

**FACTORS INFLUENCING UPTAKE OF HUMAN PAPILLOMAVIRUS VACCINE
AMONG SCHOOL-GOING ADOLESCENT GIRLS (10-14YRS) IN KIBRA SUB
COUNTY, NAIROBI CITY COUNTY, KENYA.**

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**A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH
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DECLARATION AND APPROVAL

Student Declaration

This certifies that the thesis is entirely original with no submissions made for academic recognition to any other institution than Mount Kenya University.


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DEDICATION

This thesis is dedicated to DAAD and my family. I am appreciative of my parents, Mr. and Mrs. Johnson, for their supportive words and encouragement.



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I want to express my gratitude to God for giving me life as well as for his abundant grace and support during my time in academia. I am grateful that my Master's degree was funded by the DAAD organization. I am grateful to my family and acquaintances for their encouragement. My profound appreciation is extended to my supervisors, Drs. John and Judy, for their time and appropriate direction in developing this thesis. In particular, the library personnel and the department of community health, epidemiology, and biostatistics at Mount Kenya University deserve special recognition for creating an enjoyable learning atmosphere that enabled me to effectively finish this thesis. Lastly, I want to express my gratitude to the investigation's participants for giving up their time to take part in this investigation.



Mount Kenya University

ABSTRACT

The fourth most common cancer in women is cervical carcinoma. In 2020, 604,000 cases of cervical carcinoma were reported worldwide. About 90% of the 342 thousand deaths happened in countries with low to middle incomes, where cancer treatment techniques are still insufficient. In Kibra Sub County, Nairobi City County, Kenya, the investigation sought to identify the aspects influencing school-age adolescent girls (10–14 years old)'s adoption of the Human Papillomavirus Vaccine. The objectives of this investigation were to measure the level of HPV vaccine utilization, identify sociodemographic factors that affect it, analyze parental perceptions that affect it, and identify healthcare-based factors that influence HPV immunization uptake among school-age adolescent girls (10–14 years old) in Nairobi City County's Kibra Sub County. The investigation combined qualitative and quantitative data using an analytical cross-sectional study design. The Fischer formula was used to determine the study's sample size. 422 people made up the investigation's sample size. The schools were divided into public and private entities using stratified sampling. The samples for each group were calculated using proportionate random sampling. The schools and subjects for the study were chosen using simple random sampling. The Kibra sub-county was chosen on purpose. A researcher-administered questionnaire and key informant interviews were used to gather the data. Data analysis was done using Statistical Packages for Social Sciences (SPSS) version 29. Frequencies, means, and percentages were employed in descriptive analysis. Bivariate and binary logistic regression chi-square tests were among the inferential statistical tests used to assess the degree of correlation between determining factors and immunization uptake. The school's research ethics committee, the Ministry of Education, and NACOSTI were among the authorities the researcher sought ethical clearance from. Before beginning the investigation, the participants had to give their informed consent. To determine the accuracy of the research tools, a pilot study was conducted. Additionally, the reliability of the research tools was established. The uptake of the vaccine for HPV in this research was 29.9% which is a public health concern. Attending a private school(OR=2.95%CI=1.17-3.26), easy access to HPV vaccination services(OR=2.7,95%CI=0.22-0.65), having guardians aged between 34-40 years(OR=4.7,95%CI=0.09-0.53), and having a positive perception of the HPV vaccine(OR=2.4,95%CI=0.26-0.66) amplified the odds of the HPV vaccine uptake. Study respondents' guardians who had a primary level of education(OR=4,95%CI=1.97-8.04), being Muslim(OR=1.9,95%CI=0.30-0.94), and the absence of vaccination programs for HPVs targeting school-going girls(OR=2.2,95%CI=1.36-3.46) reduced the odds of HPV vaccine uptake. In conclusion, the HPV vaccine uptake in this study was notably low at 29.9%, highlighting a significant public health concern. Key factors that positively influenced uptake included attending private schools, ease of access to vaccination services, guardians aged 34–40 years, and positive perceptions of the vaccine. Conversely, having guardians with only primary education, being Muslim, and the lack of school-based vaccination programs significantly reduced uptake. It is therefore recommended that targeted awareness campaigns be conducted, school-based HPV vaccination programs be strengthened, and access to the vaccine be improved, particularly among underserved populations.

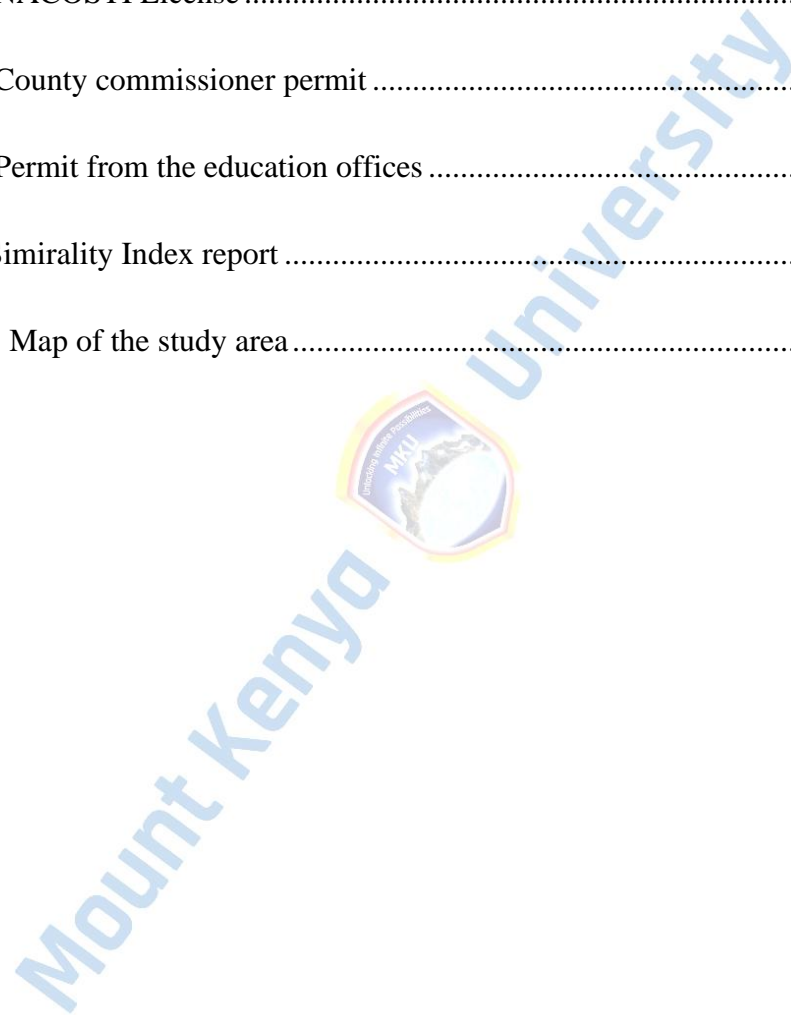
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LIST OF ABBREVIATIONS AND ACRONYMS

CDC-Centre for Disease Control

DNA-Deoxyribonucleic acid

HPV-Human Papilloma Virus

KIIs- Key Informant Interviews

KNBS-Kenya National Bureau of Statistics

LMICs- Low and Middle-Income Countries

NACOSTI- National Commission for Science, Technology, and Innovation

PIRI- Periodic Intensification of Routine Immunization

SPSS- Statistical Packages for Social Sciences

SSA-Sub Saharan Africa

STIs- Sexually Transmitted Infections

WHO-World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background of the research

The primary cause of a number of cancers, including genital, anal, oral, and pharyngeal cancers, is the human papillomavirus (HPV). Being the third most common and the fourth leading cause of cancer-related mortalities among women worldwide, cancer of the cervical cavity is crucial among these (Formana et al., 2022). Cancer of the cervical cavity is brought on by an extended infection with oncogenic HPV serotypes. Forty of the approximately 170 HPV strains are sexually transmissible. It is projected that 75% of sexually active people will contract HPV at some point in their lives. Although oral-genital cancer or warts can result from an extended infection with highly susceptible HPV varieties (11, 16, 18, 33, 51, 52, 53, 58, and 61), most illnesses are asymptomatic and resolve on their own within two years due to the body's immune system (Burd, 2023).

However, persistent HPV infection can lead to cervical cell abnormalities, which may be precursors to cervical and other anogenital cancers. As the main cause of as much as 70% of cervical carcinomas globally, HPV 16 and 18 are the most crucial oncogenic genotypes to consider (LaCour & Trimble, 2022). Cervical cancer can be prevented using various strategies, including raising the disease public awareness, the cause, the risk aspects for cervical cancer, diagnosis techniques, and strategies for prevention. Other successful preventive measures include HPV immunization, Pap smear screening, acetic acid, or Lugol's iodine for ocular inspections, and testing for the presence of high-risk HPV DNA using hybridization techniques or polymerase chain reactions (Aggarwal, 2014; McGraw & Ferrante, 2014). Low-income nations have the highest rates of cervical cancer because there is restricted access to screenings for prevention and excellent treatment is either unavailable

or prohibitively expensive(Hull1 et al., 2020). More than 45% of girls aged 9 to 14 who received vaccinations in thirty-seven nations in 2023 did so on a one-dose schedule. It is currently estimated that 27% of girls worldwide have received their first dose of HPV (WHO, 2024).

While promoting abstinence, condom use, and monogamous fidelity are all important parts of a comprehensive cancer control plan, HPV vaccination is the main preventative approach (Karanja-Chege, 2022). As the vaccines' efficacy is greatest in populations without prior exposure to HPV, prepubescent girls are the main target group for vaccination before they commence sexual intercourse(Kamolratanakul & Pitisuttithum, 2021). Although the ideal age for immunization is between 11 and 12, catch-up shots are available for up to 26 years of age. The first dose coverage rate in the African Region is only 33% as of 2022, which is less than the 90% global goal. To enhance public health outcomes and lessen the burden of cancer of the cervical cavity, coverage must be increased (WHO, 2024a). According to their most recent review, schoolgirl adolescents in sub-Saharan Africa had a pooled predicted HPV immunization uptake of 28.53% overall (Asgedom et al., 2024).

The vaccine protects people against the four primary forms of HPV before they engage in sexual contact(Pandhi & Sonthalia, 2021). Only HPV strains they have not yet contracted are safeguarded against by those who get the vaccine after starting sexual activity. There are three widely accessible HPV vaccines: Cervarix, Gardasil 4, and Gardasil 9. Gardasil 4 provides protection against HPV types 6, 11, 16, and 18. The CDC states that Cervarix is only successful against two strains of HPV (16 and 18), whereas Gardasil 9 has been proven against nine strains (6, 11, 16, 18, 31, 33, 45, 52, and 58). The safety and effectiveness rates of the three vaccines range from 90% to 100%.

Although HPV vaccines are effective and secure, the adoption rate among at-risk individuals is less than projected, reducing the vaccine's potential impact on public health(Hirth, 2019). Unfavorable perceptions and norms regarding HPV, cervical carcinoma, and the vaccine for HPV, as well as sociodemographic and cultural traits, are some of the factors that contribute to the negative reception of HPV immunization (Restivo et al., 2018). Although safety, cost, and certain socioeconomic and cultural factors are often identified as obstacles to acceptance investigations, which have primarily been conducted in nations of the West and some, more recently, in countries in the developing world (LMICs), generally show a high level of concern in these immunizations(Restivo et al., 2018; Toh et al., 2019; Vermandere et al., 2024a). Immunizations may not be considered appropriate for preventing sexually transmitted viruses from spreading in early adolescent girls due to their recent development. Similarly, a Ghanaian study found a high level of immunization readiness. Nonetheless, a number of the subjects voiced worries about negative effects, including the vaccine's uncertain delivery method and potential to impair female fertility (Coleman et al., 2011). in their meta-analysis and systematic review. According to Agimas et al., (2024), a total of 29 articles were taken into account, and the pooled magnitude of HPV immunization uptake in East Africa was 35%. In Kisumu, West Kenya, investigators reported high acceptance (95%) in a different inquiry; however, this rate dropped to 31% when they disclosed that immunization requires three doses(Becker-Dreps et al., 2020). Only 33% of the targeted population in Kenya received the 1st dose in 2020, and only 16% returned for the second dose, indicating insufficient uptake (Karanja-Chege, 2022). According to Wigle and colleagues, political and health system constraints may make it more difficult to implement long-lasting, effective programs than socio-cultural barriers in low-middle-income

nations(Wigle et al., 2023). Various studies have identified various concerns that their participants had that may have influenced their vaccine uptake. It is not clear how much influence the factors have on vaccine uptake. The purpose of this investigation was to determine the causes of vaccine uptake and its consequences.

1.2 Statement of the Problem

There were 604,000 new cases of cancer of the cervical cavity diagnosed worldwide in 2020 (WHO, 2022). Approximately 90% of the predicted 342,000 deaths took place in nations that are underdeveloped or developing, where cancer treatment techniques are still insufficient. With one of the highest prevalence and fatality rates of cervical carcinoma worldwide, Kenya is not an exception(Ng'Ang'A et al., 2018). The WHO reports that 5236 new cases of cervical carcinoma were reported in Kenya in 2020, which translates to an age-standardized incidence of 31.3 cases per 100,000 people (WHO, 2020).

Around the end of 2019, school-based programs in Kenya began routinely administering HPV immunization to 10-year-old girls (Karanja-Chege, 2022). With the help of the local Ministry of Health and school administration, HPV vaccinations are made available to students in schools. The best time to administer vaccine for HPV is between the ages of 9 and 14 because this is when people are more probable to have contracted the virus before having their first sexual experience, even though the vaccine has been designated to be administered in people aged 9 to 26 (Karanja-Chege, 2022). One strategy to implement the life-course immunization plan outlined in the nation's Vaccination Agenda 2030 was adolescent vaccination. This strategy aimed to boost coverage in medically underserved areas while extending the reach of routine immunizations to age groups other than infants.

In Kenya, the uptake of the HPV vaccine remains low, with national estimates ranging between 28% and 35%, far below the WHO-recommended target of 90% for full coverage (WHO, 2022). In urban informal settlements such as Kibra, uptake is even lower, reported in some studies to be below 25% (WHO, 2022). Several factors contribute to this low coverage, including limited awareness, cultural and religious misconceptions, fear of side effects, inadequate school-based vaccination programs, and lack of parental consent. The consequences of this low uptake are significant, as it undermines efforts to prevent cervical cancer, which remains one of the leading causes of cancer-related deaths among women in Kenya. Increasing HPV vaccine uptake is therefore critical for achieving long-term reductions in cervical cancer incidence and improving public health outcomes (WHO, 2022).

The HPV vaccination program was anticipated to influence public health considerably. However, the uptake could have been better. In 2019, the rate of acceptance of the first dose of the HPV immunization stood at 25%, but it progressed to 33% in the following year, 2020. In 2020, only over 110,000 girls (16%) returned for the second dose (Karanja-Chege, 2022). The causes of dropout need to be clarified further; however, they might include forgetting, given the lengthy period between doses (six months), believing one dosage is adequate, and the immunization services disruption brought on by the COVID-19 epidemic.

Recently, the Ministry of Health has launched sensitization campaigns and Periodic Intensification of Routine Immunization (PIRI) activities in all 47 counties to improve HPV coverage to at least 80%. To achieve this target, one of the first key steps is to identify the aspects causing vaccine hesitancy among women in Kenya. This investigation aimed to

clarify the variables influencing the adoption of the HPV immunization in Nairobi City County, Kenya's Kibra Sub County.

