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Posted Date: 4 March 2025

doi: 10.20944/preprints202503.0191.v1

Keywords: Human papillomavirus; cervical cancer; vaccine confidence; vaccine safety; vaccine up-take; vaccination; Africa

 doi:10.20944/preprints202503.0191.v1

Article

Factors Associated with Acceptance of Vaccination Against Human Papillomavirus in eThekwini District of South Africa

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Abstract: Background: South Africa launched a school-based human papillomavirus (HPV) vaccination programme in 2014 and has achieved national coverage of more than 80%. However, there is subnational variation in coverage, with eThekwini District in the province of KwaZulu-Natal having the lowest coverage at 40%. Knowing factors associated with vaccine acceptance in this district would inform tailored strategies to improve coverage, which could be extrapolated to similar settings. We thus conducted this cross-sectional study to assess factors associated with HPV vaccine acceptance in eThekwini District. **Methods:** We used stratified random sampling to select caregivers of children aged 9-14 years in the district. We interviewed participants in April-May 2023, and employed modified Poisson regression models to assess factors associated with HPV vaccine acceptance. **Results:** Of 793 individuals contacted, 713 (89.9%) participated. They were mostly women (86.1%) and had mean age of 42.6 ± 11.6 years and secondary or lower education (83.8%). Most participants knew about the HPV vaccination programme (86.0%) and accepted HPV vaccination (93.5%). The latter includes 42.9% who already vaccinated their daughters and 50.6% who were willing to allow their daughters to be vaccinated. A negligible proportion was either undecided (2.1%) or unwilling (4.4%) to accept HPV vaccination. Knowledge of the programme (adjusted prevalence ratio [aPR] 1.16; 95% confidence interval [CI] 1.06-1.28) and confidence in vaccine safety (aPR 1.14; 95% CI 1.08-1.19) were independent predictors of HPV vaccine acceptance. **Conclusion:** Our findings highlight the critical role of provision of information and education about the benefits and safety of HPV vaccination.

Keywords: human papillomavirus; cervical cancer; vaccine confidence; vaccine safety; vaccine uptake; vaccination; Africa

 doi:10.20944/preprints202503.0191.v1

1. Introduction

Human papillomavirus (HPV) encompasses a group of over 200 related viruses known to infect the genital areas, mouth, and throat of both men and women [1]. As a common sexually transmitted infection globally, HPV poses a significant health risk, being the primary cause of cervical cancer. Notably, HPV types 16 and 18 are implicated in around 70% of all cervical cancer cases worldwide [2,3]. The prevalence of HPV is so widespread that an estimated 80% of sexually active individuals will have been infected with at least one type of HPV by the age of 45 [3]. This high prevalence underscores the importance of early detection, regular screening, and preventive measures, notably vaccination, to mitigate the associated health risks [4,5].

The global fight against HPV has been bolstered by the development and dissemination of three primary HPV vaccines: the bivalent, quadrivalent, and nonavalent vaccines. These vaccines have demonstrated high safety, immunogenicity, and efficacy against the most oncogenic HPV types, especially types 16 and 18 [2]. The broad impact of these vaccines is seen in their ability to prevent specific HPV-related infections and conditions, as evidenced in the decreased rates of oral HPV infections among vaccinated young adults [6]. The administration of these vaccines typically occurs in a series of doses, with the recommended age for vaccination varying by country. The World Health Organization (WHO) advocates for achieving high vaccination coverage with at least one dose of an HPV vaccine among girls aged 9 to 14 years, before they become sexually active, thereby indirectly reducing HPV infection rates in boys as well [2].

