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Human papillomavirus (HPV) awareness and vaccine receptivity among Senegalese adolescents

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Abstract

Objective: To examine HPV vaccine awareness and receptivity among adolescents and young adults in Senegal.

Methods: Participants from 6 high schools and 5 community centers across five regions of Senegal (n=2,286) completed a self-administered questionnaire in October and November 2014. The study assessed HPV awareness and receptivity toward receiving the HPV vaccine. Multivariable logistic regression explored statistically significant relationships between the predictor variables and both outcomes.

Results: 27% had heard of HPV. Among those who had heard of HPV (n=616), only 28% indicated willingness to vaccinate. Multivariable analysis showed that respondents from rural areas had 63% higher odds (95% CI: 1.24, 2.12) of having heard of HPV than those in urban areas. Respondents with fathers who had completed higher education 41% higher odds (95% CI: 1.04, 1.92) of being aware of HPV ($p < 0.05$); however, every level of father's education (as compared to no education at all) was negatively associated with willingness to vaccinate. Respondents who had previously spoken to a healthcare professional about the HPV vaccine had 80% higher odds (95% CI: 1.16, 2.81) of willingness to vaccinate than those who did not speak to a provider about the vaccine.

Conclusions: Health care providers and parents are important stakeholders in disseminating HPV vaccine information. Given the overall low levels of awareness, there is a great opportunity for public health communication efforts to craft health messaging and information in a way to maximize receptivity, outlining benefits and providing information on the minimal risks associated with the vaccine.

Keywords: HPV; vaccine receptivity; global health; adolescent health

Introduction

Cervical cancer is the fourth most common cancer of women worldwide, affecting more than 500,000 women annually [1]. Cervical cancer disproportionately impacts developing nations, specifically those in sub-Saharan Africa [2, 3], where more than 85% of cervical cancer deaths occur [4, 5]. In Senegal in 2014, cervical cancer accounted for 30% of all cancer-related deaths among women, making it the most common cause of cancer-related deaths (breast cancer was second and accounted for 15.5% of cancer-related deaths) [6]. In 2014, the age-standardized incidence rate of cervical cancer in Senegal was 41.4 per 100,000 women per year, compared to a rate of 29.3 in West Africa and 14.0 worldwide. To mitigate this disproportionate burden of disease, primary prevention strategies will be paramount in the next decade of cervical cancer prevention and control.

Human papillomavirus (HPV) is one of the most common sexually transmitted infections in the world [2, 7]. Strains 16 and 18 of the virus are responsible for 70% of cervical cancer cases worldwide and are highly prevalent in Africa [2, 8]. While over the past two decades there has been considerable education and outreach regarding sexually transmitted infections and HIV/AIDS in Senegal and other countries in West Africa , low levels of awareness of HPV as well as a lack of infrastructure to facilitate early detection and treatment further contributes to the progression of HPV into cervical cancer [2, 4].

In the U.S. there are three vaccinations against HPV: *Gardasil®, Gardasil®9,* and *Cervarix®* [9-12]. Two of these, *Gardasil®* and *Cervarix®*, have received licensures for distribution in various countries around the world, including Senegal, [13, 14] and are highly effective (95% efficacious) in protecting against infection with HPV strains 16 and 18 [9]. The introduction of HPV vaccines presents the potential for significant global impact in the fight against cervical cancer and a necessary preventive strategy around the world especially in light of limited screening and cancer treatment facilities [9].

Currently there is no national HPV vaccine program in Senegal [1]; however, in 2014 the Global Alliance for Vaccines and Immunizations (GAVI) Alliance introduced the HPV Demonstration Project in Senegal [15]. Countries selected to participate in the demonstration projects deliver three doses of the HPV vaccine to primary program targets that include young girls ages 9-13 who are attending school, and girls who are out-of-school [16]; currently boys are not included as primary targets. Upon completion of the demonstration project, the selected countries can opt to scale up the project by applying for a national introduction of the HPV vaccine program with reduced vaccine prices. HPV vaccines typically cost more than $100 per dose in developed countries, however, through GAVI, assistance countries are able to purchase the HPV vaccination from manufacturers for $4.50 per dose [17].