1.3 Purpose of the Study

The investigation looked at healthcare-based factors, parental attitudes toward HPV immunization, and sociodemographic traits that affected the uptake of vaccine for HPV among adolescents aged 10 to 14 in the Kibra sub-county. Additionally, the investigation assessed the variables affecting the HPV immunization uptake among Kibra Sub County's teenage girls aged 10 to 14. To find out if they affect HPV vaccine uptake, sociodemographic traits, parental attitudes, and healthcare-based factors were evaluated.

1.4 Study Objectives

1.4.1 Broad Objective

To establish factors impacting HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City county, Kenya.

1.4.2 Specific Objectives

1. To assess the HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya.
2. To determine sociodemographic factors influencing HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya.
3. To evaluate parental perceptions influencing HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya.

4. To determine healthcare-based factors influencing HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya.

1.5 Research Questions

1. What is the HPV vaccine uptake level among adolescent girls (10-14 years) in Kibra Sub County, Nairobi City County, Kenya ?
2. What sociodemographic factors affect the HPV vaccine uptake in school-going adolescent girls (10-14 years) in Kibra Sub County, Nairobi City County, Kenya?
3. Do parental perceptions towards the HPV vaccine affect the HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya?
4. What healthcare-based factors influence HPV vaccine uptake among school-going adolescent girls (10-14 years) in Kibra Sub County, Nairobi City County, Kenya?

1.6 Justification of the Study

Since the introduction of the HPV vaccine, many research investigations have been conducted in various nations to assess the different factors influencing immunization acceptance (Coleman et al., 2011; Restivo et al., 2018; Vermandere et al., 2014b). On the other hand, little is known about how adolescents' acceptance and knowledge of the HPV vaccine vary by nation. The rate of immunization uptake has a significant impact of vaccination for HPV coverage and, consequently, the burden of HPV-associated illnesses. Cancer of the cervical cavity mortality is expected to decrease by half if HPV vaccination rates reach 80% (Nabirye et al., 2020).

Vaccine skepticism ranks among the top ten dangers to world health. Vaccine reluctance in Kenya stems from various complicated and location-specific factors and thus cannot be addressed with a single strategy. Due to Kenya's low HPV vaccine coverage, this research explored the factors impacting the uptake and HPV vaccination in Kibra Sub County. This information aided in developing successful tactics for the adoption and inclusivity of HPV vaccination in Kenya. The outcome of this investigation may also be leveraged to launch other health promotion programs. Additionally, the study addressed the research gap in underserved communities. Informal settlements often face significant healthcare challenges, including limited access to quality healthcare services, education, and preventive measures. The study generated knowledge specifically tailored to these underserved populations, potentially leading to targeted interventions and improved healthcare delivery.

1.7 Significance of the research

This research investigated factors influencing HPV vaccination uptake and completion in Kibra Sub-County. The outcomes of the research were crucial in helping the government and other interested parties formulate policy recommendations that would expedite the distribution of vaccines to Kenyan adolescent girls. The results of the investigation assisted different stakeholders in creating more effective interventions to boost HPV vaccine accessibility and use in Kenya. The results of the investigation were used to start additional health promotion initiatives in Kibra Sub-County. The investigation sought to close knowledge gaps in the public medical literature and serve as a resource for future investigators by determining the factors that affect HPV vaccine uptake in Kibra Sub-county.

1.8 Scope of the research

The investigation took place in Kibra Sub-County, Nairobi City County primary schools, focusing on adolescents (10-14yrs) attending school. The researcher interviewed school heads, medical staffs working in schools and self-administered questionnaires were used for the parents of the adolescent girls.

1.9 Study Limitations

The investigation was carried out in an urban area, where HPV vaccine availability and information are higher than in rural areas. As such, the findings may differ from the rural areas' situation. Secondly, the study surveyed participants in Kibra Sub County rather than the general Nairobi City County population, while the findings were used to infer the Nairobi City County population. The study addressed this by ensuring that the size of the sample is representative of the population and the sampling technique helped reduce any inherent bias that these present.

1.10 Delimitations

The study's delimitations included parents of adolescent females aged 10-14 years, as this is the vaccine target population, as per the Health Ministry. Adolescents in primary schools were targeted due to their accessibility. At the same time, public health staff were included for their knowledge of healthcare-based factors that influence vaccination behavior at vaccination centers.

1.11 Assumptions of the Study

The investigation assumes partakers would respond truthfully to questions and have unbiased perceptions. Another assumption was that the selected participants would represent the Nairobi City County residents.

1.12 Operational Definition of Key Terms

Adolescent- According to WHO, this is a person aged between 10-19 years.

Efficacy- Refers to the ability to produce a desired or intended result

Human Papillomavirus (HPV)- this is a sexually transmitted virus transmitted through skin-to-skin contact during sexual intercourse and infects both males and females.

Perception- this refers to how individuals understand and comprehend the information they receive and transform it into meaningful knowledge.

Safety- The condition of being protected from or reduced likelihood of causing danger, risk or injury.

Uptake- the percentage of teenage girls who have had at least one HPV vaccination dose.

Vaccine- Is a preparation that contains only weakened or killed forms of germs like bacteria or viruses that is given as a preventive inoculation to confer immunity against a certain disease by stimulating antibody production



CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The main method of cervical carcinoma prevention is the HPV vaccine. Although older adolescents can also receive the vaccine, children and adolescents aged 9 to 14 are the main target audience. The age at which a person receives their first dose determines the immunization schedule; individuals starting at 9–14 years old must receive 2 doses (at 0 and 5–13 months), while those starting at ≥ 15 years old must receive 3 doses (at 0, 1, and 6 months) (WHO, 2017). While high-income countries successfully implement vaccination programs, developing countries struggle to meet their targets (Dorji et al., 2021; Loke et al., 2017; Robles et al., 2021). In particular, African countries recently introducing nationwide vaccination, such as Kenya and Ethiopia, report low adolescent coverage (Beyen et al., 2022; Karanja-Chege, 2022).

This may be attributed to various factors, including parental factors and factors relating to health systems. This section covers the empirical and theoretical reviews that guide the study. The empirical review discusses HPV vaccine uptake and explores associated factors, including sociodemographic variables, parental perceptions, and healthcare system factors. It includes qualitative and quantitative studies, meta-analyses, systematic literature reviews, individual studies, and reports. Studies considered employed cross-sectional, longitudinal, and intervention research designs. The theoretical framework explores the planned behavior and systems theory to predict the relational dynamics among variables under study. Articles were selected based on their coverage of the variables or the theories under consideration.

2.2. Empirical Review

2.2.1 Human Papilloma Virus Vaccine Uptake

Nations have worked to put vaccination programs into place more than ten years after the Human Papilloma Virus (HPV) vaccine became available for general use. While nations with low to middle incomes (LMICs) consistently struggle with enhancing coverage, nations with high incomes appear to be successful in reaching their goals. The uptake of vaccines varies between LMICs and advanced nations. Loke *et al.* (2017) report high vaccine uptakes in developed countries for all three doses as well as one dose. Within their comprehensive analysis, the researchers discovered that nations like Scotland exhibit uptake percentages as considerable as 94.4% for a single dose and 91.4% for the complete three-dose regimen among adolescents. Other countries covered by the study, including Canada, Australia, and Denmark, reported rates higher than 50% for both one and three doses.

Adult women in developed nations also appear to be more receptive to HPV vaccination. Robles *et al.* (2021) found that the one dose (66.9%) and all three doses (60.9%) of the vaccine had a comparatively high overall utilization in an intervention trial that targeted adult women in nine European countries. Nonetheless, the investigation employed both population-based and convenience-based recruitment strategies and documented variations in participant utilization between the two. In Belgium, France, Germany, Finland, and Spain that recruited women seeking healthcare and screening services (convenience) recorded uptakes of >77% for one dose and $\geq 46\%$ for all doses. Denmark and Sweden, which used a population-based approach by recruiting only those invited for screening based on census registries, recorded one-dose uptake of 41.8% and 30.3% and a three-dose uptake of 40.6%,

29.4%, respectively (Robles *et al.*, 2021). This research shows that targeting methods are pertinent to increasing vaccination uptake as well as meeting targets.

Low coverage has been observed in most LMICs, where healthcare systems are not well-equipped to run efficient vaccination programs. In a meta-analysis by Dorji *et al.* (2021), researchers reported that the overall vaccine uptake among females, representing at least one dose taken, in LMICs was 61.69% between 2008 and 2020. The analysis of data from 24 countries revealed that the vaccination programs in LMICs are rarely self-sponsored, as governments and non-governmental organizations fund the majority. While the vaccine uptake in these countries increased in the 2015-2020 period compared to earlier years, countries that introduced the vaccine in the same period still experienced lower uptakes (Dorji *et al.*, 2021). This data reveals significant differences in vaccination efforts in high-income countries and LMICs.

The majority of those taking the HPV vaccine in LMICs show non-compliance to all three doses. Many people report taking the first dose, with the number declining in the second and third doses. Dorji *et al.* (2021) report this trend in 11 countries, including African countries Ghana, Cameroon, Malawi, Lesotho, and Kenya. However, the data analyzed from these countries was derived from demonstration projects undertaken before rolling out countrywide vaccination. Individual studies in Kenya, Ethiopia, and Uganda also report lower statistics for full doses compared to one dose (Beyen *et al.*, 2022; Mabeya *et al.*, 2018a; Nabirye *et al.*, 2020).

Community and school-based approaches are commonly used in vaccine delivery, especially in Africa. Health facilities and public health departments coordinate with schools to deliver

vaccines to the target population, children aged 9-15 years (Nabirye *et al.*, 2020; Karanja-Chege, 2022). While this strategy has the potential to reach many of the targeted children, vaccine uptake in African countries is still low. In an Ethiopian cross-sectional study, researchers found that most participants (55.6%) had not received the vaccine (Beyen *et al.*, 2022). The uptakes for one-dose and full vaccination at two doses were low, at 23.4% and 21%, respectively. Since HPV vaccination in Ethiopia only targets 14-year-old children, this data may not be comparable to other countries.

Just 49% of 407 adolescents aged 9 to 15 in a cross-sectional investigation conducted in Uganda had gotten at least one dose of the vaccine (Nabirye *et al.*, 2020). The uptake rate for the two doses of the full vaccination was a very low 13.8%. Kenya has also seen low vaccination uptake, despite launching the vaccine later in 2019 than Uganda did in 2012. Adolescent girls obtaining the first dose increased to 33% in 2020, from a reported low uptake of 25% in 2019 (Karanja-Chege, 2022). However, only 16% of people returned to take the second dose in 2020, indicating a lower rate of subsequent dose utilization.

Surprisingly, an earlier prospective cohort study of a demonstration program carried out in 2012-2013 recorded higher coverage in Kenya's rift Valley region (Mabeya *et al.*, 2018). In the study, 64% of the targeted adolescents received their second, and 40% received the third dose. This is evidence that Kenya can improve HPV vaccine coverage with the appropriate targeting mechanisms. There is limited information however on the vaccine uptake in low social economic settlements in Kenyan cities. This study thus, aims to understand vaccine uptake in one of the largest low social economic areas in Kenya (Kibra). It also aims to identify methods that would effectively improve the country's low vaccine coverage, it is imperative to identify the factors influencing uptake among these adolescents.

2.2.2 Sociodemographic factors and vaccination

The knowledge, attitudes, and actions of an individual are profoundly affected by their socioeconomic status. Importantly, parents' decisions about their well-being may be greatly influenced by their socioeconomic standing. Research has indicated that socioeconomic status correlates with child health outcomes, including adolescent health. For instance, a recent Japanese study reported that adolescent health outcomes were greatly influenced by their parent's socioeconomic status (Okamoto, 2021). Particularly, the author observed a significant effect of parental education and household income status in predicting adolescent health. According to the investigation, teenagers with middle-class parents (O R 1.26, $p < 0.01$, 95% CI) and high-income parents (O R 1.34, $p < 0.01$, 95% CI) were more likely to have better well-being outcomes than their impoverished counterparts.

Similarly, Poulain et al., (2019) found that children from low socioeconomic status households report engaging in unhealthy lifestyles, resulting in poor health outcomes. The authors recorded poor health outcomes, including poor nutrition status and quality of life. In the study, mother's education level ($\beta = 0.12$), employment status ($\beta = 0.14$), and household income ($\beta = 0.16$) were positively correlated with children's quality of life at $p < 0.01$. Similarly, for both young children ($\beta = 0.14$, $p = 0.005$ for education) and adolescents ($\beta = 0.15$, $p < 0.001$ for education and $\beta = 0.14$, $p = 0.004$ for occupation), maternal schooling and job status were linked to healthy nutrition practices. Additionally, adolescent health behaviors such as smoking and physical activity were also associated with low parental socioeconomic status. However, smoking only had a significant correlation with maternal education ($\beta = 0.86$, $p = 0.044$), whereas physical activity had a significant correlation with education ($\beta = 1.33$, $p < 0.001$), occupation ($\beta = 1.65$, $p < 0.001$), and income from the household

($\beta=1.83$, $p<0.001$). These findings show a strong correlation between the sociodemographic characteristics of the household and the health-related decisions parents make for their kids and teenagers.

Consistently, this behavior could be translated into vaccination decision-making. As Zhou et al., (2019) observed, parental sociodemographic factors play a noteworthy role in vaccination for HPV knowledge, attitudes, and intention to get their child vaccinated. The researchers recorded a significant effect of age, gender, education, and household income on vaccination intent among parents. Parents of older children (12-14 years) were more knowledgeable ($p=0.006$) on HPV vaccination and showed greater intent to vaccinate ($p<0.001$) than parents of younger children (9-11 years). Zhou *et al.* (2019) also observed that older parents (≥ 50 years) had higher knowledge ($p < 0.001$) and awareness ($p < 0.001$) but the lowest intentions to vaccinate ($p < 0.001$) compared to other younger parents. Contrastingly, mothers scored lower on knowledge ($p= 0.018$) and awareness ($p<0.001$) of HPV vaccination, yet displayed more positive intent ($p<0.001$) to vaccinate. Household income was also a significant predictor of all three aspects of HPV vaccination at $p<0.001$. This may indicate that sociodemographic variables allow some parents opportunities for knowledge and awareness and could influence the perception of the knowledge received. Consequently, the availability of information and its convincing power contribute to the presence or absence of intention to vaccinate.

This is steady with Tsui et al., (2013), who observed that parental level of income, age, and ability to afford health insurance predict adolescent initiation of HPV vaccination among Americans. Americans who were uninsured (Odds Ratio 0.46, $p<0.05$) had a lower tendency to start the vaccination compared to insured parents (Odds Ratio 2.13, $p<0.05$).

Contrastingly, the same study found that higher poverty levels influenced vaccine initiation, as those living in high-poverty neighborhoods had higher vaccination initiation rates. Parents living in low-poverty neighborhoods (10-20% poverty quartile) had 0.50 odds of initiating vaccination while those living in high-poverty areas (>40% poverty) had 1.79 odds of initiating HPV vaccination for their children at $p<0.05$. Since the study surveyed parents in low-income neighborhoods already using health safety net services, this could show motivation for pursuing better health to counter existing health inequities.

Another study in Sweden also reported parental sociodemographic status differences among vaccinated and unvaccinated adolescents (Grandahl et al., 2017). The researchers found that adolescents with parents with higher education and income status had a higher likelihood of getting vaccinated than those with a low socioeconomic status. They observed statistically significant differences between the number of immunized and non-immunized children among parents with 12 years of education ($p=0.02$ for mothers and $p=0.03$ for fathers). Similarly, there were more vaccinated children among working mothers ($p=0.02$) and fathers ($p<0.01$). Gender, ethnicity, and medical insurance coverage were found to be significant determinants of immunization rates in a research investigation that looked at the role of sociodemographic factors in an area of America with low HPV immunization rates (Kepka et al., 2018). The investigation found that daughters of female caregivers were more probable than daughters of male caregivers to receive vaccinations ($p=0.03$), and that more caregivers without medical coverage stated that they intended to vaccinate both sons and daughters than those with medical care insurance ($p<0.05$). Accordingly, in regions with low immunization rates, like sub-Saharan Africa, these factors may have a negative impact on immunization intention and utilization.

