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Predictors of Cervical Cancer Screening Uptake among Women Living with HIV (WLHIV) in Kigali, Rwanda

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Abstract: ***Predictors of cervical cancer screening uptake among women living with HIV (WLWH) in Rwanda was determined using a cross sectional mixed study design with a convenience sample to select 384 WLWH aged 30-50 years from four health centers (HC) in Kigali. Descriptive statistics, bivariate, and multivariable analysis were used to assess the variables and identify factors associated with cervical cancer screening. A thematic network analysis was also to analysis data from individual and key informants' interview to provide detailed information on reasons behind predictors of cervical cancer screening uptake. Among 384 participants, 224 (58.3%) have been screened for cervical cancer. Three hundred and eleven (81%) and 279 (73%) had knowledge on symptoms and risk factors of cervical cancer respectively. Women who were screened had greater awareness of the importance of early detection and prevention, more commonly had a sense of feeling at risk of developing cervical cancer, more commonly reported that a physician had recommended screening (P<0.001). Women who were not screened more commonly reported living far from screening services (P=0.007), and concerns about the expense of screening (P=0.002), fear of pain from the screening procedures (P<0.001), fear of being diagnosed with cervical cancer (P<0.001), or reported that they had no need for screening (P<0.001). Knowledge of the risk factors for cervical cancer was associated with screening uptake. Health Center based patient education were highly associated with screening uptake. Therefore, we recommend integrating cervical cancer information in community health promotion interventions to increase uptake in cervical cancer screening.***

Keywords: Cervical cancer screening, Women with HIV

1. Introduction

Globally, cancer irrespective of the type is considered a mortal disease in both developed and developing world (Bray et al., 2012). According to WHO estimates for 2011, cancer is the cause of more deaths than coronary heart diseases (Stewart & Wild, 2014) and a leading cause of morbidity and mortality worldwide, with approximately 14 million new cases and 8.2 million cancer related deaths in 2012 (Friedman-Rudovsky et al., 2015). In addition, the incidence and mortality of cancer are expected to rise rapidly worldwide with more than 20 million new cases of cancer in 2025 and approximately 15 million cancer-related deaths per year are forecast in 2035 (Ferlay et al., 2014). Over 60% of new cancer cases occur in Africa, Asia and Central, South America and these accounts for 70% of the world's cancer death (World Health Organisation, 2016).

Cervical cancer is one of themost common female cancer that threats women's lives and a significant public health globally among women aged 15-44. Worldwide, cervical cancer affects 490,000 new women annually, with more than 270,000 deaths and about 87% of deaths occurred in low and middle income countries (Torre et al., 2015; World HPV Information Center, 2017). In Africa, over 80000 women are diagnosed of cervical cancer with 75% (60000) of mortality rate annually (Finocchario-Kessler et al., 2016). In Rwanda, according to GLOBOCAN 2012 estimates, 1366 are new cases diagnosed with cervical cancer and 7.9% of female deaths occurred annually (Information Centre on HPV and Cancer, 2017).

2. Statement of the Problem

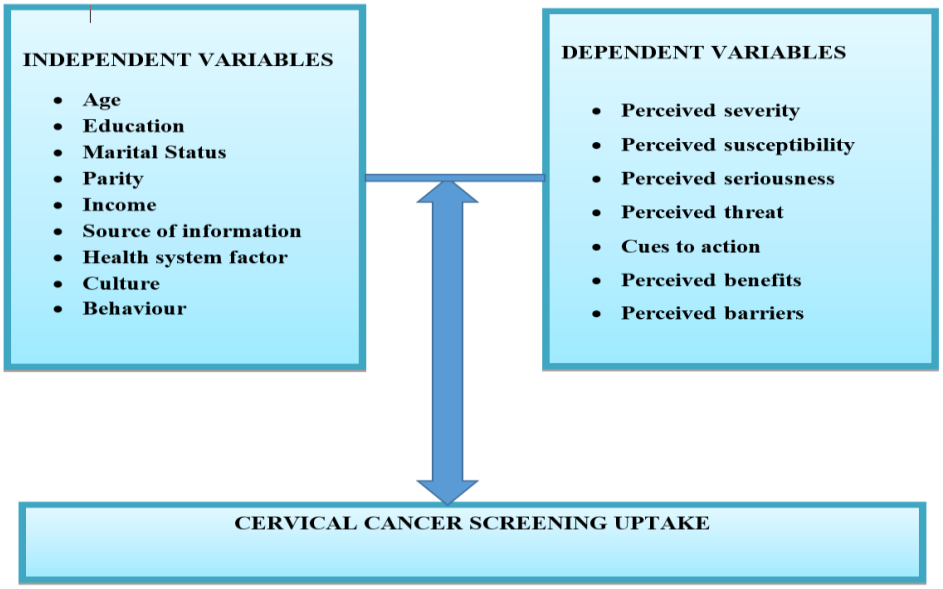
Cervical cancer remains a significant public health concern globally among women aged 30 years and older (World Health Organisation, 2016). In Rwanda, 3.7 million of people are female aged 15 years and older who are eligible for cervical cancer screening and the current estimate indicates that among 1,366 women diagnosed with cervical cancer, 804 cases are dying from the disease annually (Information Centre on HPV and Cancer, 2017). Cervical cancer is preventable if detected early through cervical cancer screening (Mapanga et al., 2017). Increased likelihood of uptake of cervical screening is believed to have a great impact in reducing the burden of the disease (Nwobodo& Maryam, 2017). Despite of efforts being made by Rwandan government assisted by NGOs in prevention of cervical cancer through different screening programs, however cervical cancer continue to kill women in the region (Binagwaho et al., 2013; Binagwaho et al., 2011).It is crucial for developing countries like Rwanda to determine the factors that predicts the uptake of cervical cancer screening among Women living with HIV. Therefore, the present study aimed at providing information that could be useful in bridging the gap for cervical cancer screening in Rwanda.