As access to and the supply of HPV vaccine continues to increase, it is important to understand demand-side factors, including social and cultural determinants that facilitate uptake of the vaccine. Beliefs that vaccines cause adverse health effects can negatively impact the implementation and uptake of the HPV vaccine programs, as seen in Japan [18] and India [19]. In sub-Saharan Africa, fears of the HPV vaccine threatening future fertility have impacted acceptance of the HPV vaccine [20]. To better understand the factors that influence vaccine uptake and to ultimately inform effective prevention strategies, this study examines HPV vaccine awareness and receptivity among Senegalese adolescents. Importantly, while many global HPV vaccine efforts have targeted young girls, based on the World Health Organization recommendations [21], HPV infection is also responsible for genital warts and many cancers that affect males, including 70% of anal cancers and more than 60% of penile cancers [22]. For this reason, our study included both boys and girls in our sample as future global efforts are likely to expand to additional priority populations. To our knowledge, this is the first study to examine HPV vaccine awareness and receptivity among male and female adolescents and young adults in Senegal.

Methods

Setting and Participants

Adolescents and young adults in 5 urban, suburban, and rural regions of Senegal (Dakar, Thies, Fatick, Mbour, and Ziguinchor) participated in this study. Participants were selected from 6 high schools and 5 community centers in those regions. Within each study school, students from randomly selected classrooms in each grade level were asked to participate in the survey. Within each class, students were stratified by gender, as typically there are more boys than girls. Within each stratum students were randomly selected until a total of 30 students were selected in each class. Community

centers were selected based on existing partnerships with Senegalese NGO CEFOREP (Centre Regional la de Formation et de Recherche en Sante de la Reproduction). Adolescents and young adults participating in skill-based programs at these community centers were recruited following a similar protocol in which participants could opt out of the survey.

Data were collected in October and November 2014, with an overall response rate of 95%. Participants completed a self-administered, paper and pencil questionnaire. However, if respondents did not speak French, the survey was administered orally by study staff in the language that study participants felt most comfortable (most commonly in Wolof). In total, 2,140 adolescents were surveyed in schools (600 per region), while 300 completed the survey in five community centers. After data cleaning, the final sample size was 2,286.

The study was approved by the University of California Los Angeles Institutional Review Board as well as the Senegalese National Ethics Committee located in the Ministry of Health, with authorizations signed by the Minister of Education and Ministry of Youth. The approvals and authorizations were presented to the directors of selected schools; all of them agreed to the survey, with students able to opt out of the study if they wished.

Instrument and Measures

The study team developed a quantitative survey instrument to measure HPV awareness and vaccine receptivity among a diverse sample of Senegalese youth. Survey question content was based on formative research conducted among similar youth populations in urban and rural areas of Senegal [23], as well as a conceptual model developed by the study team that identifies determinants and supporting factors of health information seeking [24, 25]. Several of the questions were adapted from the Senegal DHS survey [26].

Main Outcome Variables

We assessed HPV awareness by asking 1) *Have you heard of HPV (Human Papilloma Virus or Human Papillomavirus)?* Students who responded 'yes' to this question were asked about their receptivity toward receiving the HPV vaccine by asking 2) *A vaccine that protects against HPV, a virus that can cause cervical cancer, was recently recommended for boys and girls. Would you get the vaccine?* For each of the main outcomes, students responded either *Yes, No,* or *Don't Know.* We analyzed these outcomes using multinomial logistic regression and then again using logistic regression, dichotomizing responses to *Yes* and *No/Don't know.* The multinomial models produced similar findings among

respondents who answered *No* and *Don't Know*; therefore, we dichotomized the outcome variables for logistic regression.

Predictor Variables

Characteristics measured include age, area in which respondents spent the majority of their lives (suburban, urban, and rural), gender, religion, father's education, socioeconomic status (SES), self-rated health, doctor's visits within the last twelve months, and whether or not a health professional spoke to the student regarding the HPV vaccine. For the religion variable, students could indicate Muslim, Christian, Animist, Without Religion, or Other. A small proportion of the sample reported religions other than Muslim and Christian; religion was subsequently dichotomized into Muslim and Not Muslim, as Muslims comprised the largest proportion of the sample's religious affiliation (80%).