In South Africa, cervical cancer ranks as a leading cause of cancer-related deaths among women, with the country experiencing a high number of new cases annually [7]. In response, South Africa launched a school-based HPV vaccination programme in 2014, targeting girls in grade four aged nine years or older, with the bivalent vaccine [8]. Since a substantial proportion of girls in grade four are below nine years of age, the target population for HPV vaccination in South Africa was later changed to grade five girls aged nine years or older [9]. While the programme has achieved significant vaccination coverage of more than 80% nationally, wide variations exist within and between subnational geographies, with some areas like the eThekwini District in the province of KwaZulu-Natal reporting vaccination coverage as low as 40% [8,9]. Research indicates that factors such as limited awareness, safety concerns, cultural beliefs, challenges with healthcare access, and social stigma around sexual health discussions contribute to these disparities in vaccine uptake [8-10]. Understanding these barriers and facilitators is crucial for designing targeted interventions to enhance vaccine uptake and, ultimately, reduce the burden of HPV-related diseases in South Africa. We therefore conducted this cross-sectional study to assess the behavioural and social factors that influence HPV vaccination decisions within eThekwini District of KwaZulu-Natal Province in South Africa [10].

2. Materials and Methods

2.1. Study Design and Setting

This is a cross-section study conducted from 15 April 2023 to 15 May 2023 among parents and other persons fulfilling parental roles (henceforth referred to as caregivers) in four neighbourhoods of eThekwini District namely, Chatsworth, Embo, Umlazi, and Wentworth.

We employed a stratified random sampling technique because of its effectiveness in achieving representativeness in diverse populations [11]. The district was segmented into various strata based on socio-demographical factors, including income levels, educational backgrounds, ethnic group, and urban versus rural residency. This approach is in line with Newman and Gough's advocacy for capturing a wide range of perspectives in educational and social research [12]. Each stratum was proportionally represented in the sample, in accordance with the district's demographical distribution, to ensure a comprehensive understanding of the factors influencing HPV vaccine uptake.

 doi:10.20944/preprints202503.0191.v1

Caregivers were selected from varied healthcare access points, including schools, public clinics, private practices, and community health centers. Furthermore, the sample included caregivers with different employment statuses and levels of community engagement, for a nuanced understanding of community-level influences on health behaviours. Participant recruitment was conducted in collaboration with local healthcare facilities, schools, and community organizations.

2.2. Sample Size

The planned sample size for the survey, targeting caregivers of children aged 9 to 14 years, was set at 713 participants. The sample size was determined to provide sufficient statistical power to adequately assess factors associated with the uptake of HPV vaccination in this district, ensuring sufficient statistical power [13]. This sample size offers 80% statistical power to detect small correlation effects (r=0.2) with a significance level of 5% [13, 14], thereby enabling the identification of even subtle associations within the data.

2.3. Data Management and Analyses

Trained research assistants explained the importance and procedures of the study to eligible individuals, and those who consented to participate in the study signed both the study consent form and information leaflet. A structured questionnaire was then administered to consenting participants by the trained research assistants to collect the required data. We adapted the questionnaire from the WHO framework for behavioural and social drivers of vaccination (BeSD) [15]. We have previously adapted the BeSD questionnaire, which was initially developed for childhood vaccination, to study COVID-19 vaccine acceptance in South Africa [16]. The BeSD framework is designed to explore and measure multiple behavioural and social factors that influence vaccination decisions. It encompasses a range of elements including individual beliefs, trust, social norms, motivation, and structural barriers to vaccine uptake. By assessing these factors, the BeSD model aids public health professionals and researchers in identifying key drivers and barriers to vaccine uptake, thereby facilitating the development of more effective and tailored public health strategies for enhancing vaccine confidence and uptake.

To ensure the clarity and relevance of the questionnaire, we conducted pilot testing through cognitive interviews. This involved two rounds of interviews in one neighbourhood, each involving four to eight participants. The aim of this pilot testing was to ensure that participants could easily understand the questions and that their responses accurately reflected the intended constructs. This step was crucial to confirm that all survey items, including the questions and their respective response options, were not only correctly translated but also conveyed the intended meanings in the context of HPV vaccination. The adapted questionnaire (Appendix A1) has questions on socio-demographical characteristics; knowledge of HPV, the relationship between HPV and cervical cancer, and the national HPV vaccination programme and its target population; willingness to allow daughters or close relatives to receive the HPV vaccine; and safety of the HPV vaccine.

