





Article

Willingness to Pay for HPV Vaccine among Women Living with HIV in Nigeria

Folahanmi T. Akinsolu ^{1,2,*}, Olunike Abodunrin ^{1,3}, Ifeoluwa E. Adewole ¹, Mobolaji Olagunju ⁴, Aisha O. Gambari ^{1,2}, Dolapo O. Raji ¹, Ifeoma E. Idigbe ², Diana W. Njuguna ⁵, Abideen Salako ^{1,2} and Oliver C. Ezechi ^{1,2}

¹ Department of Public Health, Faculty of Basic Medical and Health Sciences, Lead City University, Ibadan 212102, Nigeria

² Nigerian Institute of Medical Research, Lagos 100001, Nigeria

³ Lagos State Health Management Agency, Lagos 100001, Nigeria

⁴ Department of Epidemiology and Biostatistics, School of Public Health, Nanjing Medical University, Nanjing 210008, China

⁵ School of Nursing, Dedan Kimathi University of Technology, Nyeri 10100, Kenya

* Correspondence: akinsolu.folahanmi@lcu.edu.ng or folahanmi.tomiwa@gmail.com

Abstract: Background: Human papillomavirus (HPV) is responsible for most cervical cancer cases globally, with women living with HIV having a higher risk of persistent HPV infection and HPV-associated disease. The HPV vaccine is a promising tool to reduce cervical cancer rates, but its uptake among women living with HIV in Nigeria is unknown. Methods: A facility-based, cross-sectional survey was conducted with 1371 women living with HIV to assess their knowledge of HPV, cervical cancer, and the HPV vaccine as well as their willingness to pay for the vaccine at the HIV treatment clinic at the Nigerian Institute of Medical Research, Lagos. To identify factors associated with the willingness to pay for the HPV vaccine, multivariable logistic regression models were developed. Results: This study found that 79.1% of participants had not heard of the vaccine, and only 29.0% knew its efficacy in preventing cervical cancer. In addition, 68.3% of participants were unwilling to pay for the vaccine, and the average amount they were willing to pay was low. Knowledge of HPV, the HPV vaccine, and cervical cancer and income were factors associated with the willingness to pay for the vaccine. Health workers were the primary source of information. Conclusions: This study highlights the lack of knowledge and low willingness to pay for the HPV vaccine among women living with HIV in Nigeria and emphasizes the importance of improving education and awareness. Factors associated with the willingness to pay, such as income and knowledge, were identified. Practical strategies, such as community outreach and school-based education programs, could be developed to increase vaccine uptake. Further research is needed to explore additional factors influencing the willingness to pay.



Citation: Akinsolu, F.T.; Abodunrin, O.; Adewole, I.E.; Olagunju, M.; Gambari, A.O.; Raji, D.O.; Idigbe, I.E.; Njuguna, D.W.; Salako, A.; Ezechi, O.C. Willingness to Pay for HPV Vaccine among Women Living with HIV in Nigeria. *Vaccines* **2023**, *11*, 928. <https://doi.org/10.3390/vaccines11050928>

Academic Editor: So Young Yoo

Received: 21 March 2023

Revised: 10 April 2023

Accepted: 19 April 2023

Published: 3 May 2023

Keywords: HPV; cervical cancer; HPV vaccine; women; HIV



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Background

With more than 600,000 newly reported cases and about 300,000 fatalities from cervical cancer in 2020, it significantly threatens public health worldwide [1,2]. Low- and middle-income countries (LMICs) account for more than 80% of the mortality and incidence, particularly in sub-Saharan Africa, and have the highest death rates. [2,3]. The cervical cancer occurrence rate in Nigeria is 250 per 100,000 women of all ages, an endemic figure that indicates an insurmountable public health problem. It predominantly occurs in women living with HIV (WLWH) [4,5]. HIV-positive women have higher rates of both infection and mortality due to cervical cancer than their HIV-negative counterparts [4]. Cervical cancer and HIV are closely intertwined, and the number of patients with comorbidities continues to increase. Most individuals contract HPV at some point, typically shortly after

beginning sexual activity [1,6]. HPV 16 and 18 are responsible for most quasi-cervical HPV-associated malignancies and 70.0% of cervical cancer. Although infection with HPV has been a significant contributory factor for cervical cancer, additional indicators of risk include early sexual contact, early marriage (before age 20), having more than one partner, sexual activity without protection, long-term hormonal contraception, a significant number of conceptions, tobacco use, and unsanitary habits [2,7].

According to the World Health Organization, vaccinating girls aged 9–14 against HPV can prevent at least one third of all HPV-related cancers in Africa [8,9]. Many high-income countries have now included HPV vaccination for adolescent girls in their routine immunization schedule [10,11]. In sub-Saharan Africa, the five countries with the highest rates of cervical cancer deaths emphasize the need for increased uptake of HPV vaccination in the region [8]. Hence, nations must execute efficient, cost-effective, and enduring HPV distribution tactics that align with their healthcare frameworks to attain optimal coverage. Since 2012, various international and domestic initiatives have implemented experimental programs to identify the most effective approaches for enhancing the distribution of HPV vaccines in LMICs [12,13].

Despite the success of cervical cancer screening programs in developed countries, screening for cervical cancer remains unpopular in Nigeria [14–16] as a result of the lack of an organized national screening program, and HPV screening is primarily opportunistic, with an estimated coverage rate of around 8.70% [15,17]. Nevertheless, two varieties of vaccines have proven effective in preventing cancer of the cervical cavity in Nigeria: the bivalent vaccine from GSK (Cervarix™, Philadelphia, PA, USA) and Merck & Co. Inc.'s quadrivalent HPV vaccine (Gardasil, Boston, MA, USA). These vaccines are highly effective in preventing persistent HPV infection and subsequent precancerous lesions caused by two types of HPV (16 and 18), which are responsible for about 70.0% of cervical cancer cases worldwide [15,17–19].

Considering all-female populations is crucial in achieving the global goal of cervical cancer elimination. WLHIV are particularly important, as they have higher rates of persistent HPV infection and HPV-associated disease. Furthermore, countries such as Nigeria, with increased rates of HIV, also tend to have low rates of cervical cancer screening, making simple and affordable vaccine schedules critical [4]. Studies have shown that the HPV vaccine is safe, immunogenic, and effective in WLWH, with the best immune responses observed in those with undetectable HIV viral loads.