3. Objectives of the Study

The main objective of the study was to determine the predictors of uptake of cervical cancer screening among WLHIV in Kigali.Specifically, to determine the uptake of cervical cancer screeningand the exposure factors (sociodemographic, behavioural features, health facility)

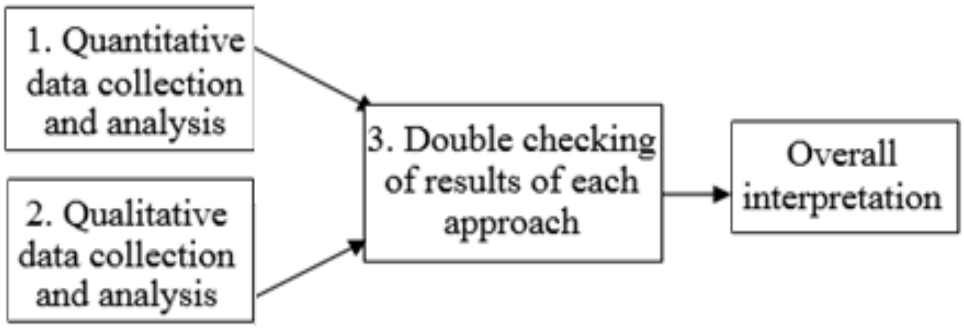
associated cervical cancer screening uptake among WLHIV in Kigali.

4. Conceptual Framework of the Study



5. Methodology

- **Research Design**



- **Target Population**: The target population for this study was women living HIV, aged 30-50 years seeking HIV care services in Kacyiru, Gikondo, Remera and Kicukiro health centers. They were the participants for both the cross-sectional study using questionnaire and individual interview. Nurses from the hospital were also the study participants for the key informant interviews (KII
- **Sample size**: In order to determine the estimate of cervical cancer screening uptake in Rwanda , sample size was determined by 95% confidence, 5% precision with a minimum sample (n) of 384 participants Based on the above assumption, the desired sample size was calculated using the following formula (Cochran, 1977) n= $\frac{Z_{(1-\alpha/2)}}{}^2 p(1-p) d^2$ i.e. 96 women for each health center. For the Key informant and interviewee participants, the sample size was conveniently determined by the researcher, and this was suggested to be two nurses and 8 women from each heath center.
- **Ethical and confidentiality issues:** Approval to conduct the study was obtained from Kenya Medical Research Institute (KEMRI) Ethical and Research Committee with the consensus of Rwanda National Ethical Committee Ref: N° 837/RNEC/2016. Permission for data collection was obtained from the head of health centers at study sites. Verbal consented were provided by the participants for both quantitative and qualitative. All interviews were recorded after provided both verbal and written consent from the participants. All the study data was stored in an area that had strict access.

6. Research Findings

6.1 Sociodemographic characteristics among the study respondents

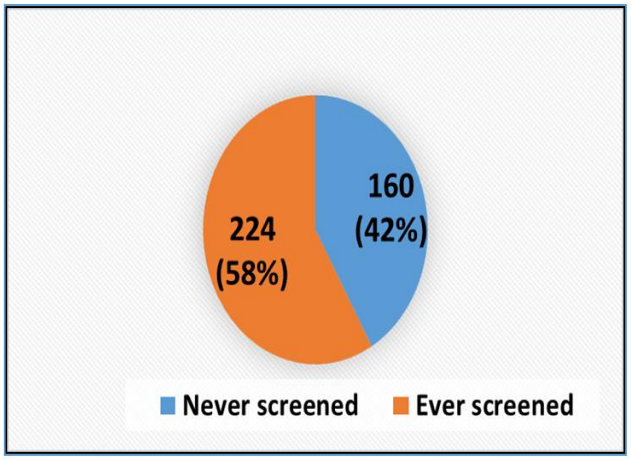
The women living with HIV that participated in this study were mostly married (49.7%), Christian (95.5%), casual worker (36.5%) with a monthly income of less Rwf 5000 (33.9%).

