involves private and confidential details, but this is merely the general knowledge that seeks and you're free to skip to any question if you find sensitized.

6. Possible Benefits

By participating in this study and answering these questions, you will not receive any direct benefit however, you may feel free to discuss any of the status, challenges or recommendations regarding the topic. Your contribution will help increase understanding of the gap in supporting government efforts to eliminate cervical cancer by ensuring girls are vaccinated against HPV through re-strategizing. The study is expected to arouse new interventions to increase the uptake of the HPV vaccines. Further, the study is hoped to contribute to global knowledge on vaccination acceptance in developing economies like Kenya.

7. If You Decide Not to Be in the Research

You are free to decide if you want to be in this research. Your decision will not affect the services that you receive from the community health volunteers and the health care providers.

8. Confidentiality

The researcher will keep your personal information confidential. Only the researcher and the research supervisors will have access to your personal details. Your name and personal details will not appear on the research paper.

9. Compensation

You will not be provided with an incentive to take part in the research.

10. Staying in the Research

When applicable: If you decide to take part in this research, we ask you to only answer the questions in the questionnaire.

11. Alternatives to Participation

You do not have to participate in the research in order to receive special treatment by the community health volunteer.

12. Leaving the Research

You may leave the research at any time. If you choose to take part, you can change your mind at any time and withdraw.

13. If You Have a Problem or Have Other Questions

Please call/SMS Laureen Wamaitha, 0796051712.

14. Your rights as a Participant

This research has been reviewed and approved by the IRB of Kenya Methodist University. An IRB is a committee that reviews research studies in order to help protect participants. If you have any questions about your rights as a research participant you may contact, Dr. Lily Masinde: Email: lily.masinde@kemu.ac.ke

Dr. Consolata MMayi :Email : Consolata.mmayi@kemu.ac.ke

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research titled (name of research) has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date

Signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

Date

Signature of Witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

Date

Signature of Person Who Obtained Consent

APPENDIX II: RESEARCH QUESTIONNAIRE

UCHUNGUZI KUHUSU SABABU ZINAZOATHIRI UCHUKUAJI WA CHANJO YA HPV KATIKA KAUNTI YA TANA RIVER

Hojaji hii imetayarishwa kusaidia katika kufanya uchunguzi wa jinsi uchukuaji wa chanjo ya Human Papilloma-Virus (HPV) unavyoathiriwa na sababu mbalimbali. Kujaza hojaji hii kutachukua takriban dakika 10.

Matokeo ya uchunguzi huu yanaweza kutumika kuboresha mipango ya chanjo na kuongeza uwigo wa chanjo. Msaada wako kwa kutoa taarifa za ukweli na sahihi utathaminiwa sana.

Jaza maswali na weka tiki kwenye visanduku vinavyofaa

Sehemu A: Taarifa za kidemografia.

1. Jinsia

☐ Mwanamume

☐ Mwanamke

2. Kundi la umri

Kundi la umri	Alama
18-29	
30-39	
40 -49	
Zaidi ya 50	

3. Hali ya ndoa

Hali ya ndoa	Alama
Sijaoa- Sijaolewa	
Mjane	
Nimeachwa/Tumetengana	
Nimeoa (Mitala)	
Nimeoa(mke mmoja/mme mmoja)	

4. Kiwango cha juu Zaidi cha elimu?

Kiwango	Alama
Sina elimu rasmi	
Nimekamilisha shule ya msingi	
Nimekamilisha shule ya sekondari	
Nimekamilisha chou cha ufundi/college	
Nimekamilisha chou kikuu	

5.Unajitambulisha na dini gani?

Kategoria	Alama
Uislamu	
Ukristo	
Miungu ya kiasili	
Nyinginezo	

6. Kazi yako ya sasa ni aina gani?

☐ Ajira rasmi (walimu.....

☐ Ujiajiri – (mvuvi, mchungaji, mkulima, muuza duka, mchoma makaa, vibarua)