Introducing HPV vaccines in developing countries has been a significant challenge due to high prices. The Vaccine Alliance (Gavi) and its partners aim to provide the poorest countries with access to a sustainable supply of new and underused vaccines, including HPV vaccines, for as low as USD 4.50 per dose (NGN 2072.25) [18,20]. Gavi assists with HPV demonstration initiatives and the nationwide implementation of HPV vaccinations, contingent upon the nation's established capacity to administer vaccinations to girls in their adolescence [15,18]. In Africa, Rwanda, Tanzania, South Africa, and Senegal are among the countries with the HPV vaccine in their national programs for immunization, following successful pilot projects [12,21]. A few other countries, including Nigeria, have ongoing pilot programs [1,20,22]. Gavi's continuous provision of vaccine encouragement in Nigeria encompasses a range of vaccines, including pentavalent, pneumococcal conjugate, yellow fever, meningitis A, and measles vaccines. In addition, Gavi provides financial assistance to bolster the healthcare structure and enhance the vaccination program's capacity [15]. Presently, individuals incur personal expenses when acquiring vaccines against HPV, as they are not included within the roster of vaccines that are provided free of charge through the National Immunization Program (NIP) in Nigeria. This exclusion is due to the potential exacerbation of the government's already limited spending on health if free HPV vaccination were to be implemented. The implementation of HPV vaccination necessitates the creation of a novel vaccine distribution mechanism to effectively target adolescent females, given the absence of an established infrastructure to facilitate this undertaking,

in addition to the associated expenses. Thus, despite the assistance provided by Gavi, substantial funding is required for the delivery of HPV vaccination to the community.

Research has indicated that impediments to the adoption of HPV immunization include the cost; parental inclination to finance the vaccination for their female offspring; insufficient awareness, particularly among caregivers of the intended demographic and particularly in lower-middle-income nations such as Nigeria; negative beliefs; and opposing attitudes [23,24]. In Nigeria, many studies that have examined the knowledge and parental acceptance of the HPV vaccine have reported low levels of expertise [25] and high levels of vaccine acceptability [7,15,25–27]. Therefore, this study aimed to ascertain the variables linked to the inclination to pay for the HPV vaccine among WLWH in Nigeria. This study also sought to assess the knowledge of HPV, cervical cancer, and the HPV vaccine among this population.

2. Materials and Methods

Study Design and Setting

This research used a cross-sectional survey at the HIV treatment clinic at the Nigerian Institute of Medical Research (NIMR), Lagos State. The institute is a preeminent institution dedicated to researching diseases with significant public health implications in Nigeria. The institute presently offers a comprehensive range of HIV care, treatment, and support services to a population exceeding 20,000 individuals, with women constituting 62.9% of the total.

Study population: The study population included women of known HIV status aged 18 years and above that were receiving treatment and were eligible for cervical cancer screening at the NIMR clinic, Lagos State. Women who were unable to provide informed consent were excluded from the study.

Sampling method and sample size determination: The sampling method for this study was convenience sampling, a type of non-probability sampling technique. The sample size was calculated according to the formula $N = Z\alpha^2P(1 - P)/d^2$, where $Z\alpha$ is the Z statistic for a 95% confidence level, N is the sample size, P is the prevalence of WLWH willing to pay for the HPV vaccine, and d is the precision. The population proportion of WLWH in Nigeria that were willing to pay for the HPV vaccine was 50%, with a 95% confidence level and a 5% margin of error; the minimum required sample size that was calculated was approximately 385 participants. However, with an increase in the precision estimate and accounting for potential non-responses or missing data, the sample size was increased to 1371 participants using a margin of error of approximately 2.5% with a 95% confidence level.

Data collection tool: The questionnaire was pretested for reliability and validity using a pilot study with a small sample of participants before its administration in the main study. The study used an interviewer-administered questionnaire to gather data on various demographic variables of the participants, including their age, level of education, primary occupation, and average monthly per capita income. In addition, the study questionnaire collected data on HPV, cervical cancer, and HPV vaccination knowledge. For the evaluation of participants' level of comprehension regarding the ailment and HPV vaccination (i.e., the knowledge index score), questions were included regarding the etiology of cervical cancer. The present investigation operationalized the willingness to pay for the HPV vaccine as the inclination of unvaccinated females to obtain the HPV vaccine after being informed of its cost. The measurement of vaccine rejection was based on the response elicited by the following inquiry: "If the vaccine is not free, and you have to pay 'out of pocket' by yourself, will you vaccinate yourself and/or your daughter against HPV?" A follow-up question was used to assess the willingness to pay (WTP) of "vaccine acceptors." The question read, "From the scale below, mark 'x' on the maximum amount you will pay (in Naira) to have yourself and/or your daughter vaccinated against HPV." Individuals who responded negatively or reported a payment card value of zero were categorized as "vaccine rejecters," whereas those who responded affirmatively and said a positive payment card value were classified as "vaccine acceptors." The payment card provided a range of WTP values from zero to NGN

27,623.40, equivalent to USD 60. The highest price tendered corresponded to the overall market value of the vaccine in Nigeria. The perceived monetary benefit of the vaccine was deemed as the upper limit of their willingness to pay. The participants' answers to the willingness to pay inquiries were classified into two groups: those who accepted the vaccine and those who declined it. The variable that became the dependent variable in the multivariate logistic regression was the response to the willingness to pay question.

Data collection procedure: The data collection was conducted between June 2022 and November 2022. It involved face-to-face interviews with eligible participants. All research assistants were trained before the commencement of the study on the research tools, interviewing skills, data management, and clarifications of ethical issues in research. The research assistants administered the questionnaires in Pidgin English or the local language for participants who could neither read nor write. The questionnaires were administered privately, and clarification and assistance were provided where necessary. The interviews took approximately 20 min to complete.

Statistical analysis: The data collected in the survey were analyzed using the SPSS version 27.0 (SPSS Inc. Chicago, IL, USA) statistical package. Descriptive statistics, including frequencies and percentages, were used to summarize the socio-demographic and health characteristics of the study's participants. The means and standard deviations were used to summarize continuous variables such as age and income. The primary outcome variable was the willingness to pay for the HPV vaccine, which was measured as a binary variable (yes/no). To test the assumptions of a logistic regression, we checked for multicollinearity, linearity, and the normality of the residuals.