Table 4.1.1: Sociodemographic characteristics among the study participants

Variable	Frequency	%
Marital Status		
Married	191	49.7
Single	44	11.5
Separated/Divorced	89	23.2
Widow	60	15.6
Religion		
Christian	366	95.3
Muslim	14	3.6
Other	4	1
Employment		
Self-employed	127	33.1
Casual Worker	140	36.5
Housewife	30	7.8
Employed	10	2.6
Unemployed	77	20.1
Monthly income		
Don't know	75	19.5
Less than Rwf 5000	130	33.9
Rwf 5001-10000	63	16.4
Rwf 10001-15000	15	3.9
Over Rwf 15000	101	26.3

6.2 Cervical cancer screening and potential covariates

The outcome variable for this study was cervical cancer screening status among women living with HIV. On a total of 384 women; 58% (224 women) were voluntarily screened of cervical cancer in 2017-2018. **Figure 4.2.1** also shows that 42% were not screened for cervical cancer.



The **Figure 4.2.2** shows the frequency of screening visits; those who were not screened were 41.7~42% (160 women). However, the most of women were screened only once (50.3% or 193 women). In addition, 7.5% (29 women), were screened more than once.

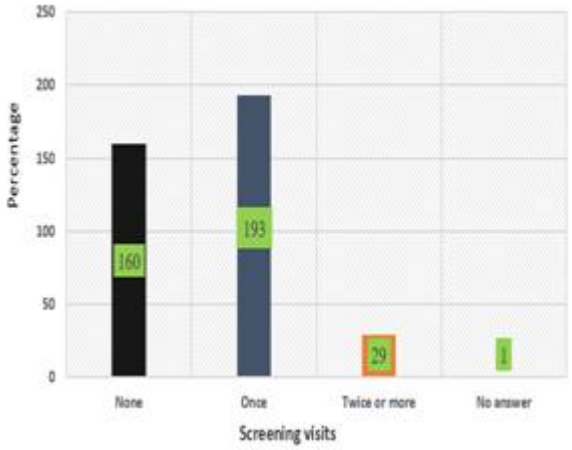


Figure 4.2.2: The frequency of screening visits

Within this subsection, the description of potential direct covariates and the relationship they may have with the

outcome variable was also checked i.e. the cervical cancer screening status among women living with HIV. Table 4.2.1 and 4.2.2 provide the reasons that motivated or discouraged women from seeking cervical cancer screening services. Women were encouraged to seek cervical screening because they wanted to know their cervical status as earlier as possible to allow early treatment if infected or prevention if tested negative, therefore 48.7 % (or 187 women) were motivated to be screened for the above mentioned reasons. Those women were also motivated to go for cervical cancer screening to know their health status in terms of cervical cancer with this regards (Table 4.2.1).

60 women), they feared death if found to have cervical cancer.

Table 4.2.1: Description of motivating factors of cervical screening

Variable	Frequency	%
Motive for screening: Early detection and prevention		
No	197	51.3
Yes	187	48.7
Motive for screening: To know health status		
No	187	48.7
Yes	197	51.3
Motive for screening: Recommended by physician		
No	353	91.9
Yes	31	8.1
Motive for screening: Feeling at risk of developing cervical cancer		
No	228	59.4
Yes	156	40.6
Motive for screening: It is available and done to all tested HIV[+] women		
No	362	94.3
Yes	22	5.7
Motive for screening: Advised by counselors at health clinic		
No	316	82.3
Yes	68	17.7
Other motives for screening		
None	373	97.1
Incentives	11	2.9
Motive for screening: Refused to answer		
No	383	99.7
Yes	1	0.3

The discouraging factors for women in general (not only those who were not screened) were also various to include the lack of information (90.6 % or 349 women). This lack of information was shown to be a serious matter as it was also reported by some among who were screened if compare the results of lack of information as a general cause of not going for screening and screening status. It's clear that those who reported the lack of information on cervical cancer screening largely exceeded those who were not screened (349 versus 160 women), (Table 4.2.2). This suggests a very low access on cervical cancer screening information. For example, some women who were asked to tell the risk factors of cervical cancer and through their responses below.