This is true in Kenya, as observed in a study steered in Nairobi City County, where HPV vaccination awareness differed across socio-demographic strata (Kairithia et al., 2016). The Nairobi study found that HPV vaccine awareness increased with age, as it was higher among older women (39-45 years) than women of lower age groups ($p=0.000$). Similarly, women who had attained tertiary education level were more probable to be aware of the vaccine than those with lower level of education ($p=0.000$). The same study recorded associations between type of occupation ($p=0.000$) and level of income ($p=0.000$), with women in stable careers and those with higher incomes demonstrating awareness of the vaccine. Considering the role of knowledge and awareness in predicting vaccination intent and consequent decisions (Zhou et al., 2019), sociodemographic variables seem to have a major impact on HPV immunization in Kenya.

This association was evident in a Ugandan study, where parental employment status, age, and education level influenced the likelihood of adolescent vaccination (Ndibazza & Barugahare, 2024). In the study, parents working as civil servants (Odds Ratio 2.36) or running businesses (Odds Ratio 1.26) had higher odds of vaccinating their children than unemployed parents. Only the correlation with parents who work as civil servants, however, was of statistical significance ($p=0.001$). Similarly, older parents (odds of 0.78 for the 30-44 age group and 0.61 for the 45-60 age group) and those with tertiary education (odds of 1.53) showed similar trends, though they were not significantly different ($p=0.382$; $p=0.183$, $p=0.517$, respectively).

The literature shows that sociodemographic variables predict adolescent health behaviors and outcomes. Studies reviewed demonstrate that sociodemographic variables have a role in determining HPV vaccination rates, especially in developed countries. However, in Kenya,

no research has been done on the relationship between HPV immunization uptake and awareness. In order to address this dearth of previously published data, this investigation aimed to determine the demographic characteristics determining HPV vaccine uptake.

2.2.3 Parental Perceptions of HPV Vaccination

Since parents are the principal decision-makers in their adolescent children's health matters, most preventive health measures taken by these age groups are connected to a parent's intentions. According to Zhou *et al.* (2019), strategies to improve adolescent healthcare should be tailored for and targeted to their parents. In their study, the authors explored the parental psychological factors in predicting HPV vaccination intent. Their results indicated that consciousness of the vaccine and intention to vaccinate are intertwined. Consequently, parental views about the vaccine, its capabilities, and side effects are motivating factors for vaccination or lack thereof.

This is further illustrated in a Nigerian study where HPV vaccination intent was high, and attitudes played a critical role in determining vaccination intent (Balogun & Omotade, 2022). According to the cross-sectional investigation, parents who felt positively about the vaccine's function and importance in preventing cancer were substantially more inclined to have their teenagers immunized. Their results showed that parents with a good experiential attitude towards vaccination had a higher likelihood of vaccinating their children than those with a poor attitude ($p < 0.01$). Similar findings were made regarding the predictive power of perceived descriptive and injunctive norms for HPV immunization in Ugandan children ($p < 0.01$). The two also noted that parents' unfavorable opinions regarding the vaccine's adverse effects would probably result in non-vaccination. Adolescents who had a favorable attitude toward HPV immunization were also more likely to receive it. Adolescents

interviewed for a high immunization rate study in Brazil showed that having a positive outlook improves the likelihood of receiving a vaccination (Galvão et al., 2022). The study results indicated an odds ratio of 1.50 ($p=0.019$) and 2.09 ($p=0.015$) of being vaccinated among adolescents with a positive attitude and those who were knowledgeable about HPV vaccination, respectively.

Additionally, according to Naoum et al., (2022), immunization among Greek adolescent girls is predicted by parental opinions regarding the vaccine and its application. According to the authors' research, parents' perceptions of HPV's contagiousness and the vaccine's supposed ability to avert cancer affected their decision to vaccinate. The findings showed that parents who had vaccinated their children perceived that it was easier to contract HPV than parents who had not vaccinated their daughters ($p<0.001$). Likewise, parents who believed that HPV immunization was a major factor in preventing cancer of the cervical cavity were 1.50 ($p<0.001$) more probable to vaccinate their daughters. Additionally, adolescents were less probable to be immunized if their parents disbelieved in medical authority when it came to preventing illnesses (Odds Ratio=1.205, $p=0.001$).

An intervention that implemented a parental HPV education program found significant changes in perception post-education in Indonesia (Sitaresmi et al., 2020). First, the researchers evaluated awareness, acceptability, and vaccination uptake and found them low. After the two-month education program, parents were found to have improved awareness and perception of vaccination for HPV. The research population's acceptability and vaccination uptake were predicted by these improvements. This was demonstrated by the bivariate analysis's findings, which indicated that after the intervention program, high HPV immunization acceptability was linked to better perceptions of infection with HPV (odds

ratio=1.13), cervical carcinoma (odds ratio=1.30), and HPV immunization (odds ratio=1.62) ($p=0.000$).

Therefore, vaccination intent and behavior can be improved by tactics meant to improve parental attitudes. Given the high level of immunization hesitancy in Africa, this could be crucial. According to a recent investigation conducted in Kenya, parental perceptions were the reason behind parents' reluctance to immunize teenagers (Kolek et al., 2022). Concerns were raised about the immunization safety as well as the recommended vaccination age. Parents who had favorable opinions about the safety and effectiveness of the vaccine were more likely to get their children vaccinated than parents who had unfavorable opinions (odds ratio=2.395, $p=0.001$). Parents with a negative perception of these aspects reported unwillingness to vaccinate their children. The same study unveiled a high involvement of adolescents (59%) in the decision-making process. As such, parental intention may not always predict vaccination uptake. This indicates that a parent's negative perception may be canceled out when the adolescent's positive perception leads to a willingness to vaccinate. Contrastingly, a Kenyan intervention study found that while some interventions may change safety perceptions of the HPV vaccine, this may be insufficient to change the decision of those hesitant to vaccination to vaccinate (Horn et al., 2021). The researchers found no statistically notable distinctions in the perceived safety of the vaccine following a doctor's endorsement ($p=0.22$). The unchanged perception could indicate a mistrust of healthcare professionals among the population studied. The study also reported increased vaccination intention after a doctor's endorsement of the vaccine. However, the study did not investigate the direct relationship between perception change in vaccine safety and vaccination intent. These studies demonstrate that parental perceptions are vital in vaccine acceptability, intent,

and willingness. On the other hand, not enough information is available regarding its ability to forecast actual immunization rates, particularly when considering countries that are developing. The present investigation intended to assess parents' perceptions of adolescent girls on HPV immunization uptake among girls in Kibra Sub County, Nairobi City County, Kenya, as there are currently no studies examining the relationship between parental perceptions and vaccination rates in Kenya.

2.2.4 Healthcare-based Factors in HPV Vaccination

The rate at which a country's healthcare system meets its targets is evidence of the efficiency of its health system. The adoption of medical services at the community and medical institution levels is influenced by national and health facility policies, programs, and procedures as well as how they are implemented. According to Mansfield et al., (2021), the quality of health services is determined by the efficiency and effectiveness of healthcare systems. Aspects of healthcare delivery such as resource allocation, communication, and appropriate planning are critical to the success of healthcare agendas such as HPV vaccination.

As Rodriguez et al., (2020) observed, systems at the health facility level significantly predict HPV vaccination outcomes. In the systematic review of studies done in developed countries, the authors highlighted that healthcare providers who implement systems to enhance vaccination recorded higher vaccine initiation and completion rates. Such systems include recommending the vaccine to the target population, reminder systems, and targeted education on HPV vaccination.

It has been demonstrated that provider recommendations play a significant role in forecasting HPV immunization rates in the United States. According to an Alabama investigation, the

majority of parents who been immunized their kids said their doctor had recommended it (Boitano et al., 2021). The study also mentioned that the level of importance the medical professional gave to the vaccination was proportional to the urgency with which parents vaccinated their children. Parents whose healthcare provider gave them the impression that it was important ($p<0.001$) or urgent ($p=0.05$) to vaccinate their children were likely to vaccinate their children on the same day or schedule a vaccination date. Contrastingly, a Kenyan randomized study observed that interventions to improve awareness by health providers do not necessarily improve vaccine perceptions and intention to vaccinate (Horn *et al.*, 2021). In this study, respondents were exposed to a visual representation of a doctor's recommendation to vaccinate. Both before and after exposure, their opinions about the safety of immunizations and their intention to get immunized were assessed. According to the results, there were no differences between the control and treatment groups' intentions to get immunized or their perceptions of vaccine safety.

Studies involving healthcare workers have also identified the role of aspects of the health facility's vaccination delivery in vaccination uptake. In one study, a lack of communication and coordination between the health facility management, health extension workers, and the community was attributed to low uptake (Beyen *et al.*, 2022). Increased vaccine uptake was associated with the availability of HPV-related information due to awareness creation by healthcare providers in schools (odds ratio=2.533, $p<0.001$). The study also reported that health promotion contributed to vaccination while communication breakdowns caused failure to vaccinate by willing parties. In another study, healthcare workers reported inefficiencies in the health system that contributed to the low vaccination rates experienced (Nabirye *et al.*, 2018). These included intermittent vaccine supply, poor communication on

vaccination goals at the facility level, and failure to train health workers on the same. These factors leave the health facility poorly equipped to deliver vaccination services and demoralize the public from seeking vaccination services.

It is imperative to comprehend whether these aspects contribute to the hesitancy reported in Kenyan studies. While one study has established that provider recommendation may not boost vaccine intent in some populations (Horn *et al.*, 2021), it is unknown whether this trend is mirrored in all Kenyan populations. It is also undetermined whether the factors identified in other studies as pertinent in predicting vaccination intent influence vaccination rates in Kenya. Therefore, the present study seeks to investigate these factors and their association with vaccination uptake in Kibra Sub County, Nairobi City County, Kenya.

2.3 Theoretical Framework

The present investigation assessed parental traits, including demographics and attitudes, and their impact on adolescents' adoption of the HPV vaccine. Studying the medical setting and how it affects vaccination uptake behavior was another goal. In order to explain health behavior, the investigation used the health belief model.

2.3.1 The Health Belief Model

The Health Belief Model (HBM), which predicts and explains differences in individual behavior, is one of the most popular models for considerate health-related behavior. People's views on health issues are valued in the health belief model because they are a powerful predictor of behavior related to health (Mckellar & Sillence, 2020). The model's main variables include a person's perception of their vulnerability to a medical condition (perceived susceptibility), their perception of the repercussions (perceived severity), their perception of the potential benefits of taking action (perceived benefits), their views on the

barriers to taking action, their exposure to aspects that motivate them to take action (perceived cues to action), and their belief in their own ability to succeed (self-efficacy).

The HBM was developed in the early 1950s by social scientists employed by the US Public Health Service to investigate the causes of people's low participation in screenings and preventive medical interventions (Baldemor et al., 2024). Later, HBM was used to track patients' responses to therapy and adherence to medication. Health-related beliefs about susceptibility to a specific public health risk and views about the impacts of the problem all fall under the scope of general health values. All these health values play a role in how seriously one takes the threat to one's health behavior, as predicted by the model (McKellar & Sillence, 2020). If a person is aware of a potential danger to their health, they are more likely to take the necessary preventative measures. They are also encouraged to take action and assured that the benefits outweigh the dangers. (McKellar & Sillence, 2020). One of the main reasons why HBM is considered a strong model is because many of its principles have face validity as they were established by researchers who have experience with health behaviors (Norman & Conner, 2017). Part of the reason for the model's success is that it effectively operationalizes a number of cognitive traits in a way that makes sense and has a direct bearing on how behaviors associated with health are carried out.

The health belief model is adaptable for designing both immediate and prolonged interventions. The model's effectiveness in pinpointing crucial decision junctures that impact health behaviors hinges on five significant factors tied to action. Medical care requires assessments and other studies to identify the population or populations that should be targeted; clearly and succinctly communicating the consequences of health issues brought on

by risky behavior to raise the apparent seriousness of the situation; emphasizing the advantages of leading a healthy life style; and fostering a supportive social environment that encourages positive behavioral change. Because it offers an in-depth comprehension of wellness behaviors by considering perceived factors like vulnerability, degree of severity, benefits, obstacles, signals to action, and self-confidence, the HBM was used in the study. Since the model has been thoroughly examined and proven in a variety of medical settings, it also has empirical support. Additionally, the model is easily adaptable to different populations and health behaviors.

The Health Belief Model

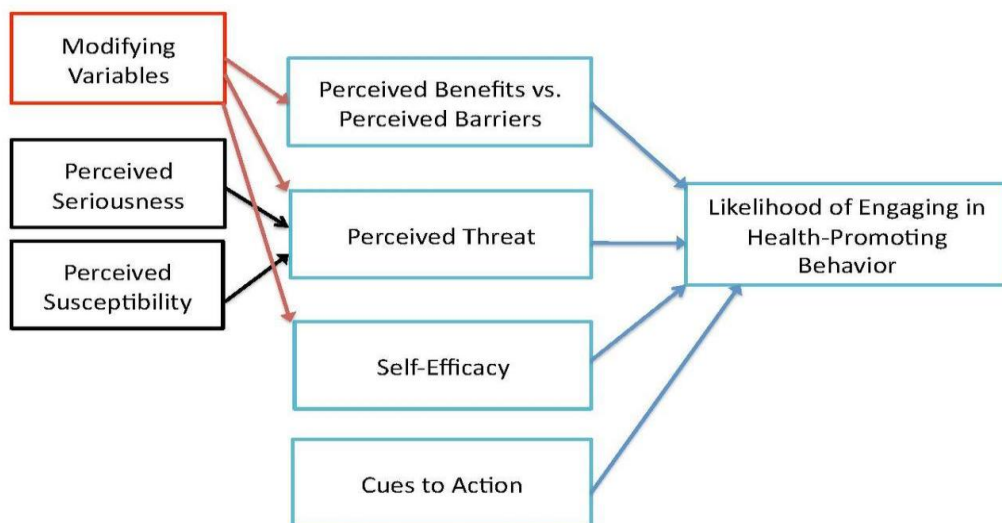


Figure 2.1: The Health Behavior Model

2.4 Conceptual Framework

The correlation between the study variables are depicted in the conceptual framework in figure 2.2. Adoption of the HPV vaccine is the dependent variable, and policymaking is the intervening variable. Parental attitudes, healthcare-related factors, and sociodemographic characteristics were examples of independent variables.