Socioeconomic status (SES) was assessed using questions adapted from the Senegal Demographic and Health Survey regarding in home access to items such as electricity, television, radio, computer, etc. Responses to these questions were summed and divided into quintiles. Forty-three students declined to answer questions related to self-rated health and number of doctor's visits in the past 12 months. These missing respondents were analyzed for differences in all predictor variables and the two main outcome variables. There were no differences between the missing forty-three respondents and the remaining respondents, therefore they were excluded from the multivariable analysis.

Statistical Analysis

All predictor variables were analyzed for frequency data. Chi squared analysis was utilized to determine any statistically significant bivariate associations between the predictor variables and outcome variables. Multivariable logistic regression was utilized to explore statistically significant relationships between the selected predictors and both outcomes. All statistical analysis were completed using STATA v. 14 [27] .

Results

Sample characteristics and HPV awareness

Table 1 provides descriptive statistics of the overall sample (N=2,286) and bivariate findings based on whether or not respondents had ever heard of HPV. Students in the sample ranged in age from 14-22 and most students (69%) grew up in an urban setting. Female respondents (56% of the sample) outnumbered males, and 80% of the students were Muslim. The survey sample captured a rela-

tively even distribution of father's education. Overall, respondents rated themselves in fair to excellent health with the greatest proportion of students rating themselves in excellent health (29%). Nearly one quarter (23%) of respondents had not seen a health care provider in the last year and 27% of the sample had heard of HPV.

Bivariate analysis in Table 1 shows that respondents who indicated living most of their lives in a rural area demonstrated a greater percentage of ever having heard of HPV ($p < 0.05$). Thirty-one percent (31%) of students who rated their health as *Excellent* had heard of HPV, compared to just 18% of students with *Poor* self-rated health. In addition, fewer respondents who were at higher levels of SES reported having heard of HPV ($p < 0.05$).

Willingness to get HPV vaccine

Table 2 describes the willingness of the HPV aware sub-sample (n=616) to receive the HPV vaccine. Most students were either uncertain or would decline to receive an HPV vaccination. Only 28% of those who had heard about HPV indicated willingness to vaccinate. There were statistically significant differences in father's education and willingness to vaccinate ($p < 0.001$); a greater proportion of students whose fathers did not attend school were willing to receive the HPV vaccination (47%) while a lower proportion of those with highly educated fathers (28%) were willing to receive the vaccine. While a majority of respondents (80%) had never spoken to a health care provider about the HPV vaccine, results suggest that speaking with a provider about the vaccine was strongly associated with willingness to vaccinate. Among the respondents who spoke with a health care professional about the HPV vaccine, 41% indicated a willingness to be vaccinated, as compared to only 25% among those who had not spoken to a health care provider about the HPV vaccine ($p < 0.001$).

Predictors of willingness to get HPV vaccine

Table 3 shows two multivariable logistic regression models used to examine HPV awareness and willingness to receive the HPV vaccine. After controlling for all other predictor variables, students who spent the majority of their lives in rural areas had 63% higher odds (95% CI: 1.24, 2.12) of having heard of HPV than students who grew up in urban areas. As compared to student respondents whose fathers received no education, students with fathers who have completed higher education had 41% higher odds (95% CI: 1.04, 1.92) of being aware of HPV ($p < 0.05$). As SES quintile increased, the odds of having heard of HPV as compared to the lowest SES group decreased. SES group 1 showed a statistically significant difference in the odds of HPV awareness; the odds of this group having heard of HPV were 25% lower (95% CI: 0.60, 0.99) than in SES group 0 ($p < 0.05$). After con-

trolling for all other predictor variables, higher self-rated health and more doctor visits were positively associated with HPV awareness, OR=1.19 (95% CI: 1.10, 1.30) and OR=1.07 (95% CI: 1.02, 1.12), respectively.