Other women reported that generally women were not screened either because that health center of data collection didn't have screening services (62 % or 238 women) or the screening services were far away (43.7 %, 168 women). They also said the screening services were expensive for the women to be not able to afford (37.3% or 143 women) or not comfortable with the service provider (27.3 % or 105 women), so the women in general were discouraged by these facts. Most of women reported the fear to be the most discouraging fact for women to go for screening; they feared the procedure used as they were wrongly told that it caused pain and discomfort (76% or 292), they feared to know that they have the cervical cancer (67.7 % or 260 women), they feared death if found to have cervical cancer (63.8% or 245 women).

Table 4.2.2: Description of discouraging factors for cervical cancer screening

Variable	Frequency	%
Reasons for not being screened: Lack of information		
No	35	9.1
Yes	349	90.9
Reasons for not being screened: Don't know the place		
No	117	30.5
Yes	267	69.5
Reasons for not being screened: No screening service at this health center		
No	146	38
Yes	238	62
Reasons for not being screened: screening services are far away		
No	216	56.3
Yes	168	43.8
Reasons for not being screened: screening services are expensive		
No	241	62.8
Yes	143	37.2
Reasons for not being screened: Not comfortable with service provider		
No	279	72.7
Yes	105	27.3
Reasons for not being screened: Fear of pain and discomfort due to procedures taken		
No	92	24
Yes	292	76

6.3 Predictors of cervical cancer screening uptake in HIV/AIDS Infected women

The full model included variables that had p-value<=0.2 (or one of its categories) during a bivariate analysis and other important demographic variables, this was an arbitrary choice to avoid model saturation in multivariable analysis. A stepwise backward regression model selection approach was used until a subset of only significant variables was reached (see table 6). The model was a good fit to the data since the Hosmer-Lemeshow test was not significant (n=384, Number of created groups=11, Hosmer-Lemeshow Chi2 (9) =6.21, P-value=0.72). (Liu, 2015) Age category specifically being aged 40 years and above was positively associated with cervical cancer screening (OR= 2.12, P-value=0.005). Talks, fliers and posters were also likely to increase the increase the odds of cervical cancer screening (respectively: OR=3.07, P-value=0.001 and OR= 3.64, P-value<0.001). In addition, the knowledge of at least a symptom or risk factors of cervical cancer were positively associated with cervical cancer screening (respectively; OR: 3.87, P-value: 0.003). However, age at first sex specifically being aged 22 years and above was negatively associated with cervical cancer screening (OR= 0.41, P-value= 0.039). Surprisingly, Radio as source of information on cervical cancer and its screening was not positively associated with cervical cancer screening; the linked reason was unknown.

Table 4.2.5: Predictors of screening status among participants

Variable	OR	P	95 % CI	
Age category				
39 years or less	1.00			
40 years and above	2.12	0.005	1.25	3.60
Age at first sex				
18 years or less	1.00			
19-21 years	1.24	0.77	0.71	2.17
22 years and above	0.41	0.039	0.18	0.96
Radio as source of info on cervical cancer screening				
No	1.00			
Yes	0.36	P<0.001	0.20	0.64
Talks at health centers (HC)				
No				
Yes	3.07	0.001	1.59	5.86
Fliers and posters at HC				
No	1.00			
Yes	3.64	P<0.001	2.03	6.53
know at least a symptom				
No	1.00			
Yes	2.07	0.0939	1.04	4.12
know at least a risk factor				
No	1.00			
Yes	3.87	0.003	1.58	9.46
Constant	0.08	P<0.001	0.03	0.18

7. Conclusions and Recommendations

7.1 Conclusions

It was found that age category was likely to increase the odds of cervical cancer screening. Talks by health professionals and fliers and posters at health centers increased the odds of cervical cancer screening among women living with HIV in Kigali. Moreover, the knowledge of at least a symptom or risk factors of cervical cancer were positively associated with cervical cancer screening uptake.

On contrary, age at first was associated with the decrease in odds of cervical cancer screening. The reason behind this negative effect may be a topic for further research as no study attempted to compare cervical cancer screening in women who had early sexual intercourse or sexual abuse to other women. Surprisingly, Radio as source of information on cervical cancer and its screening was negatively associated with cervical cancer screening, the underlying reason needed to have more investigations in the future.

7.2 Recommendations

- There is a need of integrated community health education to improve the knowledge of population on cervical cancer and its screening
- Screening service access is very low; thus there is urgent need to improve cervical cancer screening services and its availability
- There is a need of more researches on cervical cancer to increase the knowledge and facilitate its control and management.
- It's important to increase the ownership of health and research programs before waiting for external sponsors to increase sustainability of those programs
- Capacity building on cervical cancer screening for health professional is of high importance to upgrade to level of cervical cancer screening uptake.