We tested for associations between variables using the chi-squared test (for binary data) and student's t-test (for continuous data). We then used the modified Poisson regression (that is, Poisson regression with log link and robust sandwich standard error) to assess the association between exploratory factors and HPV vaccine acceptance [17]. We examined the correlation matrix, which showed that while some predictors were correlated, they did not significantly impact the model's interpretability. Therefore, we determined that multicollinearity was not a significant concern in our analyses, and no variables were removed. We believe that these steps ensured the robustness of our multivariable model. We processed datasets using Microsoft Excel and conducted analyses using the Statistical Package for Social Sciences (IBM SSPS Inc, Chicago, IL) V.27.0 and R (The R Foundation for Statistical Computing, Vienna, Austria) V4.0.5 software.

 doi:10.20944/preprints202503.0191.v1

2.4. Ethics Approval

We obtained ethics approval from the University of Cape Town's Human Research Ethics Committee (Reference: HREC 286/2021) and administrative clearance from the KwaZulu-Natal Provincial Department of Health.

3. Results

We invited 793 eligible participants and 713 (89.9%) accepted the invitation, consented, and participated in the study. The characteristics of the study population are shown in Table 1. The mean age (± standard deviation) of the study population was 42.6 (± 11.6) years and there were 614 (86.1%) female participants. Most of the participants had secondary or lower education (83.7%) and household income less than 10,000 South African Rand (92.0%).

Table 1. Characteristics of the study population.

Exploratory variables	**Summary statistics**		
	All	**Accept HPV vaccine**	**Do not accept HPV vaccine**
Sample size	N = 713 (100%)	N = 667 (93.5%)	N = 46 (6.5%)
Mean age (standard deviation)	42.6 (11.6) years	42.5 (11.4) years	44.5 (12.9) years
Gender:			
Male	99 (13.9%)	88 (13.2%)	11 (23.9)
Female	614 (86.1%)	579 (86.8%)	35 (76.1)
Education:			
Primary and below	45 (6.3%)	44 (6.6%)	1 (2.2%)
Secondary	552 (77.4%)	513 (76.9%)	38 (82.6%)
Tertiary and above	113 (15.8%)	105 (15.7%)	7 (15.2%)
Missing	5 (0.4%)	5 (0.7%)	0 (0.0%)
Household income:			
<Less than 10,000 ZAR*	656 (92.0%)	613 (91.9%)	41 (89.1%)
10,0000- to 20,000 ZAR	41 (5.8%)	38 (5.7%)	3 (6.52)
>More than 20,000 ZAR	16 (2.2%)	14 (2.1%)	2 (4.3%)
Neighbourhood:			
Chatsworth	182 (25.5%)	169 (25.3%)	13 (28.3%)
Embo	144 (20.2%)	134 (20.1%)	10 (21.7%)
Wentworth	190 (26.6%)	166 (24.9%)	23 (50.0%)
Umlazi	197 (27.6%)	196 (29.4%)	0 (0.0%)
Missing	2 (0.3%)	2 (0.3%)	0 (0.0%)

* ZAR = South African Rand (currently 1 United States Dollar = 18 ZAR).

Among the participants, 70.9% (504/710) had heard of HPV and 59.7% (425/712) knew that HPV causes cervical cancer. A higher proportion of 86.0% (602/700) were aware of the school-based HPV vaccination programme that targets girls in grade five in public schools. In addition, 93.7% (664/709) were confident that the HPV vaccine was safe for girls and 77.0% (545/708) said the vaccine should also be offered to boys. Overall, 93.5% (667/713) of study participants accept HPV vaccination of their girls. This group includes 42.9% of study participants who had already vaccinated their daughters and 50.6% of participants who expressed willingness to allow their daughters or close relatives to receive the HPV vaccine. A negligible proportion was either undecided (2.1%) or unwilling to allow

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their daughters or next of kins to take the HPV vaccine (4.4%). Denominators differ slightly due to a small number of missing data.