We assessed the presence of multicollinearity using the variance inflation factor (VIF), with a VIF value of 10 indicating high multicollinearity. We found that all independent variables had VIF values below the threshold, indicating no significant multicollinearity. We also examined the linearity assumption by plotting the residuals against the predicted values and examined the normality assumption by generating a standard probability plot of residuals. The residual plots showed no evidence of nonlinearity or non-normality, confirming that the assumptions of the logistic regression were met. We also conducted sensitivity and subgroup analyses to assess the robustness of the results using different beliefs and models. Finally, we used a logistic regression analysis to examine the factors associated with the willingness to pay for the HPV vaccine. The independent variables included in the regression model were socio-demographic variables, HIV-related health status variables, and knowledge about HPV and the HPV vaccine. The odds ratios (ORs) and 95% confidence intervals (CIs) were used to estimate the strengths and directions of the associations between the independent and outcome variables. A *p*-value of less than 0.05 was considered statistically significant. We also conducted sensitivity analyses to assess the robustness of the findings using different assumptions and models. Subgroup analyses examined the associations between the independent variables and the willingness to pay for the HPV vaccine by age group, income level, and educational level.

3. Ethical Considerations

This study was conducted following the ethical principles of the Declaration of Helsinki. Ethics approval was obtained from the Institutional Review Board of the Nigerian Institute of Medical Research, Lagos State (IRB-21-047). Before administering the questionnaire, the participants were given information sheets outlining the study's objective and scope, which were duly explained to the participants in English or the local dialect (Yoruba/Pidgin). The participants were informed that participation in the study was voluntary and that they were free to withdraw from the study at any point without any consequences. The confidentiality and anonymity of the participants were ensured, and all data were kept confidential and were used only for research purposes. The participants were assured that participation or non-participation would not affect their access to healthcare services. In addition, participants who required psychological support after the study were referred to the appropriate healthcare professionals.

4. Results

Table 1 shows the socio-demographic characteristics of the 1371 participants in this study. The mean age of the participants was 43.2 ± 9.2 . Most participants were married (809, 59%), and 668 (48.7%) had a tertiary level of education. Furthermore, 1008 (73.5%) of the participants were working. In addition, 587 (42.8%) of the participants had income levels that fell between NGN 18,000.00 (USD 40.0) and NGN 35,000.00 (USD 76.0).

Table 1. Participants' socio-demographic characteristics (N = 1371).

Socio-Demographic Characteristics	N (%)
Age (Mean \pm SD)	43.2 \pm 9.2
Age group	
≤30	117 (8.5)
31–40	409 (29.8)
41–50	578 (42.2)
51–60	225 (16.5)
>60	41 (3.0)
Ethnicity	
Igbo	545 (39.8)
Yoruba	499 (36.4)
Hausa	29 (2.1)
Others	298 (21.7)
Education level	
No Education	24 (1.8)
Primary	120 (8.8)
Secondary	559 (40.8)
Tertiary	668 (48.7)
Profession	
Unemployed	56 (4.1)
Self-employed	1016 (74.1)
Professional	240 (17.5)
Civil servant	59 (4.3)
Marital status	
Single	256 (18.7)
Married	809 (59)
Separated	85 (6.2)
Divorced	20 (1.5)
Widowed	201 (14.7)
Income (NGN)	
<18,000	358 (26.1)
18,000–35,000	587 (42.8)
36,000–50,000	165 (12)
51,000–70,000	82 (6)
71,000–100,000	77 (5.6)
>100,000	102 (7.4)
Number of sexual partners	
None	1099 (80.2)
1	242 (17.7)
<3	28 (2.0)
>3	2 (0.1)
Source of Income	
Family	329 (24)
Wages	667 (48.7)
Salary	375 (27.4)

Table 2 shows the knowledge of the HPV vaccine among the study's participants. In total, 1085 (79.1%) said they had not heard of the HPV vaccine; 1092 (78.6%) participants

said that if the vaccine exists, it will cure cervical cancer; 447 (32.6%) of the participants indicated that if the HPV vaccine has been taken, regular screening is still needed; 423 (30.9%) of the participants agreed that the HPV vaccine effectively prevents HPV infection, and 398 (29.0%) participants agreed that the HPV vaccine effectively prevents cervical cancer.

Table 2. Knowledge of the HPV vaccine.

Knowledge/Belief	No N (%)	Yes N (%)
Have you heard of the HPV vaccine?	1085 (79.1)	86 (20.9)
Does the HPV vaccine cure cancer?	279 (20.4)	1092 (79.6)
Is regular screening for cancer still needed even though you have been vaccinated against HPV?	924 (67.4)	447 (32.6)
Is the HPV vaccine highly effective in preventing HPV infection?	948 (69.1)	423 (30.9)
Is the HPV vaccine highly effective in preventing cervical cancer?	973 (71.0)	398 (29.0)

Table 3 presents the attitudes of women living with HIV in Lagos toward a willingness to pay for the HPV vaccine. In total, 937 (68.3%) said they were unwilling to pay for the HPV vaccine. When asked if they were willing to get their daughter vaccinated if the HPV vaccine was available, 762 (55.6%) said they were ready to get their daughter vaccinated. However, when asked if they were willing to pay for their daughter's vaccine, only 455 (33.2%) agreed to pay for their daughter's vaccine. When asked if they would allow all females around them to be vaccinated if vaccination was free, 1085 (79.1%) confirmed that if vaccination was free, all females around them would be vaccinated. Only 35 (2.6%) participants had been vaccinated with the HPV vaccine. The average amount the participants were willing to pay for the vaccine if it was available was NGN 3221.15 (USD 7.00) \pm NGN 3963.95 (USD 8.61).

Table 3. Attitude/willingness to pay for the HPV vaccine.

Attitude/Willingness	No N (%)	Yes N (%)
Are you willing to pay for the HPV vaccine?	937 (68.3)	434 (31.7)
Are you willing you get your daughter vaccinated?	609 (44.4)	762 (55.6)
Would you be willing to pay for your daughter's vaccine?	916 (66.8)	455 (33.2)
If vaccination was free, would you allow all females around you to be vaccinated?	286 (20.9)	1085 (79.1)
Have you been vaccinated against HPV?	1336 (97.4)	35 (2.6)
Amount willing to pay (Mean \pm SD)	3221.15 \pm 3963.950	

Table 4 shows the associations between individual factors and the willingness to pay for the HPV vaccine. The analysis revealed that the education level was significantly associated with the willingness to pay but only among participants who attended tertiary education (OR = 4.564, 95% CI: 1.860–11.164). The study also indicated that participants earning between NGN 51,000.00 and NGN 70,000.00 (USD 111 and USD 152) and those earning above NGN 100,000.00 (>USD 217) were willing to pay for the vaccine (OR = 2.178, 95% CI: 1.315–3.610 and OR = 3.673, 95% CI: 2.209–6.108, respectively).