References

[1] American cancer society. (2016). Cervical Cancer What is cervical cancer ? *American Cancer Society*, 4–7.
[2] Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. Information Technology, Learning, and Performance Journal, 19(1), 43–50.
[3] Binagwaho, A., Ngabo, F., Wagner, C. M., Mugeni, C., Gatera, M., Nutt, C. T., & Nsanzimana, S. (2013). Integration of comprehensive women's health programmes into health systems: cervical cancer prevention, care and control in Rwanda. *Bulletin of the World Health Organization*, *91*(9), 697–703.
[4] Binagwaho, A., Wagner, C. M., & Nutt, C. T. (2011). HPV vaccine in Rwanda: Different disease, same double standard. *The Lancet*;10.1016/S0140-6736(11)61837-0
[5] Bray, F., Jemal, A., Grey, N., Ferlay, J., & Forman, D. (2012). Global cancer transitions according to the Human Development Index (2008-2030): A population-based study. *The Lancet Oncology*, *13*(8), 790–801.
[6] CDC. (2012). Cervical cancer screening with the HPV test and the Pap test in women ages 30 and older. *Chronic Disease Prevention*.
[7] Chigbu, C. O., & Aniebue, U. (2011). Why Southeastern Nigerian Women Who Are Aware of Cervical Cancer Screening Do Not Go for Cervical Cancer Screening. *International Journal of Gynecological Cancer*, *21*(7), 1282. Retrieved from http://journals.lww.com/ijgc/Abstract/2011/10000/Why_Southeastern_Nigerian_Women_Who_Are_Aware_of.19.aspx
[8] Cochran, W. G. (1977). Sampling techniques (3rd ed.). New York: John Wiley & Sons.
[9] Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications.
[10] Crosbie, E. J., Einstein, M. H., Franceschi, S., & Kitchener, H. C. (2013). Human papillomavirus and cervical cancer. *The Lancet*, *382*(9895), 889–899.
[11] De Vuyst, H., Alemany, L., Lacey, C., Chibwesha, C. J., Sahasrabuddhe, V., Banura, C., … Parham, G. P. (2013). The burden of human papillomavirus infections and related diseases in sub-saharan Africa. *Vaccine*.
[12] Denny, L. (2013). Safety of HPV vaccination: A FIGO statement. *International Journal of Gynecology and Obstetrics*.
[13] Dim, C. C. (2012). Towards improving cervical cancer screening in Nigeria: A review of the basics of cervical neoplasm and cytology. *Nigerian Journal of Clinical Practice*, *15*(3), 247–252.
[14] Doorbar, J., Quint, W., Banks, L., Bravo, I. G., Stoler, M., Broker, T. R., & Stanley, M. A. (2012). The biology and life-cycle of human papillomaviruses. *Vaccine*.
[15] Ezechi, O. C., Gab-Okafor, C. V, Ostergren, P. O., & Odberg Pettersson, K. (2013). Willingness and acceptability of cervical cancer screening among HIV positive Nigerian women. *BMC Public Health*, *13*(1), 46.
[16] Felix, J. C., Lacey, M. J., Miller, J. D., Lenhart, G. M., Spitzer, M., & Kulkarni, R. (2016). The Clinical and Economic Benefits of Co-Testing Versus Primary HPV Testing for Cervical Cancer Screening: A Modeling Analysis. *Journal of Women's Health*, *25*(6), 606–616.
[17] Ferlay, J., Soejomataram, I., Ervik, M., Dikshit, R., Eser, S., Mathers, C., … Bray, F. (2012). World Cancer Research Fund International Worldwide Data. Retrieved from
[18] Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray, F. (2014). GLOBOCAN 2012 v1.1, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11.
[19] Finocchario-Kessler, S., Wexler, C., Maloba, M., Mabachi, N., Ndikum-Moffor, F., & Bukusi, E. (2016). Cervical cancer prevention and treatment research in Africa: a systematic review from a public health perspective. *BMC Women's Health*, *16*(1), 29.
[20] Fort, V. K., Makin, M. S., Siegler, A. J., Ault, K., & Rochat, R. (2011). Barriers to cervical cancer screening in Mulanje, Malawi: A qualitative study. *Patient Preference and Adherence*, *5*, 125–131.
[21] Franceschi, S., & Jaffe, H. (2007). Cervical Cancer Screening of Women Living with HIV Infection: A Must in the Era of Antiretroviral Therapy. *Clinical Infectious Diseases*, *45*(4), 510–513.
[22] Friedman-Rudovsky, N., Communications, D., Maas, J.-M., Stark, L., Tsu, V., For, E., & Wor, D. W. (2015). A New Era for Cervical Cancer Prevention, 1–28. Retrieved from www.cervicalcanceraction.org