The second regression model, willingness to be vaccinated, had two significant relationships. After controlling for the other predictor variables in the model, every level of father's education (as compared to no education at all) was negatively associated with willingness to be vaccinated. Students who were uncertain of their father's educational status were the least likely to be willing to be vaccinated (OR=0.20, 95% CI: 0.10, 0.41). Speaking to a health care provider about the HPV vaccine was again a significant predictor of willingness to vaccinate, as it was in the bivariate analysis. Students who had previously spoken to a health care professional regarding the HPV vaccine had 80% higher odds (95% CI: 1.16, 2.81) of willingness to be vaccinated than those who did not speak to a provider about the vaccine.

Discussion

The results of our study demonstrate a need for increased awareness of HPV and the HPV vaccine, as well as the need for education regarding HPV, and the benefits of vaccination, including but not limited to the prevention of cervical cancer among adolescents and young adults in Senegal. Overall, this study indicated low awareness of HPV; among those who had heard of HPV, just over one quarter (28%) were willing to receive the HPV vaccine. The results of this study reveal an opportunity to increase overall awareness, particularly in urban areas and among those with lower paternal education, and that health care providers can be engaged to increase health communication with the community on this issue.

Our findings reveal an urgent need to increase awareness among youth in Senegal as a whole. Our results further indicate that while it is laudable that efforts seem to have reached the most disadvantaged populations (e.g., lower income youth and youth in rural areas), the prevalence of HPV at the population level coupled with urban population size necessitates the need to raise awareness among youth in urban areas. Given the rural-urban disparity that exists in many countries for cervical cancer incidence and mortality with a disproportionate burden in rural areas [28], it is possible that HPV-awareness campaigns have been more targeted towards rural areas. As vaccine demonstration projects scale up and expand to national-level coverage, it is important for health education and communication strategies to be aware of these existing disparities in awareness of HPV across settings and to tailor messaging and intervention efforts accordingly.

Adolescents who had visited a health care provider within the last 12 months and who had the opportunity to discuss the HPV vaccine were significantly more likely to have ever heard of HPV and to be willing to vaccinate. Speaking to a health care provider about the HPV vaccine nearly doubled the odds of willingness to vaccinate. Across the globe, provider recommendation for HPV vaccination is one of the strongest predictors of receiving the vaccine [29]. Similar studies in Tanzania [30], Malawi [31], and Nigeria [32] support our findings and indicate that health care providers constitute a trusted source of health information and are one of the preferred methods for receiving HPV, cervical cancer, and vaccine knowledge and education [33].

Moreover, given the global efforts to strengthen and expand the mid-level provider workforce, including but not limited to nurses and midwives, there is an opportunity for HPV vaccine education to be integrated into workforce training and development. Several studies have documented low and/or limited knowledge of HPV and the HPV vaccine among health care providers in sub-Saharan Africa [34-36]. In our study, frequent contact with health care providers increased the odds of ever having heard of HPV, supporting an effective point of contact to disseminate valuable information to adolescents. The continued expansion and training of mid-level health providers in low- and middle-income countries presents a real opportunity not only to raise awareness of the HPV vaccine among the general population through health education, but also provides a feasible mechanism for vaccine delivery.

Father's education was an important determinant for both HPV awareness and willingness to vaccinate. Youth with more educated fathers were significantly more likely to hear about HPV than youth with fathers with no education. However, father's education was negatively associated with willingness to receive an HPV vaccination. These results are similar to an HPV vaccine study in Botswana that showed that parents with less education were more likely to have their daughter's vaccinated [37]. These differences suggest a 'one size fits all' communication approach will not meet the informational needs of all stakeholders. Emerging HPV vaccine communication research underscores the need for tailored and culturally competent materials, and our findings build upon this literature [38,39]. Our results show a need for increased awareness efforts among families with lower access to education. However, among higher educated families, there may be a need to provide more informational resources to help make informed vaccine decisions, especially if negative perceptions and attitudes regarding HPV stem from it being a sexually transmitted disease.