However, after controlling for potential confounders and inter-relationships between factors, it was shown that participants who had attended tertiary education (aOR = 4.004; 95% CI: 1.623–9.877) and those that were earning more than NGN 100,000.00 (USD 217) (aOR = 2.468; 95% CI: 1.458–4.180) were willing to pay for HPV vaccination. Furthermore, knowledge of HPV (aOR = 2.270, 95% CI: 1.400–3.681) and cervical cancer (aOR = 4.241, 95% CI: 3.035–5.925) were statistically significantly associated with the participants' willingness to get vaccinated. The knowledge of the HPV vaccine was initially significant (OR = 1.983; 95% CI: 1.454–2.704) but was not statistically significant after controlling for other factors (aOR = 1.284; 95% CI: 0.914–1.804).

Table 4. Factors associated with the willingness to pay for the vaccine.

Variables	Category	Crude OR 95% CI (Lower Bound–Upper Bound)	p-Value	Adjusted OR 95% CI (Lower Bound–Upper Bound)	p Value
Education Level	No education	Ref		Ref	
	Primary	1.308 (0.502–3.404)	0.583	1.273 (0.488–3.321)	0.621
	Secondary	2.386 (0.974–5.842)	0.057	2.266 (0.923–5.564)	0.074
	Tertiary	4.564 (1.860–11.164)	0.001 **	4.004 (1.623–9.877)	0.003 **
Income (NGN)	<18,000	Ref		Ref	
	18,000–35,000	1.282 (0.985–1.668)	0.065	1.183 (0.904–1.549)	0.221
	36,000–50,000	1.283 (0.886–1.858)	0.186	0.972 (0.661–1.429)	0.884
	51,000–70,000	2.178 (1.315–3.610)	0.003 **	1.649 (0.983–2.766)	0.058
	71,000–100,000	1.504 (0.914–0.475)	0.109	1.047 (0.625–1.755)	0.861
	>100,000	3.673 (2.209–6.108)	0.000 **	2.468 (1.458–4.180)	0.001 **
Knowledge of HPV	Poor knowledge	Ref		Ref	
	Good knowledge	3.899 (2.489–6.108)	0.000 **	2.270 (1.400–3.681)	0.001 **
Knowledge of the HPV Vaccine	Poor knowledge	Ref		Ref	
	Good knowledge	1.983 (1.454–2.704)	0.000 **	1.284 (0.914–1.804)	0.149
Knowledge of cervical cancer	Poor knowledge	Ref		Ref	
	Good knowledge	5.061 (3.657–7.004)	0.000 **	4.241 (3.035–5.925)	<0.001 **

** Statistically significant.

Table 5 presents the associations between perceived screening benefits and the willingness to pay for the HPV vaccine. The analysis revealed a statistically significant relationship for each perceived benefit. However, after adjusting for other confounding factors, only participants with accurate knowledge of the HPV vaccine’s effectiveness against the development of cervical cancer (aOR = 1.856, 95% CI: 1.231–2.798), the effectiveness of the early detection of cervical cancer (aOR = 1.366, 95% CI: 1.049–1.779), and the significance of regular screening (aOR = 2.227, 95% CI: 1.609–3.082) as well as the knowledge that screening for cervical cancer in women with HIV can prevent the development of cancer (aOR = 2.009, 95% CI: 1.509–2.675) had statistically significant associations.

Table 5. Health beliefs associated with the willingness to pay.

Variables	Category	Crude OR 95% CI (Lower Bound–Upper Bound)	p-Value	Adjusted OR 95% CI (Lower Bound–Upper Bound)	p Value
<i>Perceived screening benefit</i>					
Screening for cervical cancer in women with HIV can prevent the development of cancer.	No	Ref		Ref	
	Yes	3.907 (3.056–4.994)	0.000 **	2.009 (1.509–2.675)	<0.001 **
Is regular screening for cervical cancer needed even though you have been vaccinated against HPV?	No	Ref		Ref	
	Yes	4.991 (3.832–6.502)	0.000 **	2.227 (1.609–3.082)	<0.001 **
Early detection of cervical cancer can increase survival.	No	Ref		Ref	
	Yes	2.422 (1.946–3.016)	0.000 **	1.366 (1.049–1.779)	0.021 **
<i>Susceptibility to cervical cancer and HPV infection</i>					
The germ that can cause cervical cancer can be transmitted through sexual intercourse.	No	Ref		Ref	
	Yes	1.784 (1.430–2.225)	0.000 **	0.916 (0.695–1.206)	0.530
HPV is transmitted during sexual intercourse.	No	Ref		Ref	
	Yes	3.093 (2.407–3.975)	0.000 **	1.287 (0.944–1.755)	0.111
<i>Perceived benefit of the vaccine</i>					
Are HPV vaccines highly effective for HPV infection?	No	Ref		Ref	
	Yes	4.316 (3.314–5.620)	0.000 **	1.221 (0.808–1.846)	0.343
Are HPV vaccines highly effective against cervical cancer?	No	Ref		Ref	
	Yes	4.644 (3.528–6.111)	0.000 **	1.856 (1.231–2.798)	0.003 **

** Statistically significant.

5. Discussion

This study investigated the willingness to pay for HPV vaccination among WLWH in Nigeria. Cervical cancer remains a significant public health concern in Nigeria. However, it is clear that HPV awareness is low, and specific knowledge was generally poor among WLWH in Nigeria.

The results of this study indicate a significant lack of knowledge related to HPV, cervical cancer, and the HPV vaccine among the participants, indicating a need for greater public awareness and education about these critical health issues. This outcome is similar to that of a study conducted among WLWH in Lagos, Nigeria, where 67.7% of the participants had never heard of HPV infection and only 22.3% knew about the HPV vaccine [28]. Moreover, a study conducted in the United States found that HPV vaccine knowledge and awareness were low among WLWH despite their dramatically increased risk of developing precancerous cervical lesions, cervical cancer, and other HPV-associated cancers [26,29].