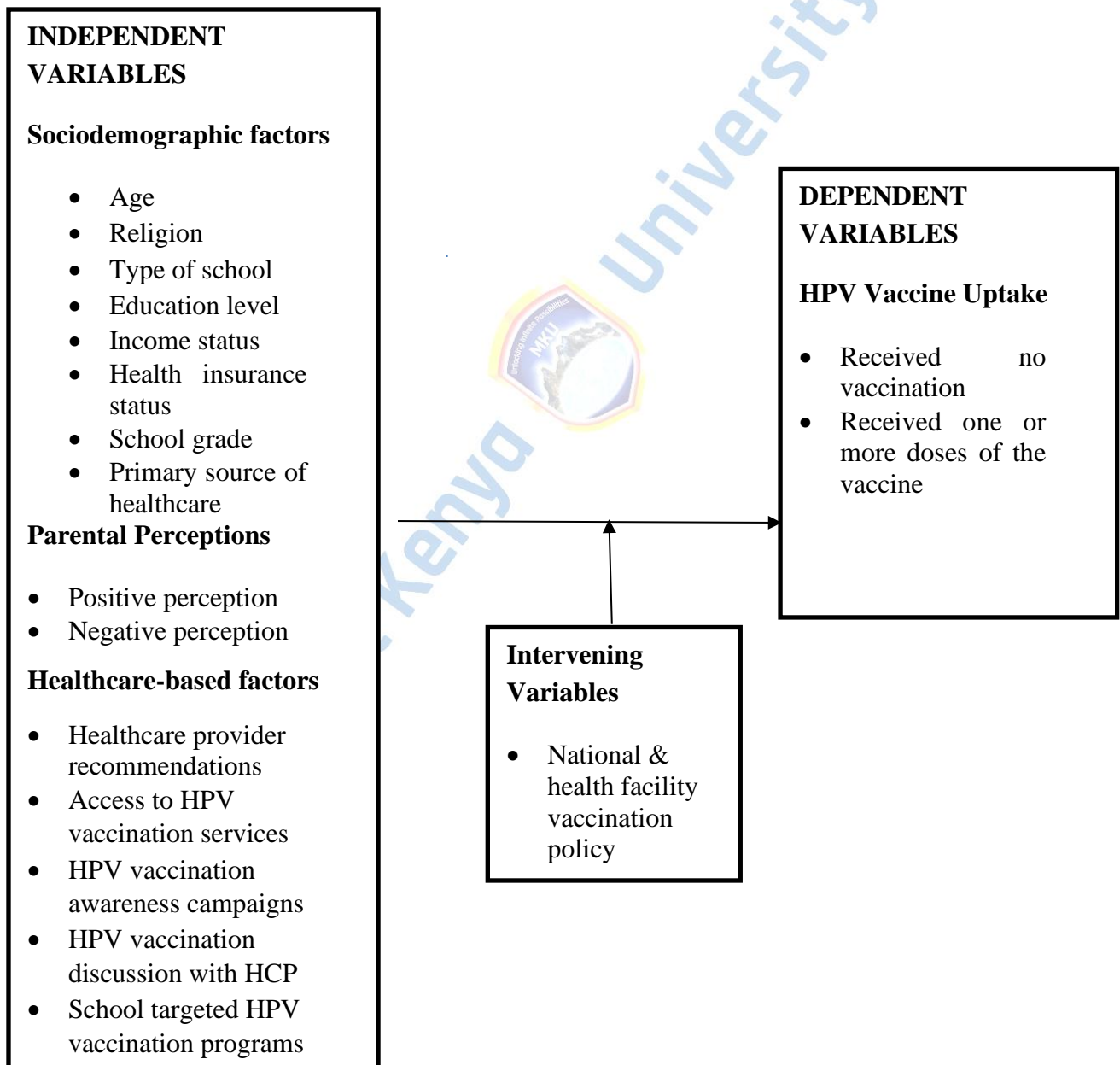


Figure 2. 2: Conceptual framework

2.5 Recap of Literature Review

According to the literature review, sub-Saharan African nations have not yet met their goals, despite the developed world having successfully adopted HPV immunization. Low HPV immunization uptake has been reported in Ethiopia, Uganda, and Kenya, according to previous investigations (Mabeya et al., 2018; Nabirye et al., 2020; Beyen et al., 2022). In 2019, Kenya was the last of these three nations to introduce vaccination. Because the empirical data that is currently available was derived from pilot and demonstration projects, there is a lack of investigation on HPV immunization uptake after implementation.

Parents who plan to vaccinate and parents who are hesitant about vaccinations differ sociodemographically, according to reviewed data. According to the investigations reviewed, vaccine knowledge and awareness vary by socioeconomic level (Kairithia et al., 2016; Zhou et al., 2019). Education, income, ethnicity, age, and vaccination were found to be associated with findings from investigations examining the sociodemographic differences between adolescents who received vaccinations and those who did not (Tsui et al., 2013; Grandahl et al., 2017; Kepka et al., 2018).

Additionally, the review discovered empirical evidence to back up the existence of unfavorable opinions regarding the safety and effectiveness of vaccines as well as a lack of trust in the medical system. According to the reviewed literature, these perceptions have been associated with vaccination acceptability, willingness, and intent (Balogun & Omotade, 2022; Kolek *et al.*, 2022). Additionally, healthcare workers report inefficiencies in implementing the vaccination framework as hindrances to national and health facility vaccination efforts (Nabirye *et al.*, 2018; Beyen *et al.*, 2022). The investigation also found that participants reported challenges in vaccine information dissemination, access, and

communication, while provider recommendations encourage vaccination intent and initiation (Rodriguez *et al.*, 2020; Boitano *et al.*, 2021; Horn *et al.*, 2021).

The evidence under review suggests a connection between HPV vaccination and sociodemographic characteristics, parental attitudes, and aspects of the healthcare system. Instead of mentioning actual immunization uptake, the majority point to a connection with acceptability, eagerness, awareness, and intent. Adolescent girls' vaccination uptake in relation to these factors is also not highlighted in the few studies that have been done in Kenya. Thus, the goal of the investigation was to determine whether these variables and immunization uptake are related.

The materials and methods that were employed during the investigation are explained in this section. The population being studied, the location, variables, gathering data tools, and procedures are all explained, along with the investigation's methodology. Additionally, methods for data analysis, concerns about ethics, and sampling strategies and processes are covered in this section. Using this theory, the researcher assumed that sociodemographic factors contributing to perceived and actual control over vaccination behavior predict actual vaccination. Further, the theory assumed that perceptions for vaccine for HPV predict the choice to vaccinate. The study used the general systems theory to form the hypothesis that various factors in the various elements of the healthcare system work together to predict the success of HPV vaccination at the health facility level.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The materials and methods that were utilized in the investigation are explained in this section. The population being studied, the location, variables, gathering data tools, and procedures are all explained, along with the investigation's methodology. Additionally, methods for data analysis, ethical considerations, and sampling strategies and processes are covered in this section.

3.2 Research Design

The research employed a quantitative, analytical, cross-sectional design, complemented by qualitative methods. Information on the sub-county's immunization status and healthcare-related factors believed to influence HPV vaccine uptake was collected using quantitative approaches. Additionally, qualitative data were gathered through interviews with heateachers and healthcare professionals working in schools. Both descriptive and analytical techniques were used to examine variable relationships and summarize frequency and distribution. The cross-sectional design was effective in allowing data collection on all relevant variables at a single point in time. Analytical methods assessed correlations between variables, while descriptive methods helped interpret data patterns and trends.

3.3 Variables

The study investigated the state of vaccine uptake among adolescent girls (10-14 years old) attending primary schools in Kibra Sub County and associated factors. These included sociodemographic factors, healthcare-based factors, and parental perceptions of HPV vaccination. The HPV vaccine uptake was the dependent variable and these factors made up the independent variables. In this study, they were considered to have achieved HPV vaccine

uptake if they had received at least one dose of the HPV vaccine. In this investigation, national and facility health policies were regarded as the intervening variables. The sociodemographic variables investigated included age of the adolescent parent, religion, school grade, type of school, health insurance status, education level of the adolescent parent, income level, and the primary source of healthcare. Parental perceptions whether positive or negative perceptions regarding the HPV vaccine were evaluated. Access to HPV vaccination services, recommendations from medical professionals, awareness campaigns, conversations with medical professionals regarding HPV immunization, and school-specific HPV immunization programs are among the healthcare-based factors that were examined. The percentage of teenagers who have received at least one dose of the HPV vaccine was used to gauge vaccine uptake.

3.4 Location of the Study

Nairobi City County was the site of this investigation. The most populous county in Kenya. The County is home to more than 4.3 million people, with a population density of more than 6,000 people per square kilometer, as reported in Kenya's 2019 census (KNBS, 2019). The County constitutes seventeen sub-counties, 205 public schools, and 2,000 private primary schools. The study will target schools in the Kibra sub-county in the southwestern part of the County. Kibra is located 5 Kilometers from the central business district of Nairobi city, at a latitude of -1.312217 and longitude 36.791376, and covers an area of 12 km². In Kibra Sub-county, there are nine public schools and 82 private schools. The residents of Kibra engage in various economic activities among them, informal trades, Domestic work for wealthier homes, transportation, artisan work, and manual labor in construction sites, and factories. Some of the residents, however, resort to begging to make ends meet. According the Muasa

& Nzioka, (2017) there are 47 health centers in the Kibra among which only one is a public health center. Kibra Sub County is the largest informal settlement located in Kenya, it was selected since the population with its unique socio-demographic characteristics, which provided valuable insights into the prevalence, risk factors, prevalence, and vaccine uptake in similar communities.

An illustration of the study location is shown in Appendix 8

3.5 Target Population

The investigation focused on the parents(guardians) of teenage girls in Kibra Sub-county who were enrolled in primary schools and were between the ages of 10 and 14. Both public and private schools were the focus of the investigation. A self-administered questionnaire was used to invite the parents to participate in the research investigation. Parents who took part in the investigation gave their informed permission. The investigation consisted of school heads, and healthcare professionals working in schools located within Kibra Sub-county. To gain insights from them, key informant interviews were conducted with them into the school-level policies, practices, and support related to HPV vaccination programs. Significant insights regarding the obstacles and enablers for accepting the HPV vaccine can be well understood by getting to understand the school's perspective. Like the parents, informed consent was also obtained from the key informant interviews.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

The research subjects encompassed parents of girls aged between 10-14 years of age and who provided their consent for study participation. School heads or healthcare professionals working in educational institutions within the Kibra sub-county were also involved in the

study. Those directly involved in school-level health programs or decision-making processes were included in the study.

3.6.2 Exclusion Criteria

All study subjects who fulfilled the requirements for inclusion were not encompassed in the investigation; however, those who were ill at the time of the investigation were not included.

All school administrators and school-level medical personnel who were ill at the time of the investigation or who did not provide informed consent were omitted from the investigation.

3.7 Sample Population

According to Pourhoseingholi *et al.* (2013), Fisher's formula is appropriate for calculating sample size in medical studies adopting a cross-sectional approach.

$$N_0 = \frac{Z^2 pq}{e^2}$$

Where:

N_0 = desired size of the sample.

Z = is the statistic conforming to the level of confidence of 95% (equal to 1.96).

➤ P = the proportion of incident of the phenomenon, p is set at 50% (0.5)

q = the proportion of non-occurrence (1- p)

e = is precision corresponding to effect size [0.05 for 95% significance level].

$$N_0 = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384.16$$

$N_0 =$ approx. 384 respondents

Attrition rate of 10%

The sample size was $384 \times 1.1 = 422$ Respondents

3.8 Sampling Procedures and Techniques

Using random sampling with stratification, the schools were divided into public and private establishments. The Neymans equation, which reads $n_h = (N_h / N) * n$, was used to calculate the sizes of the samples for the strata. In this equation, n_h represents the sample size for stratum h , N_h represents the overall size of population for stratum h , N is the total population size, and n is the size of the entire sample. There were 5316 teenage girls in grades 4–8 attending private schools, while there were 4868 teenage girls in grades 4–8 attending public schools. 10,184 girls were in their adolescent years overall, ranging from the fourth to the eighth grade.

$$N_{\text{Private}} = (N_h / N) * n = (5316/10184)422 = 220$$

$$N_{\text{Public}} = (N_h / N) * n = (4868/10184)422 = 202$$

The Strata sample size for adolescents in private schools was 220, and the sample size for girls in public schools was 202. Simple random sampling was used to choose the schools and subjects for the investigation (random numbers were generated using Microsoft Excel).

The number of private and public schools selected depended on the ratio of girls in public to those in private schools. The ratio of adolescent girls in public to adolescent girls in private primary schools in Kibra is approximately 1:1. The study selected 4 public and 4 private schools.

3.9 Construction of Research Instruments

3.9.1 Questionnaire

A key informant interview schedule and self-administered questionnaires were employed in the research to gather data from the participants. Three sections made up the questionnaire, which evaluated objectives one through four. Data on the adoption of HPV vaccines was collected in the first objective, followed by data on the social demographic variables influencing utilization, data on parental perceptions influencing utilization, and data on medical factors impacting utilization of HPV immunizations in the second and third objectives, respectively.

Objective 1. To establish the HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County.

HPV vaccine uptake was assessed using a self-administered questionnaire in Appendix 1.2 Part II. The respondents were required to provide information on whether or not the adolescent has received the vaccine, the number of doses received, the place where the vaccine was, and for those who did not receive the vaccine, they were asked to give reasons why.

Objective 2: To determine sociodemographic factors influencing HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County

Social demographic characteristics were assessed using a structured questionnaire in Appendix 1.2 Part I. It was assessed by asking for the Age of the parent, the age of the pupil,

religion, the type of school, the Grade in which the adolescent is, the health insurance status, the parent's level of income, the parent's level of education, and the primary source of healthcare.

Objective 3: To evaluate parental perceptions influencing HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County

Parental Perceptions influencing HPV vaccine uptake were assessed using a self-administered questionnaire in Appendix 1.2 Part III. The respondents were assessed by inquiring the source of information on vaccines, and a Likert scale was used to assess how much they agreed with various specs of the vaccine.

Objective 4: To determine healthcare-based factors influencing HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County

A questionnaire that was self-administered and the investigator's administration of the KII Guide in Appendix 1.3 were used to evaluate healthcare factors determining vaccine use. The medical professionals and school administrators responsible for administering vaccinations to schoolchildren

3.10 Pre-testing

A total of 42 participants from Olympic Primary School participated in a pre-test study to define the validity of the investigation tools. To ascertain the reliability, the outcomes were examined and the internal consistency tests were conducted.

3.11 Validity and Reliability of Instruments

3.11.1 Validity of Instruments

To prove the validity of the investigation tools, face and content validity were used. The investigator assessed the instruments to make sure they precisely measured the variables in order to establish face validity. The pilot study respondents were also asked to appraise the instruments by rating their effectiveness. The researcher recruited experts in healthcare research to establish content validity. Three experts were asked to evaluate the instruments and verify their ability to measure the variables under study. The supervisors as well reviewed the content accuract of the research instruments.

3.11.2 Reliability of Instruments

To ascertain the internal consistency, the investigation's instrument's reliability was examined. To ascertain the extent of interrelatedness among the questionnaire's items, the Cronbach's alpha reliability coefficient was tested using SPSS. Internal consistency was examined in the data for every variable in the survey. Using SPSS version 29, Cronbach alpha was used to determine the level of internal consistency. An internal consistency of greater than 0.7 is accepted in the literature. An internal consistency score of 0.88 was found in this investigation, indicating that the questionnaires were trustworthy for gathering data.

Table 3.1: Reliability test results.

Reliability Statistics		
	Cronbach's Alpha ^a	N of Items
HPV uptake	.97	3
Socio-demographic factors	.83	8
Parental perception	.88	11
Health casre-based factors	.85	7

3.12 Data Collection Procedure

Key informants were interviewed, and respondents filled out surveys that they administered to provide info. Assistant researchers who had received training in data collection techniques were employed by the researcher. Before distributing the questionnaire or speaking with a key informant, the study's assistants made sure the participants were fully informed before giving permission to participate. Face-to-face interviews were employed to administer questionnaires. Interviews were conducted with key informants and recorded and later transcribed. The key informants include head teachers in the selected schools and healthcare staff involved in the vaccination program. To gather information on sociodemographic factors, participants were prompted to give answers to queries regarding their sociodemographic background. These included age, religion, type of school, income status, level of education, health insurance status, school grade, primary source of healthcare. Five-point Likert scale questions about vaccine efficacy, safety, and HPV risk were given to the respondents, who were then asked to share their opinions. Questionnaires about acquiring the HPV vaccine for HPV were used to gather data on vaccine uptake.