There are limitations to this study. First, for one of the outcomes, willingness to vaccinate, we allowed students to choose whether or not they would agree to vaccinate. This question also allowed for respondents to state uncertainty in the form of *I don't know* and *it depends*. However, due to data management challenges, both uncertainty responses were coded the same and we are unable to differentiate between the two responses. While these two items may elucidate different types of information regarding the thought process of intending to vaccinate among the adolescents and young adults, they are combined in this study and represent any type of uncertainty, and more specifically, anyone not answering *Yes*.

Second, as the majority of our sample was from the high school population, our sample age range of 14-22 years was slightly older than the priority age range of current vaccine demonstration projects that prioritize vaccinating girls ages 9-13. Our sample of secondary targets may produce conservative estimates of awareness and knowledge of the HPV vaccine as vaccine demonstration projects are just underway. However, these findings provide important data that can serve as a baseline as vaccine programs continue to expand in Senegal, as well as highlight key awareness and attitudinal challenges that can be addressed in younger populations.

Third, the predictor variable for the area in which participants spent most of their lives (urban, suburban, and rural) was self-reported and we are unable to confirm the accuracy of these results as we surveyed students at school and not in their home communities. Finally, the majority of the study sample was drawn from school settings; therefore, the results of these findings may not be generalizable to the entire youth population of Senegal.

Conclusions

Cervical cancer is a growing problem in developing countries and in sub-Saharan Africa, particularly. This study investigated the factors associated with HPV awareness and willingness to vaccinate among adolescents and young adults in Senegal. As the present study has demonstrated, health care providers and parents are important stakeholders in disseminating HPV vaccine information, and therefore must be included in educational campaigns. Future studies are needed to investigate additional factors that would influence decision making to receive the HPV vaccination such as health care provider attitudes, peer and family influence, knowledge that HPV causes cervical cancer, and intention to vaccinate.

Given the overall low levels of awareness, there is a great opportunity for public health communication efforts to craft health messaging and information in a way to maximize receptivity, outlining benefits as well as providing information on the minimal risks associated with the vaccine. Media advocacy efforts can work to integrate HPV vaccine storylines into popular media, including television, radio, and online media. In addition, integrating the HPV vaccine into an existing, routine immunization schedule is likely to facilitate vaccine uptake, as has been shown in other studies that have examined the introduction of a new or altered vaccine administration [40].

As vaccine and cancer prevention efforts continue to expand around the globe, national strategies that provide a framework and basis for complementary, targeted messaging will be necessary to adequately communicate information about HPV vaccine. With the growing supply and accessibility of HPV vaccine in low- and middle-income countries, understanding cultural and social factors of HPV awareness and vaccine receptivity will be paramount to facilitate the uptake of this primary cancer control and prevention strategy.

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Table 1: Descriptive Statistics and Bivariate Analysis of Ever Having Heard of the Human Papillomavirus, Senegal, 2014, N=2,286

Variable	**Overall Sample n (%)**	**No, have not heard of HPV or I don't konw, n (%)**	**Yes, have heard of HPV, n (%)**	**P-value**
Ever Heard of HPV		1,670 (73.1)	616 (26.9)	
Age				
14	267 (11.7)	195 (73.0)	72 (27.0)	0.830
15	300 (13.1)	218 (72.7)	82 (27.3)	
16	351 (15.4)	264 (75.2)	87 (24.8)	
17	370 (16.2)	272 (73.5)	98 (26.5)	
18	394 (17.2)	278 (70.6)	116 (29.4)	
19	275 (12.0)	199 (72.4)	76 (27.6)	
20	185 (8.1)	142 (76.8)	43 (23.2)	
21	143 (6.3)	101 (70.6)	42 (29.4)	
22	1 (0.04)	1 (100.00)	0 (0.00)	
Area in which majority of life was spent				
Urban	1,528 (69.2)	1,176 (74.3)	406 (25.7)	0.022*
Suburban	304 (13.3)	224 (73.7)	80 (26.3)	
Rural	400 (17.5)	270 (67.5)	130 (32.5)	
Gender				
Male	1,025 (44.8)	767 (74.8)	258 (25.2)	0.084*
Female	1,261 (55.2)	903 (71.6)	358 (28.4)	
Religion				
Not Muslim	456 (20.0)	326 (71.5)	130 (28.5)	0.401
Muslim	1,830 (80.1)	1,344 (73.4)	486 (26.6)	
Father Education				
Did Not Attend	431 (18.9)	332 (77.0)	99 (23.0)	0.073
Primary	314 (13.7)	229 (72.9)	85 (27.1)	
Secondary	419 (18.3)	311 (74.2)	108 (25. 8)	
Higher Education	679 (29.7)	471 (69.7)	208 (30.6)	
Don't know	443 (19.4)	327 (73.8)	116 (26.2)	
SES Group				
0 (Poorest)	498 (21. 8)	335 (67.3)	163 (32.7)	0.017*
1	486 (21.3)	362 (74.5)	124 (25.5)	
2	439 (19.2)	320 (72.9)	119 (27.1)	
3	466 (20.4)	351 (75.3)	115 (24.7)	