The source of information about HPV and cervical cancer was primarily health workers, indicating the need for healthcare providers to play a more significant role in disseminating information about these health issues to the public. These findings are consistent with previous studies that have reported the critical role of health workers in improving the knowledge and awareness of HPV and cervical cancer [25,30].

This study revealed that most participants were unwilling to pay for the HPV vaccine, indicating that the cost is a substantial barrier, particularly for those with lower incomes. Only 3% of the participants had already received the HPV vaccine. The scenario above resembles a research endeavor in Vietnam, where individuals in the poor/near-poor household category have not received HPV vaccinations [31]. Multiple investigations across developing regions worldwide have identified elevated expenses as barriers to the willingness to accept and pay for vaccines [32,33]. The data suggest that women cannot access vital healthcare services due to financial limitations, even in areas where such services are available. Efforts aimed at promoting the HPV vaccine will need to carefully consider specific demographic patterns, including but not limited to educational attainment and income levels. Studies conducted on the willingness to pay for the HPV vaccine among Nigerian female undergraduates and the general population found that a higher percentage of participants were willing to pay for the HPV vaccine [15,34,35]. However, this contradicts this study's findings, where most participants were unwilling to pay for the vaccine. This study's finding might be because WLWH have other healthcare needs that take precedence over getting the HPV vaccine, such as managing their HIV medications or addressing other HIV-related complications.

This study also assessed the willingness of WLWH to pay for HPV vaccination for their daughters and females in their communities. The results showed that 55.6% of the participants were willing to vaccinate their daughters, while 66.8% were not willing to pay for the vaccine, indicating that the cost was a significant factor in their decision making. However, if the vaccine was free, 79.1% of the participants expressed their willingness to vaccinate their daughters and other females in their communities, suggesting potential demand for the vaccine. Another study found that 72.0% of parents were willing to vaccinate their daughters if the vaccine was free [36]. Studies conducted in other parts of the world have also shown that low-income individuals may be less willing to pay for the HPV vaccine due to financial constraints [10,33,37,38]. These findings suggest that the cost is a significant barrier to vaccine uptake, particularly in low-income settings. However, parents who perceive the vaccine as effective and necessary for their daughters are more willing to pay. Therefore, addressing the cost of the vaccine and educating parents on the benefits of HPV vaccination are crucial to improve vaccine uptake.

This study found that participants were willing to pay a meaningful amount of USD 7.46 ± USD 9.17 (NGN 3221.15 ± NGN 3963.95), which was significantly lower than the market cost. Therefore, reducing the vaccine cost could increase the willingness to pay and vaccine uptake, and a co-payment for HPV vaccination could be a viable option to augment the cost of vaccination in a government-funded vaccination scenario. This finding

is consistent with previous studies conducted in Kenya and India, which identified costs as a significant barrier to HPV vaccination uptake and suggested strategies to reduce costs, such as government-sponsored programs and subsidies [39,40].

This study aimed to identify factors associated with the willingness to pay for the HPV vaccine. While the education level and income were not strongly associated with the willingness to pay for the HPV vaccine, this study found that participants who had attended tertiary education were more willing to pay for the vaccine than those who had not. This study suggests that higher education levels may contribute to determining an individual's willingness to pay for the HPV vaccine. This study's finding is consistent with previous research suggesting that education can influence health-related decision making [40,41]. Another study showed that knowledge of cervical cancer was significantly associated with the willingness to pay and that participants with higher education were willing to pay for the vaccine at a lower price than those with less secondary education [39,42]. Other studies conducted in the United States, Canada, and Ethiopia also highlighted the significance of various factors affecting vaccine uptake and the willingness to pay [43–46]. These factors included knowledge about HPV and its associated diseases, the perceived risk of HPV, the perceived effectiveness of the vaccine, and awareness of cervical cancer. Overall, the findings emphasized the importance of addressing these factors to increase vaccination rates and reduce the burden of HPV-related diseases.

A study conducted in Nigeria found that the cost and a lack of knowledge about cervical cancer and its prevention were significant barriers to vaccine uptake and willingness to pay [27]. This study's findings support that study's results, which showed that knowledge of HPV and the vaccine were significant predictors of willingness to pay [27]. Another study conducted in Nigeria also identified fear of side effects and a lack of trust in the safety and efficacy of the vaccine as essential factors contributing to low vaccine uptake and willingness to pay [28,47,48]. According to this study, the perceived benefits of screening are significantly related to the willingness to pay for the HPV vaccine. The results indicate that individuals with accurate knowledge about (1) the vaccine's effectiveness in preventing cervical cancer, (2) the early detection of cervical cancer, (3) the importance of regular screening, and (4) the benefits of screening for cervical cancer in women with HIV are more willing to pay for the vaccine. These findings align with prior research suggesting that preventive health measures' perceived benefits can impact healthcare decision making [49].

Furthermore, this study highlights that the knowledge of the HPV vaccine's effectiveness in preventing cervical cancer is the most significant factor related to the willingness to pay for the vaccine. This finding suggests that increasing public awareness about the vaccine's effectiveness in preventing cervical cancer could increase vaccine uptake.

Overall, the findings of this study and similar studies conducted in other countries emphasize the importance of addressing knowledge gaps, increasing awareness about the vaccine's benefits, and managing cost barriers to improve vaccine uptake and the willingness to pay. In addition, targeted educational interventions and strategies to improve access to the vaccine and the affordability of the vaccine could help increase vaccine uptake and ultimately reduce the burden of cervical cancer.

This study has several limitations. First, the study was conducted at a single HIV treatment clinic in Nigeria and may not be generalizable to other populations or settings. Second, the study relied on self-reported data, which may be subject to social desirability or recall bias. Third, the study did not assess the knowledge and willingness to pay for the vaccine among women who were not receiving HIV treatment, and this may have biased the results. Fourth, the study did not explore other potential barriers to vaccine uptake, such as cultural or religious beliefs. Lastly, this study did not collect data on the history of violence or sexual abuse among the study participants, which could be a potential confounding factor for the willingness to pay for the HPV vaccine. Therefore, we cannot rule out the possibility that past experiences of violence or sexual abuse may have influenced the results of our analysis.