☐ Nyinginezo

7. Mapato yako ya wastani kwa siku ni kiasi gani?

☐ Chini ya KSh 300 ☐ 300-500 ☐ Zaidi ya Ksh 500

6. Je una msichana mwenye umri wa miaka 9-14 ?

Sehemu B: Utoaji wa chanjo cha HPV – Uliza kadi ya chanjo ya HPV

7. Je, binti yako/binti zako wamepewa chanjo ya HPV?

☐ Ndio ☐ Hapana

8. Kama hapana, je, unajua kwamba wasichana wenye umri wa miaka 9-14 wanapewa chanjo ya HPV?

☐ Ndio ☐ Hapana

9. Kama ndio, amepokea chanjo ngapi za HPV?

☐ Moja ☐ Mbili

10. Alipata wapi chanjo ya HPV?

☐ Shuleni ☐ Hospitalini

Sehemu C: Maarifa na ,tazamo

10. Umeshawahi kusikia kuhu saratani ya shingo ya kizazi?

☐ Ndio ☐ Hapana

11. Kama hapana/ndio, saratani zingine gani unazozijua?

12. Tafadhali chagua jibu linalofaa zaidi kuhusu kauli zifuatazo

Maarfifa ya saratani ya shingo ya kizazi

Kategoria	Nakubali	sikubali	Sina uhakika
Saratani ya shingo ya kizazi ni sababu kuu ya saratani kwa wanawake			
Uvutaji wa sigara unaongeza hatari ya saratani ya shingo ya kizazi			
Kula miraa kunaongeza hatari ya saratani ya shingo ya kizazi			
IUCD husababisha saratani ya shingo ya kizazi			
Kuwa na wapenzi wengi wa kimapenzi kunaongeza hatari ya saratani ya shingo ya kizazi			
Usafi duni katika sehemu za siri husababisha saratani ya shingo ya kizazi			
Maambukizi ya mara kwa mara ya UTI huongeza hatari ya saratani ya shingo ya kizazi			
Saratani ya shingo ya kizazi ni laana			
Saratani ya shingo ya kizazi haitibiki			
Kupima saratani ya shingo ya kizazi huzuia saratani ya shingo ya kizazi			
Chanjo ya HPV huzuia saratani ya shingo ya kizazi			

Sehemu ya C: Maarifa kuhusu HPV

13. Umeshawahi kusikia kuhusu maambukizi ya HPV?

☐ Ndio

☐ Hapana

14. Kauli zifuatazo zinahitaji jibu la kweli au si kweli au sina hakika

Kategoria	Kweli	Si kweli	Sina uhakika
Maambukizi ya HPV husababisha saratani ya shingo ya kizazi			
HPV huambukizwa kupitia mawasiliano ya kimwili			
HPV huambukizwa kupitia ngono			
Maambukizi ya HPV huathiri wanawake pekee			
HPV huathiri wanaume pekee			
Maambukizi ya HPV huathiri wanaume na wanawake			
Kuanza shughuli za kimapenzi mapema kunaongeza hatari ya maambukizi ya HPV			
UKIMWI unaongeza hatari ya maambukizi ya HPV			
Kuwa na wapenzi wengi wa kimapenzi kunaongeza hatari ya HPV			
Kuwa na mwenzi mwenye wapenzi wengi wa kimapenzi kunaongeza hatari ya HPV			
Maambukizi ya HPV huchukua miaka 10-15 kugeuka kuwa saratani ya shingo ya kizazi			

Maarifa kuhusu chanjo ya HPV

15. Umewahi kusikia kuhusu chanjo ya HPV?

☐ Ndio

☐ Hapana

16. Kama ndio, ulisikia wapi kuhusu chanjo hii kwa mara ya kwanza?

Category	Tick all that apply
Redio	
Televisheni	
Mabango na vipeperushi	
Viongozi wa kidini	
Msaidizi wa afya ya jamii/CHV	
Mkunga wa jadi	
Afisa wa afya kutoka zahanati ya mtaa	
Marafiki	
Kwingineko	
Mitandao ya kijamii	

17. Kauli zifuatazo zinahitaji majibu ya ndio, hapana, au sina hakika

Kategoria	Ndio	Hapana	Sina uhakika
Chanjo ya HPV inaweza kutolewa kwa wasichana wenye umri chini ya miaka 5			
Chanjo ya HPV huzuia maambukizi ya HPV			
Chanjo ya HPV huzuia saratani ya shingo ya kizazi			
Chanjo ya HPV inapaswa kutolewa kabla ya kuanza ngono			
Chanjo ya HPV inaweza kutolewa kwa watu ambao tayari wamewahi kufanya ngono			
Chanjo ya HPV ni hatari kwa afya			
Chanjo ya HPV husababisha ugumba/kuwa tasa			
Chanjo ya HPV hutolewa kwa wavulana nchini Kenya			

Sehemu D: Mtazamo

18.Chagua jibu linalofaa zaidi

Kauli	Ndio	Hapana	Sijui
Binti yangu yuko kwenye hatari ya kupata maambukizi ya HPV na saratani ya shingo ya kizazi			
Maambukizi ya HPV ni makubwa.			
Chanjo ya HPV ni salama			
Chanjo ya HPV inafaa dhidi ya saratani ya shingo ya kizazi.			