[23] Ghebre, R. G., Grover, S., Xu, M. J., Chuang, L. T., & Simonds, H. (2017). Cervical cancer control in HIV-infected women: Past, present and future. *Gynecologic Oncology Reports*, *21*(June), 101–108. https://doi.org/10.1016/j.gore.2017.07.009
[24] Glanz, K., & Rimer, B. K. (2005). Theory at a Glanz. A guide for health promotion practive. *Health San Francisco*, *83*(21), 52.
[25] Head, K.J., Johnson, N.L., Scott, S.F. and Zimet, G.D., 2019. Communicating Cervical Cancer Screening Results in Light of New Guidelines: Clinical Practices at Federally Qualified Health Centers. Health communication, pp.1-7
[26] Idowu, A., Olowookere, S. A., Fagbemi, A. T., & Ogunlaja, O. A. (2016). Determinants of Cervical Cancer Screening Uptake among Women in Ilorin, North Central Nigeria: A Community-Based Study. *Journal of Cancer Epidemiology*, *2016*(Vili).
[27] Information Centre on HPV and Cancer. (2017). Human Papillomavirus and Related Diseases Report, (May).
[28] J. Cresswell. (2006). Collecting data in mixed methods research. *Qualitative Research*, (January), 110–127.
[29] Jabareen, Y. (2009). Building a Conceptual Framework: Philosophy, Definitions, and Procedure. *International Journal of Qualitative Methods*, *8*(4), 49–62.
[30] Janz, N. K., & Becker, M. H. (1984). The Health Belief Model: A Decade Later. *Health Education Quarterly*, *11*(1), 1–47.
[31] Joshi, S., Sankaranarayanan, R., Muwonge, R., Kulkarni, V., Somanathan, T., & Divate, U. (2013). Screening of cervical neoplasia in HIV-infected women in India. *AIDS (London, England)*, *27*(4), 607–15.
[32] Kendra, C. (2016). What Is a Sample? Definition, Types, Sampling Errors.
[33] Kivistik, A., Lang, K., Baili, P., Anttila, A., & Veerus, P. (2011). Women's knowledge about cervical cancer risk factors, screening, and reasons for non-participation in cervical cancer screening programme in Estonia. *BMC Women's Health*, *11*(1), 43.
[34] Kress, C. M., Sharling, L., Owen-Smith, A. A., Desalegn, D., Blumberg, H. M., & Goedken, J. (2015). Knowledge, attitudes, and practices regarding cervical cancer and screening among Ethiopian health care workers. *Int J Womens Health*, *7*, 765–772.
[35] Labeit, A. M., & Peinemann, F. (2017). Determinants of a GP visit and cervical cancer screening examination in Great Britain, 1–14.
[36] Lemeshow, S., Hosmer Jr, D. W., Klar, J., & Lwanga, S. K. (1990). Part 1: Statistical Methods for Sample Size Determination. *Adequacy of Sample Size in Health Studies*, 247.
[37] Lyimo, F. S., & Beran, T. N. (2012). Demographic, knowledge, attitudinal, and accessibility factors associated with uptake of cervical cancer screening among women in a rural district of Tanzania: Three public policy implications. *BMC Public Health*, *12*(1), 22.
[38] Makuza, J. D., Nsanzimana, S., Muhimpundu, M. A., Pace, L. E., Ntaganira, J., & Riedel, D. J. (2015). Prevalence and risk factors for cervical cancer and pre-cancerous lesions in Rwanda. *The Pan African Medical Journal*, *22*, 26.
[39] M Morris, R. (2016). Factors Associated with the Uptake of Cervical Cancer Screening Among Women of Reproductive Age in Homabay County, Kenya: A Case of Kanyadhiang Sub Location. *Clinics in Mother and Child Health*, *13*(1), 1–6.
[40] Mapanga, W., Elhakeem, A., Feresu, S. A., Maseko, F., & Chipato, T. (2017). Prevention of cervical cancer in HIV-seropositive women from developing countries: a systematic review protocol. *Systematic Reviews*, *6*(1), 91.