To gather data on healthcare-based factors, health policy, and viewpoints on the immunization program, key informants participated in structured in-depth interviews. The study subjects were asked to share their knowledge and opinions about the HPV immunization infrastructure that is currently in place at the school, sub-county, and national levels. Participants were also asked for their opinions on the current national, county, and facility health legislation that influences the sub-county's HPV immunization utilization.

3.13 Data Analysis Techniques and Procedures

Following gathering the data, Statistical Packages for Social Sciences (SPSS) version 29 was used for analysis after the data had been cleaned and coded. The data was described using both descriptive and inferential statistics. The data were described using measures of central tendency. Frequencies and percentages were among them. Binary logistic regressions and chi-square tests were employed as inferential statistical tests. Using these techniques, correlations between the variables that are dependent and independent were assessed; a p-value of less than 0.05 was deemed noteworthy. Tables and figures were employed to display this data. Themes were identified by sorting and coding the data from interviews with key informant.

For the KIIs, the audio recordings were transcribed into written text which then were coded by identifying similar themes and ideas related to the research questions. The coding employed inductive coding techniques since these allowed the researcher to use most of the relevant information provided by the respondents. Once the codes were developed, the transcripts were analyzed using NVIVO software using it. The data's trends, themes, and patterns were found using the software. In order to create a cohesive narrative that addresses the issues under investigation and captures the experiences and viewpoints of the subjects,

the outcomes were then combined. The results were interpreted by providing the context of the study, comparing contrasting views of different participants, identifying areas of agreement between the participants, and comparing the findings with those of the qualitative data.

3.14 Ethical Considerations

The Ethical Review Council at Mount Kenya University was contacted for approval. Additionally, the investigator applied to the National Commission for Science, Technology, and Innovation (NACOSTI) for permission to conduct the investigation. Permission to conduct the investigation was granted by the Kibra Sub-county Education Office, the Ministry of Education, and the administrators of a few chosen schools. Subjects in the investigation gave their informed approval to partake in the investigation. Since the study targeted adolescent girls, assent was obtained from the participants, and informed consent was sought from their respective guardians prior to data collection. The research assistants were furnished with the details about the study to the participants before deciding whether to participate. Confidentiality was maintained by using codes on the questionnaires and securing and limiting access to participants' data to the researcher alone. Since the study targeted adolescent girls, assent was obtained from the participants, and informed consent was sought from their respective guardians. To ensure ethical compliance, strict measures were taken to uphold anonymity and confidentiality; no identifying information was recorded, and all data were securely stored and accessed only by authorized research personnel. Introductory letter shown in Appendix 4, NACOSTI license shown in Appendix 5 & County Commission permit shown in Appendix 6, Regional Education office and Kibra Sub County Education offices permit shown in Appendix 8.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Preamble

The investigation response rate, HPV immunization uptake, social-demographic factors, healthcare-based factors, and perception level influencing HPV immunization uptake among school-age adolescent girls (10–14 years old) in Kibra sub-county, Nairobi city county, Kenya, are all provided in this section.

4.2 Research Response Rate

In the present research, 422 eligible subjects were given questionnaires. The investigation's 91.2% response rate means that 385 of the questionnaires were deemed suitable for analysis of the data.

4.3 Uptake of HPV Vaccine

Close to a third (29.9%) of the investigation's subjects had received the vaccine for HPV, as shown in Table 4.1 below. Conversely, nearly three-quarters (70.1%) of the study subjects had not received the vaccine for HPV. The results of this investigation closely matched those of an investigation conducted in SSA (28.53%)(Asgedom et al., 2024). This contrasted with a separate investigation conducted in Ethiopia that found a 48.6% HPV vaccine uptake rate(Dawud et al., 2023) and another conducted in Kenya that found a 13.2% HPV vaccine uptake rate(Martin, 2022). Thirty-three percent of the investigation's participants reported receiving their second dose, whereas over half (67%) had received their first. While only a small percentage of the subjects (26.7%) reported paying for HPV immunization services, the majority (71.3%) reported not paying for such services. Finally, with regard to the location of HPV immunization services, the majority of the subjects in the study (70.1%)

reported receiving them at the school, whereas a small minority (20.9%) reported receiving them at a medical facility.

Table 4:1 Uptake of HPV vaccine

Independent variables	Categories	Frequencies	Valid percentage
Uptake of HPV Vaccine	Yes	115	29.9
	No	270	70.1
HPV doses administered	1 st dose	77	67
	2 nd dose	38	33
Vaccines payment	yes	33	28.7
	no	82	71.3
Place where the vaccine was received	At school	91	79.1
	Healthcare facility	24	20.9

4.4 Descriptive Statistics on Social Demographic Characteristics

Descriptive statistics on the social demographic traits of the investigation's subjects are shown in Table 4.2 below. In terms of the guardians' ages, over one-third (40.3%) of the investigation's participants' guardians were in the 34–40 age range, which may be associated with prime parental age, as most of the guardians have school-age children. Just 14.8% of the guardians of those who participated were in the 27–33 age range. In terms of the investigation's participants' academic standing, nearly half (48.1%) were in grades 4–6, while over half (51.9%) were in grades 7–8, which may be related to their age. In terms of the guardians' educational attainment, only a small percentage (15.1%) had completed tertiary education, while over a third (39%) had completed primary school, which may be related to the fact that primary and secondary education in Kenya are free. Regarding the status of household health coverage, Only a small percentage of households (19.5%) had health coverage, while the majority (80.5%) did not, which may be related to the high cost of living making it difficult to afford personal health insurance. With respect to Daughters' primary source of healthcare, More than half (54.5%) of the study respondents obtained their care from community health clinics. Community health clinics are often located within residential areas, making them easily accessible for adolescents and their families. This reduces the travel time and costs associated with receiving vaccinations. Only a few (13.5%) obtained healthcare services from a physician. More than half (54%) of the investigation's participants had household incomes between 1 and 10,000 Kshs, which may be related to the nation's high rates of inflation and limited job opportunities. Of the investigation's participants, only a small percentage (11.2%) made between 30001-40000 Kshs. Nearly three-quarters (72.2%) of the investigation participants identified as Christian, which may be connected to high birth

rates among Christians, which have also helped to sustain and increase the percentage of Christians in Kenya. However, a majority of the investigation's participants (27.8%) identified as Muslim. Finally, in terms of the investigation's participants' educational background, nearly three-quarters (71.7%) attended public schools, which may be related to the high cost of education in the county and the availability of free primary education nationwide. In contrast, over a quarter (28.3%) attended private schools.



Table 4:2: descriptive statistics on social demographic characteristics

Independent variables	Categories	Frequencies	Valid percentage	Mean	STD
Age of the respondents				12.05	1.30
Age of the guardian	27-33	57	14.8		
	34-40	155	40.3		
	41-47	115	29.9		
	48-54	58	15.1		
School grade	4 th -6 th grade	185	48.1		
	7 th -8 th grade	200	51.9		
Guardian's level of education	Never been to school	52	13.5		
	Primary	150	39		
	Secondary	77	20		
	Vocational	48	12.5		
	Tertiary	58	15.1		
Daughters' primary source of healthcare	Physician	46	11.9		
	School-based clinic	69	17.9		
	Community clinic	210	54.5		
	Private clinic	60	15.6		
Household health insurance status	Insured	75	19.5		
	Not insured	310	80.5		
Household income level	1-10000	208	54		
	10001-20000	84	21.8		
	20001-30000	50	13		
	30001-40000	43	11.2		
Religion	Muslims	107	27.8		
	Christians	278	72.2		
Type of school attended	Private	109	28.3		
	Public	279	71.7		

4.5 Social demographic factors associated with the uptake of HPV vaccines

The chi-square test of independence and binary logistic regression were used to establish the relationship between social demographic factors and HPV vaccine uptake. As shown in the following Tables 4.3 and 4.4. Regarding the guardians' ages, over one-third (36.8%) of those who had their daughters vaccinated against HPV were in the 27–33 age range. Higher educational attainment is correlated with a greater comprehension and acceptance of medical advice by many parents between the ages of 27 and 33. When it comes to the safety and effectiveness of vaccine for HPV, they are more inclined to believe scientific studies and medical experts. The HPV immunization uptake and the age of the investigation's participants' guardians were statistically significantly correlated ($\chi^2=11.999$, $df=3$, $p=0.007$). A significant correlation between the age of the investigation participants' guardians and their uptake of the HPV vaccine was also discovered by additional logistic regression analysis (table 4.4) ($P=0.009$). Additionally, the guardians of the subjects who were between the ages of 34 and 40 had a 4.7 higher likelihood of having daughters who had received an HPV vaccination than those whose guardians were between the ages of 48 and 54. Parents in this age range are typically more aware of preventive healthcare practices and more health-conscious. They have a greater likelihood to understand the advantages of vaccinations, such as the HPV vaccine, and the significance of shielding their kids from diseases that can be avoided.

The results of this research were consistent with an investigation conducted in Ethiopia that found a relationship between the age of the investigation's respondents' guardians and their uptake of the HPV vaccine (Dawud et al., 2023). Similar outcomes were found in a separate

investigation conducted in Nigeria, which found that having a young Guardian doubled the likelihood of receiving the vaccine for HPV (Azuogu et al., 2019).

Taking into account the investigation's participants' academic standing, Nearly a third (31%) of those who participated who reported receiving the HPV immunization were in the 7th–8th grade, as shown in Table 4.3. Most children between the ages of 10 and 14 are usually in the 7th and 8th grade. Since the vaccine for HPV is most efficient when given prior to being exposed to HPV, which is frequently spread through sexual contact, this is the ideal age to receive it. Children who receive vaccinations at this age will be protected before they engage in sexual activity. There was no statistically noteworthy correlation between school grade and vaccine uptake for HPV, according to the chi-square test of independence ($\chi^2=0.303, df=1, p=0.615$).

One of the key informants described the qualitative results as contradicting these findings; *“Many HPV vaccination programs in Kenya are integrated into school health initiatives. Schools provide an efficient and effective platform to reach large numbers of children in this age group, ensuring high coverage rates. School-based programs also reduce logistical barriers for parents and guardians.....”* (KII 4, Health care staff)

The findings of the present investigation coincided with those of a research investigation conducted in SSA that found no correlation between the HPV vaccine uptake and the school grading system (Asgedom et al., 2024).

As for the guardian's educational attainment, Table 4.3 shows that over half (52.1%) of the investigation's participants who received an HPV vaccination had guardians who had completed a vocational level of education. Better understanding of health topics is frequently associated with higher education. The advantages of vaccinations, such as the HPV vaccine, and the significance of preventative care are more likely to be understood by educated parents. A statistically significant correlation between guardians' educational attainment and HPV immunization uptake was found by the chi-square test of independence ($\chi^2=30.219, df=4, p<0.000$).

Additional logistic regression analysis (table 4.3) revealed a significant correlation ($p<0.000$) between the investigation participants' guardian's educational attainment and HPV vaccine uptake. Furthermore, subjects with only a primary education were four times less likely than those with a tertiary education to have daughters who had received HPV immunization. Reduced health literacy is frequently correlated with lower educational attainment. Guardians may be reluctant or refuse to vaccinate their children because they find it difficult to comprehend medical information and the advantages of vaccinations, such as the HPV vaccine.

These findings also agreed with the qualitative findings where one of the key informants narrated that;

“Guardians with low education levels are more susceptible to misinformation and myths about vaccines. They may be influenced by anti-vaccine rhetoric or false information about the safety and efficacy of the HPV vaccine. Guardians with lower education levels may have a mistrust of healthcare providers or the medical system. This distrust can stem from past

negative experiences, cultural beliefs, or a general skepticism of medical recommendations, leading to hesitancy in following vaccination advice.....”(KII 1, Teacher)

The outcome of this investigation was steady with an investigation steered among young people in the United States that found a correlation between the guardian's educational attainment and the uptake of HPV immunization (Elenwo et al., 2023). Nonetheless, a different investigation steered in the US found no correlation between guardians' educational attainment and vaccination uptake for HPV (Galvin et al., 2023).

Regarding daughters' primary source of healthcare, as indicated in Table 4.3, close to three quarters (71.4%) of the study respondents who had been vaccinated for HPV reported receiving healthcare services from community health clinics. Many community health clinics collaborate with schools to conduct vaccination drives on school premises, ensuring high coverage by reaching students directly during school hours. There was a statistically noteworthy correlation between daughters' primary healthcare provider and HPV vaccination uptake ($\chi^2=21.956$, $df=3$, $p=<0.000$). The binary logistic regression analysis revealed that there was no statistically significant correlation between daughters' primary medical care providers and HPV vaccine uptake ($p=0.179$), which contradicted these results.

According to one of the key informants, these results ran counter to the qualitative data;

“I would say many schools integrate vaccination programs into their broader health education and services. This can include health screenings, education on disease prevention, and other health-promoting activities, making vaccination a routine part of school health initiatives.....”(KII 6, Headteacher)

The results of the present investigation coincided with those of an investigation conducted in Ethiopia in which the HPV immunization uptake was not linked to the primary source of healthcare (Beyen et al., 2022). This was in contrast to another investigation carried out in Minnesota, USA, which found that the primary healthcare source had an impact on HPV immunization uptake and that seeking care from private clinics elevated the likelihood of HPV immunization uptake (Zhu et al., 2023).

In terms of household medical coverage status, Table 4.3 shows that 29.3% of the vaccinated subjects lived in a household with insurance coverage. Regular medical visits are more common among families with medical coverage. As part of standard preventive care, medical professionals can recommend and administer the HPV vaccine during these visits. The HPV immunization uptake and household health insurance status did not significantly correlate, according to the chi-square test of independence ($\chi^2=0.013, df=1, p=.91$).

These results were consistent with an investigation conducted in the Netherlands that found no correlation between household health insurance status and HPV immunization uptake (de Munter et al., 2021). In contrast, a study conducted in the United States found that the odds of HPV immunization uptake were lowered by 1.92 when household insurance coverage was absent (Goel & Vasudevan, 2021).

Concerning the religion of the subject participants, as indicated in Table 4.3, only a few (20.6%) of the study respondents who had been vaccinated with HPV vaccines were Muslims. Some Muslims may have concerns about the HPV vaccine based on religious beliefs or cultural norms. There may be misconceptions that the vaccine promotes promiscuity or contradicts Islamic principles regarding modesty and sexual behavior. There was a statistically

noteworthy correlation between religion and immunization uptake for HPV($\chi^2=6.131,df=1,p=0.013$).

A significant correlation between religion and vaccine uptake for HPV was also discovered by additional logistic regression analysis (table 4.4) ($p=0.02$). Also, compared to Christians, study participants who were Muslims had a 1.9-fold lower likelihood of having received an HPV vaccination. Muslim communities may not respond well to well-being info and communication that ignores cultural and religious contexts, which could result in low HPV immunization uptake. Culturally sensitive messaging that speaks to particular concerns and values is necessary for effective communication.

According to one of the key informants, these results ran counter to the qualitative data;

“I would say legal and ethical principles, such as autonomy, beneficence, and nonmaleficence, guide healthcare practices and policies. Vaccination services are typically provided based on public health goals, individual consent, and medical necessity, rather than religious considerations.....”(KII 3, School nurse)

These outcomes were consistent with an investigation conducted in the United States that discovered a correlation between religion and HPV vaccine uptake(Hittson et al., 2023). This was in contrast to a research investigation conducted in Kenya that found no correlation between religion and vaccine uptake for HPV (Mabeya et al., 2018b).