Sehemu F: Sababu za kijamii na kitamaduni

21. Je, dini yako inakataza matumizi ya chanjo ya HPV?

☐Ndio

☐ Hapana

22. Je, tamaduni zako zinakataza matumizi ya chanjo ya HPV?

☐Ndio

☐ Hapana

23. Je, kuna mshiriki wa familia, rafiki, au jirani aliyekukataza kutumia chanjo ya HPV?

☐ Ndio

☐Hapana

24. Je, kuna aina yoyote ya ubaguzi au unyanyapaa wa kijamii kuhusu maambukizi ya HPV au chanjo ya HPV?

☐ Ndio

☐Hapana

Sehemu G: Sababu za mfumo wa afya

25. Ni kituo gani unachotembelea unapougua?

26. Je, unatumia usafiri gani kufika kwenye kituo hicho?

Kategoria	Chagua
Kwa kutembea	
Pikipiki	
Gari	

27. Inachukua muda gani kufika huko?

Kategoria kwa dakika	Chagua
Chini ya 15	
15- 30	
Zaidi ya 30	

28. Inagharimu kiasi gani kufika huko?

Kategoria kwa ksh	Chagua
Chini ya 100	
100-300	
Zaidi ya 300	

29. Je, kuna CHV, mfanyakazi wa afya, au mwakilishi wa NGO aliyekuelimisha kuhusu chanjo ya HPV?

☐Ndio ☐Hapana

30. Je, unasikia mara ngapi kuhusu HPV kutoka kwa vituo vya afya au wafanyakazi wa afya?

☐ Kamwe ☐ Mara chache sana ☐ Mara chache ☐ Mara nyingi ☐ Mara nyingi sana

31. Tafadhali chagua jibu linalofaa zaidi kuhusu kauli zifuatazo.

SD- Sikubaliani Kabisa; D- Sikubaliani; N- Sina Maoni; A- Nakubali; SA- Nakubali Kabisa

	SD	D	N	A	SA
Chanjo za HPV zinapatikana kila wakati kwenye kituo changu cha afya cha mtaa					
Binti yangu anaweza kupata chanjo ya HPV bure kwenye kituo cha afya cha mtaa					
Mtoa huduma za afya katika kituo cha afya cha mtaa ni mjuzi sana kuhusu chanjo za HPV					

33. Ungependa binti yako apate chanjo ya HPV wapi?

☐ shuleni ☐ Kituo cha afya ☐ Nyumbani

Asanti kwa ushirikiano

APPENDIX III: KEMU SERC LETTER

KENYA METHODIST UNIVERSITY	
P. O BOX 267 MERU - 60200, KENYA	FAX: 254-64-30162
TEL: 254-064-30301/31229/30367/31171	EMAIL: INFO@KEMU.AC.KE

February 7, 2024 KeMU/ISERC/PHT/03/2024

LAUREEN WAMAITHA KAMUYA
PHT-3-3012-1/2022

Dear Laureen,

SUBJECT: FACTORS INFLUENCING THE UPTAKE OF HUMAN PAPILLOMA VIRUS VACCINE IN TANZANIA RIVER COUNTY, KENYA

This is to inform you that Kenya Methodist University Institutional Scientific Ethics and Review Committee has reviewed and approved your research proposal. Your application approval number is KeMU/ISERC/PHT/03/2024. The approval period is 7th February, 2024 to 7th February, 2025.

This approval is subject to compliance with the following requirements:-

- I. Only approved documents including (informed consents, study instruments, MTA) will be used.
- II. All changes including (amendments, deviations, and violations) are submitted for review and approval by Kenya Methodist University Institutional Scientific Ethics and Review Committee.
- III. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KeMU ISERC within 72 hours of notification.
- IV. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KeMU ISERC within 72 hours.

- V. Clearance for export of biological specimens must be obtained from relevant institutions.
- VI. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- VII. Submission of an executive summary report within 90 days upon completion of the study to KeMU ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

 Yours sincerely,

APPENDIX IV: INTRODUCTORY LETTER TO NACOSTI



KENYA METHODIST UNIVERSITY

P. O. Box 267 Meru - 60200, Kenya

Fax: 254-64-30162

Tel: 254-064-30301/31229/30367/31171

Email: deanrd@kemu.ac.ke

DIRECTORATE OF POSTGRADUATE STUDIES

February 7, 2024

Commission Secretary,
National Commission for Science, Technology and Innovations,
P.O. Box 30623-00100
NAIROBI.

Dear Sir/Madam,

RE: LAUREEN WAMAITHA KAMUYA – (REG. NO. PHT-3-3012-1/2022)

This is to confirm that the above named person is a bona fide student of Kenya Methodist University, in the School of Medicine and Health Sciences, Department of Public Health, Human Nutrition and Dietetics undertaking a Master's Degree in Public Health. She is conducting research on: "Factors Influencing the Uptake of Human Papilloma Virus Vaccine in Tana River County, Kenya".

We confirm that her research proposal has been presented and approved by the University.

In this regard, we are requesting your office to issue a research license to enable her collect data.

Any assistance accorded to her will be highly appreciated.

Yours sincerely,


Dr. John M. Muchiri (PhD)
Dean, Postgraduate Studies

Cc: Dean SMHS
CoD, PHT
Program Coordinator - PHT
Student Supervisors

APPENDIX IV: NACOSTI LICENSE

 REPUBLIC OF KENYA Ref No: 870920	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Date of Issue: 20/February/2024
RESEARCH LICENSE	
	
This is to Certify that Miss., Laureen Wamaita Kamuya of Kenya Methodist University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Tanariver on the topic: Factors influencing the uptake of HPV vaccine in Tana River county, Kenya for the period ending : 20/February/2025.	
License No: NACOSTI/P/24/33217	
870920 Applicant Identification Number	<i>W. Kamuya</i> Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code 	
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See overleaf for conditions	