[41] Maza, M., Schocken, C. M., Bergman, K. L., Randall, T. C., & Cremer, M. L. (2017). Cervical Precancer Treatment in Low- and Middle-Income Countries: A Technology Overview. *Journal of Global Oncology*, *3*(4), 400–408.
[42] MBATIA, S. F. W.(2016). *Cervical cancer screening uptake among women Attending Naivasha County Referral Hospital* (Doctoral dissertation, Jomo Kenyatta University of Agriculture and Technology).
[43] McKenzie, N. D., Kobetz, E. N., Hnatyszyn, J., Twiggs, L. B., & Lucci, J. A. (2010). Women with HIV are more commonly infected with non-16 and -18 high-risk HPV types. *Gynecologic Oncology*.
[44] Modibbo, F., Iregbu, K. C., Okuma, J., Leeman, A., Kasius, A., de Koning, M., … Adebamowo, C. (2017). Randomized trial evaluating self-sampling for HPV DNA based tests for cervical cancer screening in Nigeria. *Infectious Agents and Cancer*, *12*(1), 11.
[45] Moore de Peralta, A., Holaday, B., & Hadoto, I. M. (2017). Cues to Cervical Cancer Screening Among U.S. Hispanic Women. *Hispanic Health Care International*, *15*(1), 5–12.
[46] Morse, J. M. (1994). Designing funded qualitative research. In Denizin, N. K. & Lincoln, Y. S., *Handbook of qualitative research* (2nd Ed). Thousand Oaks, CA: Sage.
[47] Mukama, T., Ndejjo, R., Musabyimana, A., Halage, A. A., & Musoke, D. (2017). Women's knowledge and attitudes towards cervical cancer prevention: a cross sectional study in Eastern Uganda. *BMC Women's Health*, *17*(1), 9.
[48] Naing, C., Pereira, J., Abe, T., Wei, D. E. Z., Bajera, I. B. A. R., & Perera, U. H. K. (2012). Predictors associated with the willingness to take human papilloma virus vaccination. *Journal of Community Health*, *37*(2), 288–293.
[49] Ncube, B., Bey, A., Knight, J., Bessler, P., & Jolly, P. E. (2015). Factors Associated with the Uptake of Cervical Cancer Screening Among Women in Portland, Jamaica. *North American Journal of Medical Sciences*, *7*(3), 104–113.
[50] Ndejjo, R., Mukama, T., Musabyimana, A., & Musoke, D. (2016). Uptake of cervical cancer screening and associated factors among women in rural Uganda: A cross sectional study. *PLoS ONE*, *11*(2).
[51] Nega, A. D., Woldetsadik, M. A., & Gelagay, A. A. (2018). Low uptake of cervical cancer screening among HIV positive women in Gondar University referral hospital, Northwest Ethiopia: cross-sectional study design. *BMC women's health*, *18*(1), 87.
[52] Nelson, W., Moser, R. P., Gaffey, A., & Waldron, W. (2009). Adherence to cervical cancer screening guidelines for U.S. women aged 25-64: data from the 2005 Health Information National Trends Survey (HINTS). *Journal of Women's Health*, *18*(11), 1759–1768.
[53] Ngabo, F., Franceschi, S., Baussano, I., Umulisa, M. C., Snijders, P. J. F., Uyterlinde, A. M., Clifford, G. M. (2016). Human papillomavirus infection in Rwanda at the moment of implementation of a national HPV vaccination programme. *BMC Infectious Diseases*, *16*(1), 225.
[54] Nivers, N. (2015). Survey Key findings Rwanda National Institute of Statistics of Rwanda.
[55] Ntekim, A. (2012). Cervical Cancer in Sub Sahara Africa. *Topics on Cervical Cancer With an Advocacy for Prevention*.
[56] Nthiga, A.M. (2014). Cervical cancer knowledge and screening uptake among women in Embu County, Kenya. *Asia-Pacific Journal of Clinical Oncology*, *10*(November),