Univariate analyses revealed the following exploratory variables to be associated with acceptance of HPV vaccination: knowledge of HPV (crude prevalence ratio [cPR] = 1.06; 95% confidence intervals [CI] = 1.01 to 1.11); awareness of the existence of the national school-based HPV vaccination programme (cPR 1.23; 95% CI 1.10 to 1.36); belief that HPV vaccination is important (cPR 1.12; 95% CI 1.03 to 1.23); confidence in the safety of HPV vaccines (cPR 1.17; 95% CI 1.12 to 1.24); and recommendation from religious leaders encouraging HPV vaccination (cPR 1.45]; 95% CI 1.05 to 2.00). As shown in Table 2, there was no distinct association between acceptance of HPV vaccination and any of the following variables: age, gender, level of formal education, household income, and vaccination against COVID-19.

Finally, in the multivariable analyses, controlling for awareness of the existence of the school-based HPV vaccination programme, confidence in the importance of HPV vaccines, confidence in the safety of HPV vaccines, and recommendation by religious leaders, two factors emerged as independent predictors of HPV vaccine acceptance in eThekwini District. These are knowledge of the school-based HPV vaccination programme (adjusted prevalence ratio [aPR] 1.16; 95% CI 1.06 to 1.28) and confidence in the safety of HPV vaccines (aPR 1.14; 95% CI 1.08 to 1.19). In addition, recommendation from religious leaders in favour of HPV vaccination was a marginally significant independent predictor of HPV vaccine acceptance (aPR 1.30; 95% CI 0.98 to 1.72).

Table 2. Predictors of acceptance of HPV in eThekwini District of KwaZulu-Natal Province, South Africa.

Exploratory variables	**n**	**cPR (95% CI)**	**P value**	**aPR (95% CI)**	**P value**
Age	713	1.00 (0.99 to 1.00)	0.30	---	---
Gender:					
Male	99	Baseline		---	---
Female	614	1.06 (0.99 to 1.14)	0.11	---	---
Education level:					
Primary and below	45	Baseline	---	---	---
Secondary	552	0.95 (0.91 to 1.00)	0.05	---	---
Tertiary	113	0.96 (0.90 to 1.02)	0.21	---	---
Household income:					
0 to 10,000 ZAR	656	Baseline	---	---	---
10,00 to 20,000 ZAR	41	0.99 (0.91 to 1.08)	0.80	---	---
More than 20,000 ZAR	16	0.93 (0.77 to 1.12)	0.47	---	---
Vaccinated against COVID-19:					
No	260	Baseline	---	---	---
Yes	452	1.02 (0.98 to 1.07)	0.28	---	---
Knowledge of HPV:					
No	206	Baseline	---	---	---
Yes	504	1.06 (1.01 to 1.11)	0.03	1.00 (0.97 to 1.04)	0.79
Knowledge of school-based HPV vaccination programme:					
No	98	Baseline	---	---	---
Yes	602	1.23 (1.10 to 1.36)	<0.001	1.16 (1.06 to 1.28)	0.002

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View on importance of HPV vaccine:					
Not important	90	Baseline	---	---	---
Very important	618	1.12 (1.03 to 1.23)	0.012	1.03 (0.95 to 1.12)	0.45
Recommendation from religious leaders on vaccines:					
Discourages vaccination	20	Baseline	---	---	---
Encourages vaccination	691	1.45 (1.05 to 2.00)	0.023	1.30 (0.98 to 1.72)	0.07
View on HPV vaccine safety:					
Skeptical	270	Baseline			
Very safe	439	1.17 (1.12 to 1.24)	<0.001	1.14 (1.08 to 1.19)	<0.001

aPR: adjusted prevalence ratio; cPR: crude prevalence ratio; CI: confidence intervals; ZAR: South African Rand (Currently 1 United States Dollar is equivalent to about 18 ZAR).

4. Discussion

Cervical has a significant health and social impact on South African society, ranking among the top causes of cancer-related deaths among women [7]. One of the main tools to fight the scourge of cervical cancer is HPV vaccination of girls before they become sexually active, introduced in South Africa in 2014; but wide variations exist within and between subnational geographies in HPV vaccination coverage, with some areas like the eThekwini District having coverage as low as 40% [8,9]. However, in this cross-sectional study, we found very high HPV vaccine acceptance of 93.5% in eThekwini District. This acceptance is influenced by what caregivers think and feel (including knowledge of the HPV vaccination programme and confidence in vaccine safety) and, to a certain extent, social norms (including recommendations by religious leaders). Our finding of high acceptance of HPV vaccination among caregivers of young girls is a powerful positive message that can form the basis of a comprehensive vaccine communication and education strategy in South Africa. The high levels of knowledge and acceptance of HPV vaccination found in this study can be compared with findings from other studies in South Africa [18] and in other low and middle-income countries [19].