Concerning the Household income level, as indicated in Table 4.3, only a few (26.4%) of the study respondents who had been vaccinated had a household earning between 1-10000 Ksh per month. Vaccination costs, even if partially covered by insurance or government

programs, can still be a significant expense for low-income families. Financially strapped families might put necessities like food, housing, and utilities ahead of immunizations and other preventative healthcare services. There was no statistically significant correlation between household revenue level and immunization uptake for HPV ($\chi^2=4.862$, $df=3$, $p=.182$).

The outcomes of the investigation were steady with an investigation conducted in Germany that found no correlation between the income of households and immunization uptake for HPV (Schüle et al., 2016). The odds of vaccine uptake for HPV were found to increase by 2.2 with higher household income in an additional investigation conducted as part of a systematic review (Murfin et al., 2019).

Concerning the type of school attended by the study participant, as indicated in Table 4.3, more than a third (40.4%) of the study respondents who had been vaccinated for HPV were from private schools. Families who can afford private school tuition often have higher socioeconomic status. They may have better access to healthcare, including preventive services like vaccinations, due to higher income levels and comprehensive health insurance coverage. The research revealed that the respondent's school type and HPV vaccination uptake were found to be significantly correlated ($\chi^2=7.998$, $df=1$, $p=0.005$).

Additional logistic regression analysis revealed a significant correlation ($p=0.01$) between the type of school attended and HPV immunization uptake (table 4.4). Furthermore, the study participants who attended private schools had a twofold higher likelihood of receiving an HPV vaccination than those who attended public schools. Parents who choose private education for their children may have more resources and support networks to navigate

healthcare systems and overcome barriers to vaccination. They may be more proactive in scheduling appointments, obtaining vaccines, and ensuring their children receive recommended immunizations.

According to one of the key informants, these results were in line with the qualitative data;

“Private schools often foster strong community networks among parents and families. These networks may share information, resources, and support related to healthcare decisions, including vaccination, leading to higher vaccination rates within the community.....(KII 5, Teacher)

These results were consistent with an investigation conducted in Ethiopia that found a correlation between the type of school attended and immunization for HPV uptake(Shitu et al., 2023). Nonetheless, an additional investigation conducted in Kenya found no correlation between the type of school attended and HPV immunization uptake(Mabeya et al., 2018b).

Table 4:3: Social demographic factors associated with the uptake of HPV vaccines

Independent variables	Categories	Dependent Variable (HPV Vaccine Uptake)		Statistical Significance (Chi-square Test)
		Yes(N=115)	No(N=270)	
Age of the guardian	27-33 years	21(36.8%)	36(63.2%)	$\chi^2=11.999$ df=3 p=0.007
	34-40 years	54(34.8%)	101(65.2%)	
	41-47 years	33(28.7%)	82(71.3%)	
	48-54 years	7(12.1%)	51(87.9%)	
School grade	4 th -6 th grade	53(28.6%)	132(71.4%)	$\chi^2=0.254$ df=1 p=0.615
	7 th -8 th grade	62(31%)	138(69%)	
Guardian's level of education	Never been to school	13(25%)	39(75%)	$\chi^2=30.219$ df=4 p=<0.000
	Primary	25(16.7%)	125(83.3%)	
	Secondary	27(35.1%)	50(64.9%)	
	Vocational	25(52.1%)	23(47.9%)	
Daughters' primary source of healthcare	Tertiary	25(43.1%)	33(56.9%)	$\chi^2=26.533$ df=3 p=<0.000
	Physician	3(6.5%)	43(93.5%)	
	School-based clinic	35(50.7%)	34(49.3%)	
	Community clinic	150(71.4%)	60(28.6%)	
Household health insurance status	Private clinic	17(28.3%)	43(71.7%)	$\chi^2=0.013$ df=1 p=.91
	Insured	22(29.3%)	53(70.7%)	
Household income level	Not insured	93(30%)	217(70%)	$\chi^2=4.862$ df=3 p=.182
	1-10000	55(26.4%)	153(73.6%)	
	10001-20000	29(34.5%)	55(65.5%)	
	20001-30000	20(40%)	30(60%)	
Religion	30001-40000	11(25.6%)	32(74.4%)	$\chi^2=6.131$ df=1 p=0.013
	Muslims	22(20.6%)	85(79.4%)	
	Christians	93(33.5%)	185(66.5%)	
Type of school attended	Private	44(40.4%)	65(59.6%)	$\chi^2=7.998$ df=1 p=0.005
	Public	71(25.7%)	205(74.3%)	

Table 4:4: Binary logistic regression table with significant variables on social demographic factors

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1^a	age of the parent			11.490	3	.009			
	27-33	-1.409	.466	9.141	1	.092	.244	.098	.609
	34-40	-1.549	.464	11.149	1	.001	.212	.086	.527
	41-47	-1.255	.504	6.196	1	.313	.285	.106	.766
							ref		
	Religion	.630	.289	4.736	1	.020	.533	.302	.939
							ref		
	type of school	-.671	.261	6.615	1	.010	1.955	1.173	3.260
							ref		
	the primary source of healthcare			18.478	3	.179			
	Physician	1.903	.694	7.529	1	.236	6.707	1.722	26.115
	School-based clinic	-.845	.414	4.178	1	.241	.429	.191	.966
	Community clinic	-.017	.362	.002	1	.962	.983	.483	1.998
							ref		
	level of education			27.188	4	.000			
	Never been to school	.792	.439	3.260	1	.071	2.208	.934	5.215
	Primary	1.381	.359	14.792	1	.000	3.980	1.969	8.047
	Secondary	.538	.379	2.016	1	.156	1.713	.815	3.599
	Vocational	-.382	.416	.844	1	.358	.682	.302	1.542
							ref		
	Constant	1.896	.873	4.716	1	.030	6.659		

4.6 Parental Perception of HPV Vaccine Uptake

Table 4.5 provides descriptive statistics on perception regarding HPV vaccine uptake. The guardians of nearly half (47%) of the study partakers strongly agreed that the vaccine for HPV prevents cervical carcinoma. The HPV vaccine is very effective at preventing infections with the HPV types that cause most cases of cervical carcinoma, as many research investigations have shown. This robust body of scientific evidence reassures parents of its efficacy. Just 5.5% of those involved in the study completely disagreed that the HPV vaccine prevents cervical cancer. Of the study participants, over one-third (34.3%) completely disagreed that the HPV immunization is safe. Given that the vaccine for HPV is more recent than other vaccines, such as those for polio or measles, some parents may be wary because they believe its long-term safety profile is less established. Just 17.4% of study participants firmly agreed that the vaccine for HPV is safe. More than a third (41.8%) of the study respondents' guardians disagreed that Unvaccinated adolescents can contract HPV, which could be linked to school-going girls delaying becoming sexually active reducing their window of exposure to HPV during their teenage years. Close to half (44.2%) of the study respondents' guardians strongly agreed It is important for adolescent girls to receive the Vaccine for HPV. The vaccine for HPV protects against the types of HPV that cause the majority of cervical cancer cases. Cervical cancer is a serious and potentially fatal disease, and vaccination can significantly reduce the risk. Close to half (47.8%) of the study respondents' guardians strongly agreed vaccine for HPV is only important for sexually active individuals. The vaccine helps prevent cervical cancer by protecting against HPV types that cause the majority of these cancers. Even after becoming sexually active, receiving the vaccine can reduce the risk of future HPV infections that could lead to cancer. More than

half (52.2%) of the study respondents' guardians agreed they would recommend the HPV vaccine to someone you know. If their children have received the HPV vaccine without any issues and they feel reassured by the protection it offers, they might want others to benefit similarly hence a valid reason to recommend the vaccine to another parent. Nearly half (47.5%) of the guardians of the study's subjects disagreed with the claim that adolescents who receive HPV vaccines commonly face stigma. As public knowledge about HPV and the vaccine's benefits grows, misconceptions about the vaccine being solely for sexually active individuals diminish. Educational campaigns highlight that the vaccine is a preventive measure against cancer, not just an STI. Finally, the majority of guardians of those who participated (51.7%) unanimously agreed that the HPV vaccine is essential for preventing HPV infection. As people age and their risk of exposure rises, the vaccine's long-term immunity against HPV guarantees that they will continue to be protected.

Table 4:5: Frequency table on parental perception of HPV vaccine uptake

Statement	Strongly agree n(%)	Agree n(%)	Neutral n(%)	Disagree n(%)	Strongly disagree n(%)
HPV vaccine is accurate in preventing cancer of the carcinoma	181(47%)	118(30.6%)	24(6.2%)	41(10.6%)	21(5.5%)
Vaccine for HPV is safe	67(17.4%)	73(19%)	15(3.9%)	98(25.5%)	132(34.3%)
Unvaccinated adolescents can contract HPV	60(15.6%)	102(26.5%)	26(6.8%)	161(41.8%)	36(9.4%)
It is important for adolescent girls to receive the vaccine for HPV	170(44.2%)	126(32.7%)	28(7.3%)	36(9.4%)	25(6.5%)
Vaccine for HPV is only important for sexually active individuals	88(22.9%)	184(47.8%)	21(5.5%)	69(17.9%)	23(6%)
You can endorse the HPV vaccine to someone you know	79(20.5%)	201(52.2%)	31(8.1%)	50(13%)	24(6.2%)
Adolescents who receive the Vaccine for HPV are stigmatized	54(14%)	90(23.4%)	25(6.5%)	183(47.5)	33(8.6)
HPV vaccine is important in preventing HPV Infection	199(51.7%)	72(18.7%)	31(8.1%)	50(13%)	33(8%)

4.7 Association between Parental Perception of HPV Vaccine and the Uptake of HPV Vaccines

Binary logistic regression and the chi-square test of independence were used to determine the relationship between parental perception of vaccine for HPV and vaccination uptake. In this study, perception of the HPV vaccine was assessed using a set of structured statements rated on a 5-point Likert scale. The statements reflected both positive and negative views. Responses were scored, and the overall perception was categorized as positive or negative based on a predetermined cut-off point. This helped determine how perception influenced vaccine uptake among adolescent girls. As indicated in Tables 4.6 and 4.7 below. More than a quarter of the study participants' guardians who had a positive perception of HPV vaccines had their daughters vaccinated with HPV vaccines. When parents perceive the HPV vaccine as safe and effective, they are more likely to trust healthcare providers and recommendations, leading to higher vaccination rates. The perception of vaccine for HPV and its uptake were found to be statistically significantly correlated ($\chi^2=13.986, df=2, p=0.001$). The perception of the HPV vaccine and its uptake were found to be significantly statistically correlated ($P=0.001$) by additional logistic regression analysis (table 4.7). Moreover, a favorable opinion of the HPV vaccine raised the likelihood of receiving it by 2.4. It may reassure others and encourage them to get immunized to hear positive stories and testimonies from people who have received the vaccine for HPV. Personal experiences have the capacity to significantly influence attitudes and actions.

The results of this investigation were consistent with an investigation conducted in SSA that found that a favorable opinion of HPV vaccinations raised the likelihood of HPV uptake (Asgedom et al., 2024). In line with these findings, another investigation steered in

Uganda revealed that a negative opinion of vaccine for HPV decreased the likelihood of HPV uptake (Bitariho et al., 2023).



Table 4:6: Association between parental perception of HPV vaccine and the Uptake of HPV Vaccines

Independent variable	Categories	Dependent Variable (HPV Vaccine Uptake)		Statistical Significance (Chi-square Test)
		Yes(N=115)	No(N=270)	
Perception factor(Likert scale aggregate)	Positive perception(A,SA)	71(38.8%)	112(61.2%)	$\chi^2=13.986$ df=2 p=0.001
	Neutral	6(30%)	14(70%)	
	Negative perception(D,SD)	38(20.9%)	144(79.1%)	

Table 4:7: Binary logistic regression table on the influence of parental perception of HPV vaccine and the Uptake of HPV Vaccines

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1 ^a	Perception factor overall			13.654	2	.001			
	Positive perception	-.876	.237	13.649	1	.000	2.4	.261	.663
	Neutral	-.485	.521	.867	1	.352	.616	.222	1.709
	Negative perception								
	Constant	1.332	.182	53.362	1	.000	3.789		

4.8 Descriptive Statistics on healthcare based factors

Table 4.8 below provides descriptive statistics on healthcare-based factors. When asked if there had ever been a time when an investigation participant's guardian had brought up HPV immunization with a medical professional, over half (59%) of the investigation's participants' guardians said they had never done so. This may be related to the fact that some parents may not fully understand the HPV vaccine, its advantages, or how important it is for their kids to get vaccinated. They may be unaware of the necessity or recommendation of the vaccine. Over one-third (41%) of the guardians of those who participated said they had spoken with a medical professional about HPV immunization. Regarding the presence of vaccination for HPV campaigns aimed at adolescent girls enrolled in school, Over one-third (39.5%) of the study participants stated that school-age girls were the target of HPV vaccination programs. The vaccine for HPV works best when it is given prior to a person being exposed to the virus, which usually occurs during intercourse. Since younger people have a stronger immune response to the vaccine, preteens and early adolescence (typically ages 11 to 14) are thought to be the best times to get vaccinated.

More than half of the investigation's participants (60.5%) stated that there were no HPV vaccination campaigns aimed at school-age girls. Regarding the existence of educational and awareness initiatives regarding HPV immunization for teenage girls enrolled in school, There was an HPV vaccination campaign, according to more than half (59.7%) of study participants. In order to promote HPV vaccination as part of national vaccination campaigns, the Kenyan government has implemented regulations and provided funding. The promotion of widespread vaccination uptake has also been greatly aided by legislative mandates and health authority recommendations. Of the study participants, nearly half (40.3%) said that

this HPV immunization campaign did not exist. Regarding the availability of healthcare services related to HPV vaccination, over one-third (37.3%) of the subjects in the study conveyed having trouble accessing HPV vaccination services. It can be challenging to reach adolescents, who are the main target for HPV immunization, and this may be related to inadequately established school-based vaccination programs. Schools provide an organized setting for administering vaccines, and the absence of such programs can lead to lower coverage rates. Only a few (9.6%) of the study respondents reported easy access to HPV vaccination services. Concerning recommendations by healthcare providers for HPV vaccination to school-going girls, More than half (65.7%) of the study respondents' guardians reported having never discussed HPV vaccination with a healthcare provider on their daughters. Providers might assume that parents will be resistant or uninterested in the HPV vaccine, especially if they believe discussing it might imply that their child will become sexually active soon. This assumption can prevent providers from bringing up the topic. On the contrary, more than a quarter (34.3%) of the study respondents reported hVIN discussed HPV vaccination with a healthcare provider on their daughters.

Table 4:8: Descriptive Statistics on healthcare based factors

Independent variables	Categories	Frequencies	Valid percentage
Discussed about HPV vaccination	yes	158	41
Discussed about HPV vaccination	no	227	59
HPV vaccination programs targeting schools	present	152	39.5
HPV vaccination programs targeting schools	absent	233	60.5
HPV vaccination awareness campaign	present	230	59.7
HPV vaccination awareness campaign	absent	155	40.3
Access to HPV vaccination services	Very easy	127	33
Access to HPV vaccination services	easy	37	9.6
Access to HPV vaccination services	neutral	26	6.8
Access to HPV vaccination services	difficulty	51	13.2
Access to HPV vaccination services	Very difficult	144	37.4
Reccomendation for HPV vaccination	yes	132	34.3
Reccomendation for HPV vaccination	no	252	65.7

4.9 Healthcare-based factors Associated with the uptake of HPV vaccines

Using binary logistic regression and the chi-square test of independence, the relationship between healthcare-based factors and HPV vaccine uptake was determined. As indicated in Tables 4.9 and 4.10 below. Regarding having a guardian talk to a medical professional about HPV immunization, nearly three-quarters (73.6%) of the investigation's participants' guardians who said they had not spoken to a healthcare provider about HPV immunization had daughters who had not received one. Without in-depth conversations, parents and teenagers might not be completely informed about the HPV vaccine's availability, advantages, or significance of getting it. A low perceived need for the vaccine may result from this ignorance. There was no statistically significant correlation between talking about immunization for HPV and getting the vaccine ($\chi^2=3.122, df=1, p=0.077$).