In terms of prospects, this study highlights the need for effective strategies to increase awareness and access to the HPV vaccine among women living with HIV in Nigeria. Community outreach programs, school-based education programs, and targeted campaigns for women and parents could be effective strategies to increase vaccine uptake. Additionally, further research is necessary to explore other factors that may influence the willingness to pay for the HPV vaccine in Nigeria and to identify potential barriers to vaccine uptake that were not explored in this study. Future studies should consider collecting such data to better understand the relationship between past experiences of violence or sexual abuse and the willingness to pay for the HPV vaccine among women living with HIV.

6. Conclusions

This study highlights the low levels of knowledge about HPV, cervical cancer, and the HPV vaccine among WLWH in Nigeria, resulting in 66.8% of participants being unwilling to pay for the vaccine. The study emphasizes the importance of increasing education and awareness about the vaccine's significance in preventing cervical cancer, with health workers playing a crucial role in providing information. Factors associated with the willingness to pay, such as income, knowledge of HPV and the vaccine, awareness of cervical cancer, and the health belief model of a perceived screening benefit, were also identified. The study's findings could aid in developing effective strategies to increase vaccine uptake in Nigeria, such as community outreach and school-based education programs. Further research is necessary to explore additional factors influencing the willingness to pay for the vaccine. This study recommends that the Nigerian government and healthcare providers prioritize increasing awareness and education about the HPV vaccine and cervical cancer prevention among WLWH.

Author Contributions: Conceptualization, F.T.A. and O.C.E.; Data curation, F.T.A., M.O., D.O.R., D.W.N. and A.S.; Formal analysis, O.A., I.E.A. and M.O.; Investigation, A.O.G., D.O.R., D.W.N. and A.S.; Methodology, F.T.A., O.A., I.E.I. and M.O.; Resources, F.T.A.; Software, M.O. and A.O.G.; Supervision, F.T.A. and O.C.E.; Validation, F.T.A.; Writing—original draft, F.T.A. and M.O.; Writing—review and editing, F.T.A., I.E.A., D.W.N. and A.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted following the Declaration of Helsinki and was approved by the Institutional Review Board of the Nigerian Institute of Medical Research, Lagos State (IRB-21-047).

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

Data Availability Statement: The data used to support the findings of this study are available from the corresponding author upon request.

Acknowledgments: This work was supported by grants from the Fogarty International Center (FIC) and the National Institutes of Health (funding provided by Fogarty training grant D43TW010934-03). The content is solely the responsibility of the author and does not necessarily represent the official views of the National Institutes of Health.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Egbon, M.; Ojo, T.; Aliyu, A.; Bagudu, Z.S. Challenges and lessons from a school-based human papillomavirus (HPV) vaccination program for adolescent girls in a rural Nigerian community. *BMC Public Health* **2022**, *22*, 1611. [[CrossRef](#)] [[PubMed](#)]
2. Sung, H.; Ferlay, J.; Siegel, R.L.; Laversanne, M.; Soerjomataram, I.; Jemal, A.; Bray, F. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J. Clin.* **2021**, *71*, 209–249. [[CrossRef](#)]
3. World Health Organization. *Guide to Introducing HPV Vaccine into National Immunization Programmes*; World Health Organization: Geneva, Switzerland, 2016.