Vaccine literacy and vaccine confidence are crucial factors which influence vaccine acceptance and uptake. Vaccine literacy plays an important role in shaping public perceptions and influencing behaviour regarding vaccination. In a previous study in Israel, Gendler and Ofri found that parents with higher levels of vaccine literacy showed more positive vaccine perceptions and were more likely to accept vaccination for their children [20]. These findings are supported by a systematic review by Mavundza and colleagues of the factors that influence caregivers' views and practices regarding vaccines in Africa. The review found that caregivers' views and practices regarding vaccination in Africa are influenced by various factors including lack of information or knowledge about vaccines [21]. There is therefore need for providing reliable and accessible information about vaccines to enhance understanding and acceptance. However, several studies highlight persisting gaps in awareness and understanding of HPV vaccination among different population groups in South Africa [8,9,22]. In particular, a study by Tathiah and colleagues targeting the South African private health sector found that low awareness levels about HPV and its vaccines remain a significant barrier to achieving high vaccine coverage and reducing the burden of HPV-related illnesses [22]. These studies collectively suggest that while there are ongoing efforts to improve HPV vaccination coverage in countries like South Africa, low level awareness about HPV and its vaccines remains a fundamental barrier. There is thus a need to address this gap through public education in the form of targeted vaccine literacy campaigns to provide information about vaccines, including HPV vaccines, where it is presently lacking. Education campaigns, public health communication, and messaging should also provide information regarding where girls can access HPV vaccination services and address any concerns about the vaccine.

 doi:10.20944/preprints202503.0191.v1

We found that vaccine confidence, which encompasses trust in the safety and efficacy of vaccines, is a major determinant of vaccine acceptance. A literature review focusing on COVID-19 vaccination in Eastern European countries also identified public confidence in vaccine safety and efficacy as a central attitude associated with vaccine acceptance [23]. The study emphasized that improving public confidence through transparent communication about vaccine development and safety profiles is essential to increase vaccine uptake. The perception of vaccine safety as a critical factor in willingness to vaccinate is a common finding in vaccination literature worldwide [24]. Addressing safety concerns is central to vaccine acceptance. Systematic reviews of HPV vaccine acceptance research conducted in Africa provide evidence to support this view, which places significant emphasis on the importance of addressing safety concerns to improve vaccine uptake [25]. It is therefore important to have a comprehensive vaccine communication strategy that disseminates timely, accurate, and transparent information about HPV vaccines to address any apprehensions about the vaccine and ensure vaccine confidence and uptake.

This study revealed high willingness to get vaccinated against HPV in eThekwini District, but actual HPV vaccine uptake in the district is still low [8,9]. Willingness and good knowledge alone do not always translate to high vaccine uptake [26, 27]. Beyond motivation to get vaccinated, factors such as vaccine availability also drive actual vaccine uptake [27]. Caregiver's vaccination attitudes and behaviours consist of an ongoing engagement that is contingent on unfolding personal and social circumstances, which can potentially change over time [26]. Therefore, communication on HPV vaccination should involve more than information and factor in that people develop their beliefs through their life experiences and that culture, personal background, and religion all shape people's reactions to facts presented to them. The study identifies religious leaders as key influencers within communities. Integrated faith-based perspectives with public health objectives could present a considerable opportunity for synergistic action in favour of vaccination programmes. In addition, communication strategies should resonate with various cultural sentiments within communities. The intersection of health care, education, and religion presents a tapestry of channels through which vaccine literacy can be effectively amplified.