4	397 (17.4)	302 (76.1)	95 (23.9)	
Self-Rated Health[1]				
Poor	51 (2.27)	42 (82.4)	9 (17.6)	0.001***
Fair	452 (20.2)	334 (73. 9)	118 (26.1)	
Good	559 (24.9)	440 (78.7)	119 (21.3)	
Very Good	529 (23.6)	395 (74. 7)	134 (25.3)	
Excellent	652 (29.1)	447 (68. 6)	205 (31.4)	
Doctor's Visits in the last 12 months[1]				
Never	525 (23.4)	398 (75.8)	127 (24.2)	0.061
1 Time	524 (23.4)	381 (72.7)	143 (27.3)	
2 Times	388 (17.3)	306 (78.9)	82 (21.1)	
3 Times	271 (12.1)	202 (74.5)	69 (25.5)	
4 Times	212 (9. 5)	150 (70.8)	62 (29.3)	
5-9 Times	105 (4.7)	74 (70.5)	31 (29.5)	
10 Times	103 (4.6)	72 (69.9)	31 (30.1)	
I Don't Know	115 (5.1)	75 (65.2)	40 (34.8)	

n = 2,243
*p < 0.05, **p < 0.01, ***p < 0.001

Table 2: Descriptive Statistics and Sub-sample Bivariate Analysis of Predictors & Willingness to Receive HPV Vaccine, Senegal, 2014, N=616				
Variable	**Overall sub-Sample n (%)**	**I don't know or not willing to vaccinate n (%)**	**Yes, willing to vaccinate n (%)**	**P-value**
Willingness to Vaccinate	444 (72.1)	172 (27.9)		
Age				
14	72 (11.7)	54 (75.0)	18 (25.0)	0.525
15	82 (13.3)	65 (79.3)	17 (20.7)	
16	87 (14.1)	65 (74.7)	22 (25.1)	
17	98 (15.9)	69 (70.4)	29 (29.6)	
18	116 (18.8)	75(64.7)	41 (35.3)	
19	76 (12.3)	54 (71.1)	22 (29.0)	
20	43 (7.0)	31 (72.1)	12 (27.9)	
21	42 (6.8)	31 (73.8)	11 (26.2)	
22	0 (0.00)	n/a	n/a	
Area in which majority of life was spent				
Urban	406 (65.9)	290 (71.4)	116 (28.6)	0.296
Suburban	80 (14.0)	54 (67.5)	26 (32.5)	
Rural	130 (21.1)	100 (76.9)	30 (23.1)	
Gender				
Male	258 (41.9)	187 (72.5)	71 (27.5)	