4. Ezechi, O.C.; Petterson, K.O.; Gbajabiamila, T.A.; Idigbe, I.E.; Gab-Okafor, C.V.; Abu Okolo, C.; Ujah, I.A.O.; Ostergren, P.O. Evaluation of Direct Visual Inspection of the Cervix in Detecting Cytology Diagnosed Squamous Intraepithelial Lesion in Women of known HIV Status. A Randomized Trial (CANHIV Study). *Afr. J. Reprod. Health* **2016**, *20*, 77–88. [[CrossRef](#)] [[PubMed](#)]
5. Bray, F.; Ferlay, J.; Soerjomataram, I.; Siegel, R.L.; Torre, L.A.; Jemal, A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *J. CA Cancer J. Clin.* **2018**, *68*, 394–424. [[CrossRef](#)] [[PubMed](#)]
6. Bosch, F.X.; Brooker, T.R.; Forman, D.; Moscicki, A.-B.; Gillison, M.L.; Doorbar, J.; Stern, P.L.; Stanley, M.; Arbyn, M.; Poljak, M.; et al. Comprehensive control of human papillomavirus infections and related diseases. *J. Vaccine* **2013**, *31*, H1–H31. [[CrossRef](#)]
7. Oluwole, E.O.; Idowu, O.M.; Adejimi, A.A.; Balogun, M.R.; Osanyin, G.E. Knowledge, attitude and uptake of human papillomavirus vaccination among female undergraduates in Lagos State, Nigeria. *J. Fam. Med. Prim. Care* **2019**, *8*, 3627–3633. [[CrossRef](#)]
8. Gallagher, K.E.; Howard, N.; Kabakama, S.; Mounier-Jack, S.; Burchett, H.E.D.; Lamontagne, D.S.; Watson-Jones, D. Human papillomavirus (HPV) vaccine coverage achievements in low and middle-income countries 2007–2016. *Papillomavirus Res.* **2017**, *4*, 72–78. [[CrossRef](#)]
9. Canfell, K. Towards the global elimination of cervical cancer. *Papillomavirus Res.* **2019**, *8*, 100170. [[CrossRef](#)]
10. Gallagher, K.; LaMontagne, D.; Watson-Jones, D. Status of HPV vaccine introduction and barriers to country uptake. *Vaccine* **2018**, *36*, 4761–4767. [[CrossRef](#)]
11. Gultekin, M.; Ramirez, P.T.; Broutet, N.; Hutubessy, R. World Health Organization call for action to eliminate cervical cancer globally. *Int. J. Gynecol. Cancer* **2020**, *30*, 426–427. [[CrossRef](#)]
12. Mphuru, A.; Li, A.J.; Kyesi, F.; Mwengee, W.; Mazige, F.; Nshunju, R.; Shayo, B.; Giattas, M.R.; Loharikar, A.; Lyimo, D. National introduction of human papillomavirus (HPV) vaccine in Tanzania: Programmatic decision-making and implementation. *Vaccine* **2022**, *40*, A2–A9. [[CrossRef](#)]
13. Howard, N.; Gallagher, K.E.; Mounier-Jack, S.; Burchett, H.E.; Kabakama, S.; LaMontagne, D.S.; Watson-Jones, D. What works for human papillomavirus vaccine introduction in low and middle-income countries? *J. Papillomavirus Res.* **2017**, *4*, 22–25. [[CrossRef](#)] [[PubMed](#)]
14. Ekwunife, O.I.; Lhachimi, S.K. Cost-effectiveness of Human Papilloma Virus (HPV) vaccination in Nigeria: A decision analysis using pragmatic parameter estimates for cost and programme coverage. *BMC Health Serv. Res.* **2017**, *17*, 815. [[CrossRef](#)] [[PubMed](#)]
15. Umeh, I.B.; Nduka, S.O.; Ekwunife, O.I. Mothers' willingness to pay for HPV vaccines in Anambra state, Nigeria: A cross sectional contingent valuation study. *Cost Eff. Resour. Alloc.* **2016**, *14*, 8. [[CrossRef](#)]
16. John-Akinola, Y.O.; Ndikom, C.M.; Oluwasanu, M.M.; Adebisi, T.; Odukoya, O. Cervical Cancer and Human Papillomavirus Vaccine Knowledge, Utilisation, Prevention Educational Interventions and Policy Response in Nigeria: A Scoping Review. *J. Cancer Control* **2022**, *29*, 10732748221130180. [[CrossRef](#)]
17. Bruni, L.B.R.L.; Barrionuevo-Rosas, L.; Albero, G.; Aldea, M.; Serrano, B.; Valencia, S.; Brotons, M.; Mena, M.; Cosano, R.; Muñoz, J.; et al. Human papillomavirus and related diseases in the world. *J. Summ. Rep.* **2019**, *17*.
18. Hanson, C.M.; Eckert, L.; Bloem, P.; Cernuschi, T. Gavi HPV programs: Application to implementation. *Vaccines* **2015**, *3*, 408–419. [[CrossRef](#)] [[PubMed](#)]
19. Marijam, A.; Schuerman, L.; Izurieta, P.; Pereira, P.; Van Oorschot, D.; Mehta, S.; Ota, M.O.; Standaert, B. Estimated public health impact of human rotavirus vaccine (HRV) and pneumococcal polysaccharide protein D-conjugate vaccine (PHiD-CV) on child morbidity and mortality in Gavi-supported countries. *J. Hum. Vaccines Immunother.* **2022**, *18*, 2135916. [[CrossRef](#)]
20. Tsu, V.D.; LaMontagne, D.S.; Atuhebwe, P.; Bloem, P.N.; Ndiaye, C. National implementation of HPV vaccination programs in low-resource countries: Lessons, challenges, and future prospects. *Prev. Med.* **2021**, *144*, 106335. [[CrossRef](#)]
21. Casey, S.M.M.; Jansen, E.M.; Drainoni, M.-L.P.; Schuch, T.J.M.; Leschly, K.S.M.; Perkins, R.B.M. Long-Term Multilevel Intervention Impact on Human Papillomavirus Vaccination Rates Spanning the COVID-19 Pandemic. *J. Low. Genit. Tract Dis.* **2022**, *26*, 13–19. [[CrossRef](#)] [[PubMed](#)]
22. Karanja-Chege, C.M. HPV Vaccination in Kenya: The Challenges Faced and Strategies to Increase Uptake. *Front. Public Health* **2022**, *10*, 204. [[CrossRef](#)]
23. Tung, I.L.Y.; Machalek, D.A.; Garland, S.M. Attitudes, Knowledge and Factors Associated with Human Papillomavirus (HPV) Vaccine Uptake in Adolescent Girls and Young Women in Victoria, Australia. *PLoS ONE* **2016**, *11*, e0161846. [[CrossRef](#)]
24. Bingham, A.; Drake, J.K.; LaMontagne, D.S. Sociocultural Issues in the Introduction of Human Papillomavirus Vaccine in Low-Resource Settings. *Arch. Pediatr. Adolesc. Med.* **2009**, *163*, 455–461. [[CrossRef](#)]
25. Enebe, J.T.; Enebe, N.O.; Agunwa, C.C.; Nduagubam, O.C.; Okafor, I.I.; Aniwada, E.C.; Aguwa, E.N. The awareness, acceptability and uptake of cervical cancer vaccination services among female secondary school teachers in Enugu, Nigeria: A cross-sectional study. *Pan Afr. Med. J.* **2021**, *39*. [[CrossRef](#)]
26. Ezenwa, B.N.; Balogun, M.R.; Okafor, I.P. Mothers' human papilloma virus knowledge and willingness to vaccinate their adolescent daughters in Lagos, Nigeria. *J. Int. J. Women's Health* **2013**, *5*, 371–377. [[CrossRef](#)] [[PubMed](#)]
27. Ihudiebube, S.; Ndidiamaka, C.; Jisieike, O.; Nonyelum, N.; Ezeh, E.N.; Odikpo, L.C.; Mba, F.C. Attitude and perceived barriers to uptake of human papillomavirus vaccine among female students in a Nigerian tertiary institution. *Int. J. Med. Res. Health Sci.* **2019**, *8*, 85–92.
28. Sajo, E.; Ozonu, J.; Okunade, K.; Ejiofor, J.; Adenekan, M.; Amaeshi, L.; Anorlu, R.; Akanmu, S. 203 Knowledge and awareness of HPV and HPV vaccine among HIV positive women in Lagos, Nigeria. *ePoster* **2019**, *29* (Suppl. S3), A89. [[CrossRef](#)]