Author Contributions: Conceptualization: PB, CSW; methodology: PB, CSW, MS; formal analysis: PB and PK; investigation: SB, AVM, TS, MS, DS, LGT; resources: CSW and DN; writing—original draft preparation: PB, CSW, PDMCK; writing—review and editing: PB, CSW, PDMCK, DN, SC, SB, AVM, TS, MS, DS, LGT, PK, MS; supervision: CSW, DN, and MS; project administration: PB. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the South African Medical Research Council (SAMRC), through Cochrane South Africa (Project 43500). PB received a training fellowship from the SAMRC through its Division of Research Capacity Development (under the Bongani Mayosi National Health Scholars Programme funded by the South African National Department of Health).

Institutional Review Board Statement: Ethical approval was obtained from the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC Reference: 286/2021). We also obtained permission to carry out the study from the KwaZulu-Natal Provincial Department of Health of Health and Department of Education. All research procedures were conducted according to Helsinki declaration.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data generated in this study is available from the corresponding author upon reasonable request.

Acknowledgments: The authors acknowledge the support received from the South African Medical Research Council. The authors are also grateful to the caregivers who participated in this study.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results. The content of this manuscript is the sole responsibility of the authors and does not

 doi:10.20944/preprints202503.0191.v1

necessarily represent the official views of the South African Medical Research Council or any institutions to which the authors are directly or indirectly affiliated.

Appendix A

Appendix A1: Adapted HPV Vaccination Survey Questionnaire

Survey –Screening

Good [morning / afternoon]. I am [interviewer's name] with the University of Cape Town and the South African Medical Research Council (SAMRC).We would like to have a conversation with you with regards to the vaccine against human papillomavirus(HPV). HPV is a type of virus that causes infection and cancer of the cervix in women. We are interviewing parents from eThekwini district in KwaZulu-Natalto help improve the HPV vaccination services in our country.

If potential participant informs you that they do not have children, end the interview.

I know you are busy, so this will take only 30 minutes. Your participation is completely voluntary and anonymous. If you do not want to answer a question or wish to stop the interview, just let me know.

1. Would you be willing to take the survey?
   - Yes
   - No

If "yes" to Q1: Thank you very much. Do you have any questions for me before we begin? ***Proceed to survey screener after addressing any questions.***

If "No" to Q1: Thank you very much. End interview.

2. What is your gender?
   - Man
   - Woman
   - Non-binary or transgender
   - Prefer not to say
3. In what year were you born? (CCYY)

   (4-digit figure) if born in 2005 or later thank participant and end interview.
4. What is the highest educational level that you have obtained?
   - No formal education
   - Primary Sec

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5. Which of the following best describes your total monthly household income (from all sources) at this time
   - No Incomeincome
   - Between R0 and R 2 999 per month
   - Between R3 000 and R10 000 per month
   - Between R10 000 and R20 000 per month
   - Between R20 000 and R30 000 per month
   - R30 000 or more per month
6. To your knowledge, were you vaccinated as a child?
   - Yes
   - No
7. Have you ever been vaccinated for flu?
   - Yes
   - No

8. Are you vaccinated or planning to vaccinate against COVID-19?
   - Yes
   - No
   - I don't know
   - I don't want the vaccine
9. Are you the parent or are you responsible for any child who is 9 years old or older?
   - Yes

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- No

If "Yes" to Q9, participant is eligible for survey, continue to Q10.

If "No" to Q9, participant is not eligible for survey, and you can thank the participant as follows:

Thank you for answering those questions. Unfortunately, you are not eligible to participate in the survey since we are going to ask questions about children and you are currently not having children. We would like to thank you very much for taking thetime to answer my questions. ***End Interview***.

10. How many children do you have who are 9 years old or older?

(Record number of children) ##

The next questions are about you and about your **youngest** child who is 9 years old or older.

11. What is your relationship to the child? Are you the…

- Mother
- Father
- Grandparent
- Uncle or Aunt
- Brother or Sister
- Other? [IF "OTHERother": Please specify_____]

12. How old is your child?

__years [***Record age in number of completed years***].

13. Is your child a……?

- Boy
- Girl
- Non-binary or transgender
- Prefer not to say

Survey – Main Survey Items

14. How important do you think vaccines are for your child's health? Would you say…

- Not at all important
- A little important
- Moderately important
- Very important

15. How much do you think vaccinating children protects other people in your

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community from diseases? Would you say other people are…

- Not at all protected
- A little protected
- Moderately protected
- Very protected

16. Do your religious or spiritual beliefs **encourage** vaccinating your child, **discourage** vaccinating you child, or would you say this **doesn't apply** to you?