239. Retrieved from
[57] Nwankwo, K.C., Aniebue, U.U., Aguwa, E.N., Anarado, A.N. and Agunwah, E., 2011. Knowledge attitudes and practices of cervical cancer screening among urban and rural Nigerian women: a call for education and mass screening. *European journal of cancer care*, *20*(3), pp.362-367
[58] Nwobodo HA1* and Maryam Ba-Break2. (2017). Public Health Open Access Analysis of Interventions for Improving Cervical-Cancer Screening Uptake among Nigerian Women, 1–14.
[59] Nwozor, C. M., & Oragudosi, A. L. (2013). Awareness and uptake of cervical cancer screening among women in Onitsha, South-East, Nigeria. Greener Journal of Medical Sciences, 3(8), 283-288
[60] Nyangasi, M., Nkonge, N. G., Gathitu, E., Kibachio, J., Gichangi, P., Wamai, R. G., & Kyobutungi, C. (2018). Predictors of cervical cancer screening among Kenyan women: results of a nested case-control study in a nationally representative survey. *BMC public health*, *18*(3), 1221.
[61] Ombech Elizabeth , Muigai Anne, W. P. (2012). Awareness of cervical cancer risk factors and practice of Pap smear testing among female primary school teachers in Kasarani division , Nairobi Kenya . *Afr J Health Sci.*, *21*(2), 121–132. Retrieved from http:// Palefsky, J. (2006). Biology of HPV in HIV infection. *Adv.Dent.Res.*, *19*(1544–0737 (Electronic)), 99–105.
[62] Pateson, D, Garrett, A, Hammond, I, Dr Lara Roeske, Whop, L, Wrede, CD, Cancer Council Australia Cervical Cancer Screening Guidelines Working Party. 15. Screening in women who experienced early sexual intercourse or have been victims of sexual abuse.
[63] Ronco, G., Dillner, J., Elfström, K. M., Tunesi, S., Snijders, P. J. F., Arbyn, M., … Naucler, P. (2014). Efficacy of HPV-based screening for prevention of invasive cervical cancer: Follow-up of four European randomised controlled trials. *The Lancet*, *383*(9916), 524–532.
[64] Siddiqui, T. R., Ghazal, S., Bibi, S., Ahmed, W., & Sajjad, S. F. (2016). Use of the Health Belief Model for the Assessment of Public Knowledge and Household Preventive Practices in Karachi, Pakistan, a Dengue-Endemic City. *PLoS Neglected Tropical Diseases*, *10*(11), 1–15.
[65] Sinayobye, J., Sklar, M., Hoover, D. R., Shi, Q., Dusingize, J., Cohen, M., … Anastos, K. (2014). Prevalence and risk factors for High-Risk Human Papillomavirus (hrHPV) infection among HIV-infected and Uninfected Rwandan women: implications for hrHPV-based screening in Rwanda. *Infectious Agents and Cancer*, *9*(1), 40. 9378-9-40
[66] Singh, D. K., Anastos, K., Hoover, D. R., Burk, R. D., Shi, Q., Ngendahayo, L., … Castle, P. E. (2009). Human Papillomavirus Infection and Cervical Cytology in HIV-Infected and HIV-Uninfected Rwandan Women. *The Journal of Infectious Diseases*, *199*(12), 1851–1861.
[67] Silver, M. I., Rositch, A. F., Phelan-Emrick, D. F., & Gravitt, P. E. (2018). Uptake of HPV testing and extended cervical cancer screening intervals following cytology alone and Pap/HPV cotesting in women aged 30–65 years. Cancer Causes & Control, 29(1), 43-50.
[68] Thompson, T. L., Parrott, R., & Nussbaum, J. F. (Eds.). (2011). The Routledge handbook of health communication. Routledge.
[69] Stewart, B. W., & Wild, C. P. (2014). World cancer report 2014. *World Health Organization*, 1–2.
[70] Torre, L. A., Bray, F., Siegel, R. L., Ferlay, J., Lortet-tieulent, J., & Jemal, A. (2015). Global Cancer Statistics, 2012. *CA: A Cancer Journal of Clinicians.*, *65*(2), 87–108..
[71] Unaids, & Who. (2012). *UNAIDS report on the global AIDS epidemic. Unaids, Who*.
[72] Veldhuijzen, N. J., Braunstein, S. L., Vyankandondera, J., Ingabire, C., Ntirushwa, J., Kestelyn, E., … van de Wijgert, J. H. (2011). The epidemiology of human papillomavirus infection in HIV-positive and HIV-negative high-risk women in Kigali, Rwanda. *BMC Infectious Diseases*, *11*(1), 333.
[73] Wanyenze, R. K., Bwanika, J. B., Beyeza-Kashesya, J., Mugerwa, S., Arinaitwe, J., Matovu, J. K. B., … Makumbi, F. (2017). Uptake and correlates of cervical cancer screening among HIV-infected women attending HIV care in Uganda. *Global Health Action*, *10*(1), 1380361.
[74] WHO. (2013). *Guidelines for screening and treatment of precancerous lesions for cervical cancer prevention*. *WHO Guidelines*. Retrieved from
[75] Wong, L. P., Wong, Y. L., Low, W. Y., Khoo, E. M., & Shuib, R. (2009). Knowledge and awareness of cervical cancer and screening among Malaysian women who have never had a Pap smear: A qualitative study. *Singapore Medical Journal*, *50*(1), 49–53.
[76] World Health Organisation. (2016). *The Work of WHO in the African Region, 2015-2016, Report of the Regional Director*. *World Health Organisation-Afro region*.
[77] World Health Organization. (2006). Comprehensive Cervical Cancer Control. A guide to essential practice. *WHO Library Cataloguing-in-Publication Data*, 1–284.
[78] World HPV Information Center. (2017). Human Papillomavirus and Related Diseases Report. *HPV Information Centre Report*, (Indonesia), 60