One of the key informants described the qualitative findings as contradicting the results in question;

“...I would say detailed discussions help parents and adolescents understand the importance of the vaccine for HPV, its benefits, and the diseases it prevents. Educated parents are more likely to consent to vaccination. In addition, Open conversations allow healthcare providers to dispel myths and correct misinformation about the HPV vaccine. Addressing concerns about safety, side effects, and effectiveness can alleviate fears and hesitancy.....”(KII 8, Health care staff)

The findings of the present investigation were consistent with a research investigation steered in the United States of America that found no correlation between discussing vaccination for HPV with a medical professional and HPV immunization uptake (Osaghae et al., 2023).

Having an open discussion about vaccination for HPV with a healthcare professional, however, increased the likelihood of HPV vaccine uptake by 3.2, according to an additional investigation conducted in Houston, USA (Osaghae et al., 2022).

Regarding the existence of HPV immunization programs aimed at school-age girls, as revealed in Table 4.9, Of the study subjects who reported receiving an HPV vaccination, over one-third (39.5%) mentioned that school-age girls were the target of HPV vaccination programs. School-based vaccination programs provide a convenient setting for administering vaccines, reducing the need for parents to schedule separate healthcare visits. This convenience encourages higher participation rates. The existence of HPV immunization programs aimed at school-age girls and the uptake of HPV vaccines were found to be statistically significantly correlated ($\chi^2=11.058, df=1, p=0.001$).

Additional logistic regression analysis (table 4.10) revealed a significant correlation ($P=0.001$) between the adoption of the HPV vaccine and the existence of HPV immunization programs aimed at school-age girls. Additionally, the odds of HPV immunization decreased by 2.2 when school-age girls were not the target for vaccination for HPV programs. Without school-based vaccination programs, adolescents may face barriers in accessing HPV vaccines. They may need to rely on healthcare visits, which can be less convenient and more challenging to schedule, especially for parents with limited time or resources.

According to one of the key informants, these results coincided with the qualitative outcomes;

“...Schools offer a structured environment where large numbers of adolescents can be reached systematically. This organization ensures that more students are vaccinated within

a short period. Furthermore, School-based programs often integrate vaccination for HPV with other routine health services, such as physical exams and other immunizations. This holistic approach makes it easier to include the HPV vaccine as part of comprehensive adolescent health care.....”(KII 7, Headteacher)

The results of the present investigation were consistent with an investigation conducted in Los Angeles that found that the existence of HPV vaccination programs aimed at school-age girls raised the likelihood of receiving an HPV vaccination (Shin et al., 2023). These results ran counter to another investigation carried out in Ethiopia that found no statistically noteworthy correlation between HPV immunization uptake and the existence of programs aimed at school-age girls (Beyen et al., 2022).

As indicated in Table 4.9, With respect to HPV immunization awareness campaigns, The majority (80%) of the study respondents who reported the absence of HPV vaccination awareness campaigns had not been vaccinated with HPV vaccines. Without education initiatives, people might not be aware of immunization for HPV, its advantages, and how it helps prevent illnesses linked to HPV, particularly parents and teenagers. Misconceptions and reluctance about vaccination may result from this ignorance. There was a statistically noteworthy correlation between HPV vaccination awareness campaigns and HPV vaccine uptake ($\chi^2=12.066, df=1, p=0.001$). as shown in Table 4: 10, these outcomes were inconsistent with the binary logistic regression analysis. Because HPV vaccination awareness campaigns were not found to have a statistically noteworthy correlation with the use of HPV vaccines ($p=0.08$),

The verdicts of this investigation were steady with a research investigation steered in Malawi that found no correlation between HPV immunization uptake and awareness campaigns (Bitariho et al., 2023). However, a different systematic review disagreed with these results, finding that the odds of HPV immunization uptake rose to 2.4 when awareness campaigns were in place (Ortiz et al., 2019).

Regarding easy access to HPV immunization services, Table 4.9 shows that 40.9% of those participating in the study who said they had easy access to HPV immunization services had already received the HPV vaccine. Accessibility of vaccination services, including availability of healthcare facilities, proximity to vaccination centers, and ease of transportation, directly impacts vaccine uptake. People may be less likely to get the vaccine if immunization services are hard to get to or located far away.

Access to immunization for HPV services and HPV vaccine uptake were found to be statistically significantly correlated ($\chi^2=15.76, df=4, p=0.003$). Having access to HPV immunization services and HPV immunization uptake were found to be significantly correlated ($p=0.001$) by additional logistic regression analysis (table 4.10). In addition, easy access to HPV immunization services increased the odds of HPV immunization uptake by 2.7. School-based vaccination programs increase access to HPV vaccines by providing vaccinations in a familiar and convenient setting. These programs ensure that a large number of adolescents have access to the vaccine, regardless of their healthcare-seeking behaviors or parental involvement.

The results of the present investigation were consistent with an investigation conducted in India that found that the likelihood of HPV vaccine uptake was enhanced by easy access to HPV immunization services (Rathod et al., 2023). Poor access to HPV

immunization services, however, decreased the odds of HPV immunization uptake by 3.2, according to an additional investigation conducted in Kenya that contradicted these results (Karanja-Chege, 2022).

Regarding recommendations for HPV vaccination by a healthcare provider, as indicated in Table 4.9, close to three-quarters (71.1%) of the study respondents who had not been vaccinated for HPV vaccination their guardians had no recommendations for HPV vaccination by a healthcare provider. Healthcare providers are trusted sources of medical information. When they recommend a vaccine, patients are more likely to trust its safety and efficacy. Without a recommendation, patients may question the importance or necessity of the vaccine. The immunization for HPV uptake and medical professional suggestions for HPV vaccination did not significantly correlate ($\chi^2=0.364, df=1, p=0.547$).

These verdicts aligned with the qualitative data, which included a key informant's narrative that;

“...Medical professional providers play a crucial role in educating parents about the benefits of HPV vaccination and addressing any concerns or misconceptions they may have. Without provider recommendations, parents may lack the necessary information to make informed decisions about vaccination for their daughters. In addition, For adolescents, parental consent is often required for vaccination. Provider recommendations can influence parental decisions regarding consent. Without recommendations, parents may be less likely to consent to vaccination for HPV for their children.....”(KII 3, School nurse)

The results of the present investigation were consistent with a Canadian study that found no correlation between HPV immunization uptake and medical practitioner suggestions for

HPV immunization(Rubens-Augustson et al., 2019). Another investigation steered in the USA, however, contradicted these results, finding that a healthcare provider's recommendations for HPV immunization raised the likelihood of HPV immunization uptake by five(Osaghae et al., 2022).

Table 4: 9: Healthcare-based factors Associated with the Uptake of HPV Vaccines

Variables	Categories	Dependent Variable (HPV Vaccine Uptake)		Statistical Significance (Chi-square Test)
		Yes(N=115)	No(N=270)	
Discussed about HPV vaccination	Yes	55(34.8%)	103(65.2%)	$\chi^2=3.122$ df=1 p=0.077
	No	60(26.4%)	167(73.6%)	
HPV vaccination programs targeting schools	Present	60(39.5%)	92(60.5%)	$\chi^2=11.058$ df=1 p=0.001
	Absent	55(23.6%)	178(76.4%)	
HPV vaccination awareness campaign	Present	84(36.5%)	146(63.5%)	$\chi^2=12.066$ df=1 p=0.001
	Absent	31(20%)	124(80%)	
Access to HPV vaccination services	Very easy	52(40.9%)	75(59.1%)	$\chi^2=15.76$ df=4 p=0.003
	Easy	12(32.4%)	25(67.6%)	
	Neutral	10(38.5%)	16(61.5%)	
	Difficulty	11(21.6%)	40(78.4%)	
Recommendations for HPV vaccination	Yes	42(31.8%)	90(68.2%)	$\chi^2=0.364$ df=1 p=0.547
	No	73(28.9%)	180(71.1%)	

Table 4:10: Binary logistic regression table with significant variables on healthcare-based factors

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.	
								Lower	Upper
Step 1^a	Access to HPV vaccination services?			14.444	4	.006			
	Very easy	-.978	.283	11.973	1	.001	2.7	.216	.654
	Easy	-.564	.421	1.793	1	.181	.569	.249	1.299
	Neutral	-.905	.470	3.700	1	.064	.405	.161	1.017
	Difficulty	-.082	.406	.041	1	.839	.921	.415	2.042
							ref		
	Vaccination Programs targeting schools	.776	.237	10.677	1	.001	2.2	1.364	3.458
							ref		
	and Awareness Campaigns	.916	.254	13.022	1	.08	2.500	1.520	4.113
							ref		
	Constant	-1.126	.553	4.154	1	.042	.324		

CHAPTER FIVE

SUMMARY CONCLUSION AND RECOMMENDATIONS

5.0 Preamble

The study's summary, conclusions, and recommendations are presented in this section.

5.1 Summary

Regarding the first objective, which is to find out how many school-age girls (10–14 years old) have gotten the HPV vaccine. The HPV vaccine was received by close to a third (29.9%) of the study participants. Conversely, nearly 70.1 percent of the study participants had not received the HPV vaccine. Moreover, nearly one-third (33%) of the study participants reported receiving their second dose, while over half (67%) had received their first dose.

Regarding the second objective, which was to determine the social demographic factors that influence the uptake of HPV immunization, the following variables were imported for binary logistic regression analysis because they showed a significant statistical correlation when the bivariate analysis was completed: the guardian's age, education level, the daughter's primary healthcare provider, religion, and type of school attended. The HPV vaccination uptake was not statistically correlated with household income level, student grade, or household health insurance status. Regarding the third objective, which was to assess how parental perceptions influenced HPV vaccine uptake, a significant statistical correlation between the influence of parental perceptions and HPV vaccine uptake was found during the bivariate analysis; as a result, this variable was imported for binary logistic regression analysis.

With respect to the fourth goal, which focuses on healthcare-based factors which influence HPV immunization uptake, the following variables were imported for binary logistic

regression analysis because they showed a significant statistical relationship when the bivariate analysis was completed: the existence of school-based HPV vaccination programs, awareness campaigns, and access to HPV vaccination services. The uptake of HPV vaccination was not statistically correlated with discussions of the vaccine or medical providers' recommendations for HPV vaccination.

5.2 Conclusion

Regarding the HPV vaccination uptake among teenage girls (10–14 years old) enrolled in school. Of the study participants, close to a quarter (29.9%) had received the HPV vaccine. This is a public health issue because the Kenyan government and the Ministry of Health aim to vaccinate 80% of girls between the ages of 10 and 14 against HPV.

Regarding the second objective, which was to determine how social demographic factors influenced the uptake of HPV immunization, the study subjects who attended private schools had twice the likelihood of receiving an HPV vaccination compared to those who attended public schools. Additionally, the guardians of the study subjects who were between the ages of 34 and 40 had a 4.7 higher likelihood of having daughters who had received an HPV vaccination than those whose guardians were between the ages of 45 and 54. Muslims were 1.9 times less likely than Christians to have received an HPV vaccination, and guardians of study subjects with only a primary education were 4 times less likely to have daughters who had received an HPV vaccination than those with a tertiary education.

Regarding the third objective, which assessed how parental attitudes influenced HPV vaccine uptake, having a positive perception of the HPV vaccine raised the likelihood of receiving HPV by 2.4.

Regarding the fourth objective, which focuses on healthcare-based factors that affect HPV vaccination uptake, the odds of HPV vaccination uptake were lowered by 2.2 when school-age girls were not targeted by HPV vaccination programs, while the odds were raised by 2 when easy access to HPV vaccination services was available.

5.3 Recommendations

1. The Nairobi county government, The Ministry of Education and Health, and other relevant stakeholders should set up temporary vaccination clinics within schools, making it convenient for students to receive the vaccine. In addition, they should develop and implement policies that support routine HPV vaccination as part of the school health services.
2. The Nairobi county government, The Ministry of Education and Health, and other relevant stakeholders should ensure increased efforts towards vaccination programs targeting school girls by collaborating with local health departments and healthcare providers to support vaccination efforts and provide additional resources.
3. The Nairobi county government, The Ministry of Education and Health, and other relevant stakeholders should organize workshops to educate parents and guardians about the safety, efficacy, and benefits of the HPV vaccine. Providing opportunities for them to ask questions and address concerns will aid in ensuring they have a positive perception of HPV uptake.
4. The Nairobi county government, The Ministry of Education and Health, and other relevant stakeholders should form coalitions with multiple faith communities to create a unified message about the importance of HPV vaccination. In addition, they

should train religious health workers to provide accurate information and vaccination services within the community.

5. The Nairobi county government. The Ministry of Education and Health, and other relevant stakeholders should provide parents with clear, factual information about the safety, efficacy, and importance of the HPV vaccine. Counter common myths and misconceptions thus enhancing increased uptake of HPV vaccines.

Recommendation for Further Research

1. This research recommends an intervention study on the role of community education and awareness programs towards the uptake of HPV vaccines in Kibra Sub-county, Nairobi City County, Kenya.

Recommendation for policy

1. To enhance HPV vaccine uptake in Kenya, the Ministry of Health, in collaboration with the Ministry of Education, should implement a nationwide school-based vaccination policy that mandates routine HPV immunization for all eligible adolescent girls, integrated into existing health and education systems. This should be supported by sustained community sensitization campaigns, targeted training for healthcare workers and teachers, and policies that address sociocultural barriers such as myths, misinformation, and religious beliefs. Furthermore, the government should ensure consistent vaccine supply and accessibility across both rural and urban settings to reduce disparities in uptake.

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Appendix 1

Appendix 1. Participant Information Leaflet and Consent Form

Researcher name: Edith Kinya

Study topic: factors influencing uptake of human papillomavirus vaccine among school-going adolescent girls (10-14yrs) in Kibra Sub-county, Nairobi City County, Kenya.

Introduction and Study Purpose

I invite your daughter to participate in a research study on factors influencing the uptake of the human papillomavirus vaccine. The purpose of this study is to understand the factors influencing the uptake of human papillomavirus vaccine among school-going adolescent girls (10-14yrs) in Kibra Sub-county, Nairobi City County, Kenya. This study will be conducted to help improve community health programs and support systems for adolescents girls. The study aims to identify factors influencing the uptake of the human papillomavirus vaccine among school-going adolescent girls (10-14yrs) in Kibra Sub-county and to gather information that may support the increased uptake of HPV vaccines for young girls.

Participation and Withdrawal from the Research

Participation in this study is entirely voluntary. Your daughter/ward may refuse to participate, or you may choose to withdraw her from the study at any time without any consequence. Her participation or non-participation will not affect any services she may receive.

Benefits of the Research

There are no direct benefits to participating in this study. However, the information provided may help to improve health policies and programs that support HPV vaccination among young adolescents in the community.

Potential Risk and Discomfort

There are minimal risks associated with this study. Some questions may feel personal or sensitive. Your daughter/ward may skip any questions she is uncomfortable answering, and she can stop participating at any time.