- **Encourage** vaccinating
- **Discourage** vaccinating,
- Would you say this doesn't apply to you?

17. Have you ever heard of human papillomavirus or HPV?

- Yes
- No

18. Where have you heard about HPV before? Mark all that apply

- Doctor, nurse or other health care professional
- Family or friends
- Newspaper or magazine
- Television
- Internet
- Radio
- Don't remember
- Other [Please specify]

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19. Did you know that HPV can cause cervical cancer and many other cancers?
    - Yes
    - No
20. Are you aware that all grade five girls in public schools are being offered the HPVvaccine?
    - Yes
    - No

If YES, how did you hear about it? (Tick all that apply)from

- From family or friends
- On Radio
- From Education Officials
- On Television
- From Health Officials
- Other (specify):

21. Would you allow your daughter or a close relative to get the HPV vaccine?
    - Yes
    - I do n't kn o w N o
    - She has already taken it

If your answer is NO, please indicate why?

- I am against all vaccinations
- The vaccine is not safe
- The HPV vaccine will make young girls start sexual activity early
- My religion does not allow vaccination
- The HPV vaccine is not necessary
- Other (specify):

22. How safe do you think the HPV vaccine is for your child? Would you say…
    - Not at

 doi:10.20944/preprints202503.0191.v1

all
safe
- A
little
safe
- Moder
ately
safe
- Very
safe

23. How concerned are you that HPV vaccine could cause your child to have a serious reaction? Would you say...
- Not at all
concerned
- A little
concerned
- Moderately
concerned
- Very
concerned

24. Do you think that the HPV vaccine should be offered to boys as well?
- Yes
- I
do
n't
kn
o
w
- N
o

25. Which of these delivery systems do you think are appropriate for HPV vaccinedelivery (select all that apply)?
- Schools
- Health facilities/clinics
- Community (village market, churches)
- Other (Specify):

Thank you so much for your time!