29. Wigfall, L.T.; Bynum, S.A.; Brandt, H.M.; Hébert, J.R. HPV Vaccine Awareness and Knowledge Among Women Living with HIV. *J. Cancer Educ.* **2016**, *31*, 187–190. [[CrossRef](#)]
30. Adejuyigbe, F.F.; Balogun, M.R.; Balogun, B.R.; Osekoni, A.; Adegbola, A.A. Cervical Cancer and Human Papilloma Virus Knowledge and Acceptance of Vaccination among Medical Students in Southwest Nigeria. *Afr. J. Reprod. Health* **2015**, *19*, 140–148.
31. Le, X.T.T.; Nguyen, P.T.N.; Do, T.T.T.; Nguyen, T.H.; Le, H.T.; Nguyen, C.T.; Ha, G.H.; Hoang, C.L.; Tran, B.X.; Latkin, C.A.; et al. Intention to Pay for HPV Vaccination among Women of Childbearing Age in Vietnam. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3144. [[CrossRef](#)] [[PubMed](#)]
32. Wong, L.P. Issues Surrounding HPV Vaccine Delivery in a Multi-Ethnic Country in Asia: The Physician's Perspective. *J. Community Health* **2011**, *36*, 14–22. [[CrossRef](#)]
33. Rambout, L.; Tashkandi, M.; Hopkins, L.; Tricco, A.C. Self-reported barriers and facilitators to preventive human papillomavirus vaccination among adolescent girls and young women: A systematic review. *Prev. Med.* **2014**, *58*, 22–32. [[CrossRef](#)] [[PubMed](#)]
34. Iliyasu, Z.; Galadanci, H.S.; Muhammad, A.; Iliyasu, B.Z.; Umar, A.A.; Aliyu, M.H. Correlates of human papillomavirus vaccine knowledge and acceptability among medical and allied health students in Northern Nigeria. *J. Obstet. Gynaecol.* **2022**, *42*, 452–460. [[CrossRef](#)] [[PubMed](#)]
35. Rabiou, K.A.; Alausa, T.G.; Akinlusi, F.M.; Davies, N.O.; Shittu, K.A.; Akinola, O.I. Parental acceptance of human papillomavirus vaccination for adolescent girls in Lagos, Nigeria. *J. Fam. Med. Prim. Care* **2020**, *9*, 2950. [[CrossRef](#)]
36. Brotherton, J.M.; Service, V.C. Human papillomavirus vaccination update: Nonavalent vaccine and the two-dose schedule. *Aust. J. Gen. Pract.* **2018**, *47*, 417–421. [[CrossRef](#)] [[PubMed](#)]
37. Tabrizi, S.N.; Brotherton, J.M.L.; Kaldor, J.M.; Skinner, S.R.; Liu, B.; Bateson, D.; McNamee, K.; Garefalakis, M.; Phillips, S.; Cummins, E.; et al. Assessment of herd immunity and cross-protection after a human papillomavirus vaccination programme in Australia: A repeat cross-sectional study. *Lancet Infect. Dis.* **2014**, *14*, 958–966. [[CrossRef](#)] [[PubMed](#)]
38. Mugo, N.R.; Eckert, L.; Magaret, A.S.; Cheng, A.; Mwaniki, L.; Ngure, K.; Celum, C.; Baeten, J.M.; Galloway, D.A.; Wamalwa, D.; et al. Quadrivalent HPV vaccine in HIV-1-infected early adolescent girls and boys in Kenya: Month 7 and 12 post vaccine immunogenicity and correlation with immune status. *Vaccine* **2018**, *36*, 7025–7032. [[CrossRef](#)]
39. Rajiah, K.; Maharajan, M.; Num, K.S.F.; Koh, R.C.H. Knowledge about Human Papillomavirus and Cervical Cancer: Predictors of HPV Vaccination among Dental Students. *Asian Pac. J. Cancer Prev.* **2017**, *18*, 1573–1579. [[CrossRef](#)]
40. Tsu, V.D. Overcoming Barriers and Ensuring Access to HPV Vaccines in Low-Income Countries. *Am. J. Law Med.* **2009**, *35*, 401–413. [[CrossRef](#)] [[PubMed](#)]
41. Gwatkin, D.R.; Rutstein, S.; Johnson, K.; Suliman, E.; Wagstaff, A.; Amouzou, A. *Socio-Economic Differences in Health, Nutrition, and Population*; The World Bank: Washington, DC, USA, 2007; 301p.
42. Tran, B.X.; Than, P.T.Q.; Doan, T.T.N.; Nguyen, H.L.T.; Thi Mai, H.; Nguyen, T.H.T.; Le, H.T.; Latkin, C.A.; Zhang, M.W.; Ho, R.C. Knowledge, attitude, and practice on and will-ingness to pay for human papillomavirus vaccine: A cross-sectional study in Hanoi, Vietnam. *Patient Prefer. Adherence* **2018**, *12*, 945–954. [[CrossRef](#)]
43. Gowda, C.; Dempsey, A.F. The rise (and fall?) of parental vaccine hesitancy. *Hum. Vaccines Immunother.* **2013**, *9*, 1755–1762. [[CrossRef](#)] [[PubMed](#)]
44. Reno, J.E.; O'leary, S.; Garrett, K.; Pyrzanowski, J.; Lockhart, S.; Campagna, E.; Barnard, J.; Dempsey, A.F. Improving Provider Communication about HPV Vaccines for Vaccine-Hesitant Parents Through the Use of Motivational Interviewing. *J. Health Commun.* **2018**, *23*, 313–320. [[CrossRef](#)]
45. Remes, P.; Selestine, V.; Chungalucha, J.; Ross, D.A.; Wight, D.; de Sanjosé, S.; Kapiga, S.; Hayes, R.J.; Watson-Jones, D. A qualitative study of HPV vaccine acceptability among health workers, teachers, parents, female pupils, and religious leaders in northwest Tanzania. *Vaccine* **2012**, *30*, 5363–5367. [[CrossRef](#)] [[PubMed](#)]
46. Tarekegn, A.A.; Yismaw, A.E. Health professionals' willingness to pay and associated factors for human papilloma virus vaccination to prevent cervical cancer at College of Medicine and Health Sciences University of Gondar, Northwest Ethiopia. *BMC Res. Notes* **2019**, *12*, 58. [[CrossRef](#)]
47. Tagbo, B.N.; Eke, C.B.; Omotowo, B.I.; Onwuasigwe, C.N.; Onyeka, E.B.; Mildred, U.O. Vaccination Coverage and Its Determinants in Children Aged 11–23 Months in an Urban District of Nigeria. *World J. Vaccines* **2014**, *4*, 175–183. [[CrossRef](#)]
48. Cockcroft, A.; Usman, M.U.; Nyamucherera, O.F.; Emori, H.; Duke, B.; Umar, N.A.; Andersson, N. Why children are not vaccinated against measles: A cross-sectional study in two Nigerian States. *Arch. Public Health* **2014**, *72*, 48. [[CrossRef](#)] [[PubMed](#)]
49. Lagerlund, M.; Hedin, A.; Sparén, P.; Thurffjell, E.; Lambe, M. Attitudes, Beliefs, and Knowledge as Predictors of Nonattendance in a Swedish Population-Based Mammography Screening Program. *Prev. Med.* **2000**, *31*, 417–428. [[CrossRef](#)] [[PubMed](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.