Confidentiality and Anonymity

All information gathered in this study will be kept confidential. Your daughter's name or any other identifying information will not be linked to the data collected. The results will be reported in a way that ensures her anonymity.

Contact Information

You can get in touch with Edith Kinya at +254713264228, or the Institutional of Ethics and Review Committee at Mount Kenya University at research@mku.ac.ke.

Parent/Guardian Consent

I, the undersigned, have read the information provided above. I understand the purpose, procedures, risks, and benefits of this study. I hereby give permission for my daughter to participate in this study.

Respondent's Signature/Thumbprint

..... Date.....

Participant Assent

I understand what this study is about, and I have had a chance to ask questions. I know that I can stop participating at any time. I agree to take part in this study.

Respondent's Signature/Thumbprint

..... Date.....

Research Statement

The intention of this study has been made clear to the participant by me, the researcher, in a language they are both comfortable with.

Researcher Signature

.....

Date.....



Appendix 2: Questionnaire

Part I: Social Demographic Characteristics

1. How old are you _____
2. How old is your adolescent Daughter? _____
3. What is your religion?
 - a) Muslim []
 - b) Christian []
 - c) Any other []
4. Which type of school does your daughter attend
 - a) Private []
 - b) Public []
5. In which grade is your daughter?
 - a) 4th Grade []
 - b) 5th Grade []
 - c) 6th Grade []
 - d) 7th Grade []
 - e) 8th Grade []
6. What is your highest level of education?
 - a) Never went to school []
 - b) Primary school []
 - c) Secondary School []
 - d) Vocational []
 - e) Tertiary []
7. What is your household's income level?
 - a) <Ksh. 10,000 monthly []
 - b) Ksh. 10001- 20,000 []
 - c) Ksh. 30,001-40,000 []
 - d) >40,000 []
8. What is the household health insurance status
 - a) Insured []

b) Not insurance []

9. What is your daughters' primary source of healthcare

a) Primary care physician []

b) School-based health clinic []

c) Community health center []

d) Private healthcare facility []

Part 2: Uptake of HPV Vaccine

10. Has your Daughter received the HPV vaccine?

a) Yes []

b) No []

11. If yes how many doses did they receive

a) 1 dose []

b) 2 doses []

12. If yes how old was she when she got her first dose _____

13. Did you pay for the vaccine

a) Yes []

b) No []

14. Where did your daughter get the vaccine

a) At school []

b) At a healthcare facility []

15. If no (to receiving the HPV vaccine) give reasons why

.....

PART 3: Perception of HPV Vaccine

To evaluate parental perceptions influencing HPV vaccine uptake among school-going adolescent girls

1. Where did you get your information on HPV vaccine
 - a) School Administration []
 - b) Healthcare provider []
 - c) Mass media (radio, TV, newspaper) []
 - d) Social Media (Facebook, Instagram, WhatsApp) []
 - e) Others specify.....
2. Have you discussed the HPV vaccine with your child's healthcare provider,
 - a) Yes []
 - b) No []
3. Have you received any information about the HPV vaccine from your child's school or other community organizations?
 - a) Yes []
 - b) No []
4. Have you talked to your child about the HPV vaccine
 - a) Yes []
 - b) No []
5. How active do you believe the HPV vaccine is in preventing HPV infections?
 - a) Very effective []
 - b) Somewhat effective []
 - c) Not very effective []
 - d) Not sure []
6. Have you or someone you know received the HPV vaccine?
 - a) Yes []
 - b) No []

Likert scale questionnaire.

	SA	Agree	Neither agree nor disagree	Disagree	SD
Cancer of the cervical cavity can be prevented with the HPV vaccine.					
The HPV vaccine is safe to use.					
Unvaccinated adolescents can contract HPV					
The HPV vaccine info you were given is reliable.					
Adolescent girls should get the HPV vaccination.					
The HPV vaccine is costly.					
Only those who engage in sexual activity should get the HPV vaccine.					
Worried about possible adverse reactions to the HPV vaccine					
You can suggest the HPV vaccine to a friend or acquaintance.					
Adolescents who receive HPV Vaccine are stigmatized					

Part 4: Healthcare-based factors

1. Have you ever discussed HPV vaccination with a healthcare provider?

- a) Yes []
- b) No []

2. Are there HPV Vaccination Programs targeting school-going adolescent girls in your area of residence

- a) Yes []
- b) No []

3. Are there Education and Awareness Campaigns on HPV vaccination for school-going adolescent girls

- a) Yes []
- b) No []

4. How would you rate Access to Healthcare Services concerning HPV vaccination?

- a) Very easy []
- b) Easy []
- c) Neutral []
- d) Difficult []
- e) Very difficult []

5. Has there been a moment when a Healthcare Provider Recommended the HPV vaccination to your daughter?

- a) Yes []
- b) No []

Appendix 3: Key Informant Interview Guide

Outline

My name is Mutiga Edith Kinya. A student enrolled in Mount Kenya University's public health master's program. Researching my field of expertise is expected of me as a requirement for the degree. In Kibra sub-county, Nairobi city county, Kenya, my study will focus on the factors that affect school-age adolescent girls (10–14 years old)'s adoption of the papillomavirus, or HPV, vaccine. The info gathered will only be used for academic purposes, and any info you provide will be kept completely private. To help me finish this investigation, I would appreciate it if you could give me some of your time. You will need twenty-five minutes to complete this interview. Let's begin by introducing yourself and kindly tell what your occupation designation is.

- a) In your opinion, What is the level of HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County
- b) Based on your understanding, what are the socio-demographic factors influencing HPV vaccine uptake among school-going adolescent girls (10-14 years) in Kibra Sub County, Nairobi City County?
- c) Based on your understanding, How do parental perceptions influence HPV vaccine uptake among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County?
- d) Based on your understanding, What are healthcare-based factors influencing HPV vaccine uptake level among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County?
- e) Closing remarks.

END OF INTERVIEW.

Appendix 4: ERC certificate



REF: MKU/ISERC/3157
TO: EDITH KINYA MUTIGA

Date: 28 September 2023

REG: MPH/2021/86826

Dear Sir/Madam,

RE: FACTORS INFLUENCING UPTAKE OF HUMAN PAPILLOMAVIRUS VACCINE AMONG SCHOOL-GOING ADOLESCENT GIRLS (10-14YRS) IN KIBRA SUB COUNTY, NAIROBI CITY COUNTY, KENYA.

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **2201**. The approval period is **28/09/2023 - 27/09/2024**.

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 **Mount Kenya University**
- 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 **Mount Kenya University** within 72 hours of notification
- iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** 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 **Mount Kenya University**


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

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

Appendix 5: Introductory Letter



Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2021/86826

29th September, 2023

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki Way, Upper Kabete,
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,


RE: EDITH KINYA MUTIGA - REGISTRATION NO. MPH/2021/86826

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Epidemiology and Biostatistics** in the school of **Public Health**.

The title of the research is **"Factors Influencing Uptake of Human Papillomavirus Vaccine among School-Going Adolescent Girls (10-14yrs) in Kibra Sub-County, Nairobi City County, Kenya."** It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **October, 2023 and December, 2023**.

Any assistance accorded to the student will be highly appreciated.






Thank you.


Dr. Samuel M. Karenga, Ph.D
Director, Graduate Studies

Mount Kenya University
P. O. Box 342 - 01000, THIKA
Office of the Director,
Graduate Studies

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000
Email: info@mku.ac.ke, Web: www.mku.ac.ke
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Appendix 6: NACOSTI License

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 503589	Date of Issue: 11/December/2023
RESEARCH LICENSE	
	
This is to Certify that Miss.. Edith Kinya Mutiga of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Factors Influencing Uptake of Human Papillomavirus Vaccine among School-going Adolescent Girls (10-14yrs) in Kibra Sub-County, Nairobi City County, Kenya for the period ending : 11/December/2024.	
License No: NACOSTI/P/23/31657	
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Appendix 7: County commissioner permit



**OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND NATIONAL ADMINISTRATION**

Telegram: _____
Telephone: Nairobi 316845, 341666
When replying please quote

**COUNTY COMMISSIONER
P.O. Box 30124
NAIROBI**

REF: ED 10/6 VOL. XXIX (8)

4th April, 2024

**EDITH KINYA
MOUNT KENYA UNIVERSITY**

RESEARCH AUTHORIZATION

Your letter dated 3rd April, 2024 refers.

This office has no objection and authority is hereby granted to conduct research on the topic "**Factors Influencing Uptake of Human Papilloma Virus Vaccine among School-going Adolescent Girls (10-14 yrs) in Kibra Sub County**" for the period ending 11th December, 2024.

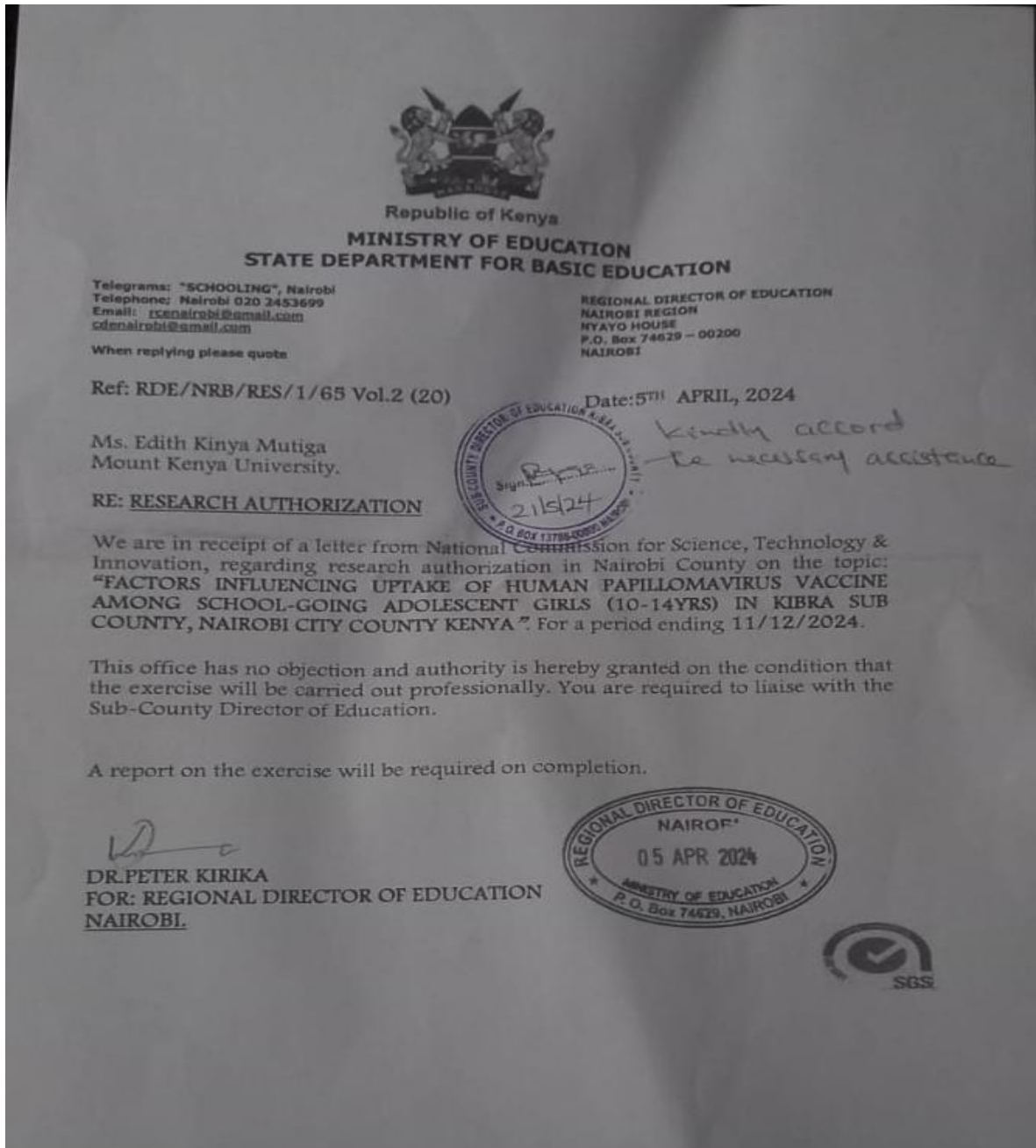
A handwritten signature in black ink, appearing to read 'Mercy Kavoi'.

**MERCY KAVOI
For: COUNTY COMMISSIONER**

Copy to: Deputy County Commissioner
KIBRA SUB COUNTY

**COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
TEL: 341666**

Appendix 8: Permit from the education offices



Appendix 9: Simirality Index report



Edith Kinya

Edith thesis

THESIS

STUDENT THESIS

Mount Kenya University

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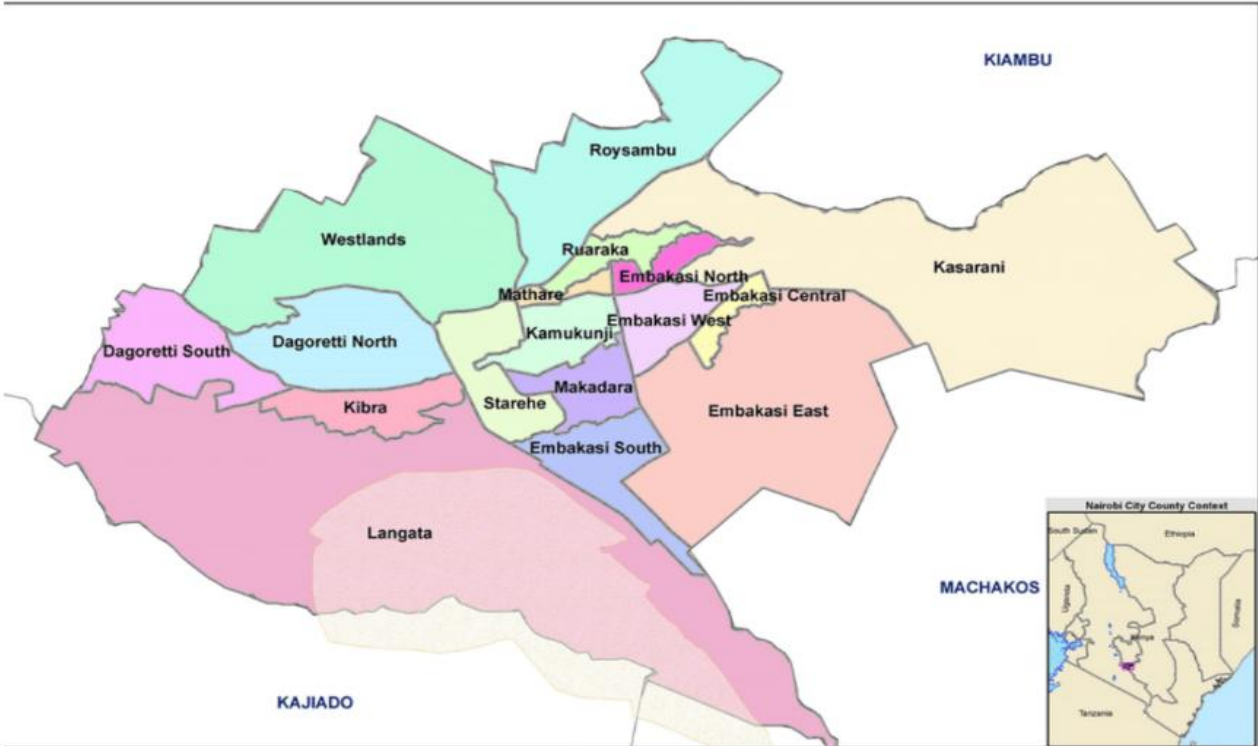
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Appendix 10: Map of the study area



Mount Kenya