 doi:10.20944/preprints202503.0191.v1

References

1. Bruni L, Saura-Lázaro A, Montoliu A, Brotons M, Alemany L, Diallo MS, Afsar OZ, LaMontagne DS, Mosina L, Contreras M, Velandia-González M, Pastore R, Gacic-Dobo M, Bloem P. HPV vaccination introduction worldwide and WHO and UNICEF estimates of national HPV immunization coverage 2010-2019. Prev Med 2021; 144:106399.
2. World Health Organization. Human papillomavirus vaccines: WHO position paper (2022 update). Weekly Epidemiological Record 2022;97:645-672.
3. Chesson HW, Dunne EF, Hariri S, Markowitz LE. The estimated lifetime probability of acquiring human papillomavirus in the United States. Sexually Transmitted Diseases 2014;41(11):660-4.
4. Adamu AA, Jalo RI, Ndwandwe D, Wiysonge CS. Exploring the complexity of the implementation determinants of human papillomavirus vaccination in Africa through a systems thinking lens: a rapid review. Human Vaccines & Immunotherapeutics 2024;20(1):2381922.
5. Mavundza EJ, Mmotsa TM, Ndwandwe D. Human papillomavirus (HPV) trials: a cross-sectional analysis of clinical trials registries. Human Vaccines & Immunotherapeutics 2024;20(1):2393481.
6. Chaturvedi AK, Graubard BI, Broutian T, Pickard RK, Tong ZY, Xiao W, Kahle L, Gillison ML. Effect of prophylactic human papillomavirus (HPV) vaccination on oral HPV infections among young adults in the United States. Journal of Clinical Oncology 2018;36(3):262-7.
7. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians 2018;68(6):394-424.
8. Ngcobo NJ, Burnett RJ, Cooper S, Wiysonge CS. Human papillomavirus vaccination acceptance and hesitancy in South Africa: research and policy agenda. S Afr Med J 2018;109(1):13-15.
9. Amponsah-Dacosta E, Blose N, Nkwinika VV, Chepkurui V. Human papillomavirus vaccination in South Africa: programmatic challenges and opportunities for integration with other adolescent health services?. Frontiers in Public Health 2022;10:799984.
10. Bhengu P, Ndwandwe D, Cooper S, Katoto PDMC, Wiysonge CS, Shey M. Behavioural and social drivers of human papillomavirus vaccination in eThekwini District of KwaZulu-Natal Province, South Africa. PLoS One 2024;19(12):e0311509.
11. Iliyasu R, Etikan I. Comparison of quota sampling and stratified random sampling. Biom Biostat. Int J Rev 2021;10(1):24-27.
12. Newman M, Gough D. Systematic reviews in educational research: Methodology, perspectives and application. Systematic reviews in educational research: Methodology, perspectives and application 2020:3-22.
13. Kumar R. Research methodology: A step-by-step guide for beginners. SAGE Publications Limited, 2019.
14. Pett, M., Lackey, N. & Sullivan, J. Making Sense of Factor Analysis. SAGE Publications Limited, 2003.
15. World Health Organization. Understanding the behavioural and social drivers of vaccine uptake: WHO position paper. Weekly Epidemiological Record 2022;97(20):209-24.
16. Katoto PDMC, Parker S, Coulson N, Pillay N, Cooper S, Jaca A, Mavundza E, Houston G, Groenewald C, Essack Z, Simmonds J, Shandu LD, Couch M, Khuzwayo N, Ncube N, Bhengu P, van Rooyen H, Wiysonge CS. Predictors of COVID-19 Vaccine Hesitancy in South African Local Communities: The VaxScenes Study. Vaccines 2022;10(3):353.
17. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Medical Research Methodology 2003;3(1):1-3.
18. Maree JE, Moitse KA. Exploration of knowledge of cervical cancer and cervical cancer screening amongst HIV-positive women. Curationis 2014;37(1):1209.
19. Santos AC, Silva NN, Carneiro CM, Coura-Vital W, Lima AA. Knowledge about cervical cancer and HPV immunization dropout rate among Brazilian adolescent girls and their guardians. BMC Public Health 2020;20(1):301.

 doi:10.20944/preprints202503.0191.v1

20. Gendler Y, Ofri L. Investigating the influence of vaccine literacy, vaccine perception and vaccine hesitancy on Israeli parents' acceptance of the COVID-19 vaccine for their children: a cross-sectional study. Vaccines. 2021;9(12):1391.
21. Mavundza EJ, Cooper S, Wiysonge CS. A Systematic Review of Factors That Influence Parents' Views and Practices around Routine Childhood Vaccination in Africa: A Qualitative Evidence Synthesis. Vaccines 2023;11(3):563.
22. Tathiah N, Naidoo M, Moodley I. Human papillomavirus (HPV) vaccination of adolescents in the South African private health sector: Lessons from the HPV demonstration project in KwaZulu-Natal. South African Medical Journal 2015;105(11):933-936
23. Popa AD, Enache AI, Popa IV, Antoniu SA, Dragomir RA, Burlacu A. Determinants of the hesitancy toward COVID-19 vaccination in Eastern European countries and the relationship with health and vaccine literacy: a literature review. Vaccines 2022;10(5):672.
24. Larson HJ, Cooper LZ, Eskola J, Katz SL, Ratzan S. Addressing the vaccine confidence gap. Lancet 2011;378(9790):526-535.
25. Perlman S, Wamai RG, Bain PA, Welty T, Welty E, Ogembo JG. Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review. PloS ONE 2014;9(3): e90912.
26. Cooper S, Schmidt BM, Sambala EZ, Swartz A, Colvin CJ, Leon N, Wiysonge CS. Factors that influence parents' and informal caregivers' views and practices regarding routine childhood vaccination: a qualitative evidence synthesis. Cochrane Database Syst Rev 2021;10(10):CD013265.
27. Cooper S, Wiysonge CS. Towards a More Critical Public Health Understanding of Vaccine Hesitancy: Key Insights from a Decade of Research. Vaccines 2023;11(7):1155.