				0.850
Female	358 (58.1)	257 (71.8)	101 (28.2)	
Religion				
Not Muslim	130 (21.1)	100 (76.9)	30 (23.1)	0.166
Muslim	486 (78.9)	344 (70.8)	142 (29. 2)	
Father Education				
Did Not Attend	99 (16.1)	52 (52.5)	47 (47.5)	0.001***
Primary	85 (13.8)	66 (77.7)	19 (22.4)	
Secondary	108 (17.5)	76 (70.4)	32 (29.6)	
Higher Education	208 (33.8)	150 (72.1)	58 (27.9)	
Don't know	116 (18.8)	100 (86.2)	16 (13.8)	
SES Group				
0 (Poorest)	163 (26.46)	114 (69.94)	49 (30.1)	0.257
1	124 (20.13)	81 (65.32)	43 (34.7)	
2	119 (19.32)	90 (75.63)	29 (24.4)	
3	115 (18.67)	87 (75.65)	28 (24.4)	
4	95 (15.42)	72 (75.79)	23 (24.2)	
Self-Rated Health[1]				
Poor	9 (1.54)	9 (100.00)	0 (0.0)	0.032*
Fair	118 (20.17)	81 (68.64)	37 (31.4)	
Good	119 (20.34)	88 (73.95)	31 (26.1)	
Very Good	134 (22.91)	104 (77.61)	30 (22.4)	
Excellent	205 (35.04)	134 (65.37)	71 (34.6)	
Doctor's Visits in the last 12 months[1]				
Never	127 (21.71)	85 (66.93)	42 (33.1)	0.318
1 Time	143 (46.15)	97 (67.83)	46 (32.2)	
2 Times	82 (14.02)	61 (74.39)	21 (25.6)	
3 Times	69 (11.79)	53 (76.81)	16 (23.2)	
4 Times	62 (10.60)	47 (75.81)	15 (24.2)	
5-9 Times	31 (5.30)	21 (67.74)	10 (29.5)	
10 Times	31 (5.30)	19 (61.29)	12 (38.7)	
I Don't Know	40 (6.84)	33 (82.50)	7 (17.5)	
Spoken with health care professional about HPV vaccine				
No	494 (80.19)	372 (75.30)	122 (24.7)	0.001***
Yes	122 (19.81)	72 (59.02)	50 (41.0)	

n = 585
*p < 0.05, **p < 0.01, ***p < 0.001

Table 3: Multivariable Logistic Regression of Ever Having Heard of HPV and Willingness to Receive HPV Vaccine[+], Senegal, 2014		
Variable	**Ever Heard of HPV (n = 2,243) OR (95% CI), Ref. : No**	**Willingness to Vaccinate (n = 585) OR (95 % CI), Ref. : No**
Age	1.03 (0.99, 1.09)	1.01 (0.92, 1.12)
Area in which majority of life was spent (Reference: Urban)		
Suburban	1.12 (0.84, 1.50)	1.30 (0.74, 2.26)
Rural	1.63 (1.24, 2.12)***	0.94 (0.55, 1.60)
Gender (Reference: Male)	1.21 (1.00, 1.48)	1.13 (0.76, 1.67)
Religion (Reference: Not Muslim)	0.90 (0.70, 1.15)	1.10 (0.65, 1.85)
Father Education (Reference: No Education)		
Primary	1.25 (0.88, 1.78)	0.34 (0.17, 0.68)**
Secondary	1.20 (0.86, 1.66)	0.45 (0.24, 0.82) **
Higher Education	1.41 (1.04, 1.92)*	0.42 (0.24, 0.75) **
I Don't know	1.21 (0.87, 1.67)	0.20 (0.10, 0.41) ***
SES Group (Reference: Group 0)		
1	0.75 (0.56, 0.10)*	1.28 (0.75, 2.19)
2	0.80 (0.60, 1.08)	0.78 (0.44, 1.40)
3	0.68 (0.50, 0.93)*	0.73 (0.39, 1.36)
4	0.57 (0.40, 0.81)*	0.82 (0.40, 1.68)
Self-Rated Health	1.19 (1.10, 1.30)***	1.11 (0.94, 1.32)
Doctor's Visits in the last 12 months	1.07 (1.02, 1.12)**	0.95 (0.87, 1.05)
Spoken with health care professional about HPV vaccine	n/a	1.80 (1.16, 2.81)**

+ 43 respondents excluded from multivariable analysis
* p < 0.05, ** p < 0.01, ***p < 0.001