

Women's healthcare decision-making capacity and HIV testing in sub-Saharan Africa: a multi-country analysis of demographic and health surveys

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Abstract

Background Global commitment to stop Human Immunodeficiency Virus (HIV) and ensure access to HIV treatment calls for women empowerment as these efforts play major roles in mother-to-child transmission. We explored the association between women's healthcare decision-making capacity and HIV testing in sub-Saharan Africa (SSA).

Methods We used data from the current Demographic and Health Surveys (DHS) conducted between January 1, 2010 and December 31, 2018 in 28 countries in SSA. At the descriptive level, we calculated the prevalence of HIV testing in each of the countries. This was followed by the distribution of HIV testing across the socio-demographic characteristics of women. Finally, we used binary logistic regression to explore the likelihood of HIV testing by women's health care decision-making capacity and socio-demographic characteristics. The results were presented as Crude Odds Ratios (COR) and Adjusted Odds Ratios (AOR) with their corresponding 95% confidence intervals signifying precision. Statistical significance was set at p-value <0.05.

Results We found that prevalence of HIV testing in the 28 SSA countries was 64.4%, with Congo DR having the least (20.2%) and the highest occurred in Rwanda (97.4%). Women who took healthcare-decisions alone [COR=3.183, CI=2.880-3.519] or with their partners [COR=2.577, CI=2.335-2.844] were more likely to test for HIV compared to those whose healthcare-decisions were taken by others and this persisted after controlling for significant covariates [AOR=1.507, CI=1.321-1.720] and [AOR=1.518, CI=1.334-1.728], respectively.

Conclusion SSA countries intending to improve HIV testing need to incorporate women's healthcare decision-making capacity strategies. These strategies can include education and counselling. This is essential because our study indicates that the capacity of women to make healthcare decisions has an association with their decision to test for their HIV status.

Background

Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) constitute one of the world's most serious public health problems [1]. Worldwide, an estimated 1.8 million newly infected HIV cases were recorded in 2017 [1]. This was made up of 180,000 children predominantly living in sub-Saharan Africa (SSA) who were infected by their HIV-positive mothers during pregnancy, childbirth or breastfeeding [2]. HIV testing among women is a challenge in SSA, especially among married women aged 15-49 [3, 4]. Some of the challenges identified in some studies include but not limited to HIV-related stigma from health professionals, HIV status disclosure dilemma, unintended pregnancy, intimate partner violence, HIV and environmental structural barriers, distress and fear related to maternal and child health [3, 5]. The few studies on this subject target individual women who access health services in specific countries [6].

Global commitment to stopping new HIV infections and ensuring access to treatment call for empowering women as they play a major role in mother-to-child-transmission [1, 7]. Women's decision-making capacity is imperative for ensuring HIV testing and addressing the pandemic [8], especially in SSA. The importance of women decision-making capacity in the area of HIV testing has been highlighted to build women's confidence to prevent HIV infection, especially mother to child infection [9]. Women's access to HIV testing depends substantially on the level to which they have been empowered to make decisions [10]. It is believed that a woman who is empowered either culturally, politically or professionally, has the confidence to decide on HIV testing, as she does not depend on her husband or partner to make decision to test for HIV or not [11].

The Theory of Gender and Power (TGP) by Connell [12], could guide the exploration of association between women's healthcare decision-making capacity and HIV testing. The TGP postulates that power dynamics between men and women are manifested in three major structures: sexual division of labour, sexual division of power and structure of social exposure and affective attachment [12, 13]. These structures provide a description of the gendered relationships between men and women which explain the power and role dynamics drifting more dominance to the males making the female subservient. Hence, a woman's decision to go for testing may depend on whether there is equality between her and the partner, societal expectations and norms in relation to who should decide on going for testing and whether or not there is male dominance in the home. According to the theory, although there is a distinction between these structures, they overlap and thus may not be considered in isolation from each other. These structures are also maintained through societal and institutional social mechanisms [13,14]. These societal and institutional social mechanisms include specific socio-demographic characteristics of individuals.

For women, the specific socio-demographic characteristics, which together with healthcare decision making capacity influence HIV testing include age, education, wealth, employment, residence and parity [8, 15]. In SSA, literature on women decision-making capacity and HIV testing are limited to specific countries such as Tanzania [8], Ethiopia [16] and South Africa [17] and mostly among women who are accessing health care services at health facilities [18, 19]. This suggests the paucity of studies on women's decision-making and HIV testing in SSA. It is therefore imperative for a study in a broader context covering the entire SSA in order to empower and imbue women with a positive attitude for HIV testing. In light of the foregoing, we examined women's healthcare decision-making capacity and HIV testing in SSA. We hypothesize that women who have the capacity to take decisions on healthcare alone or with their partners are more likely to test for their HIV status. Findings from such a multi-country study will provide evidence on the need and how to strengthen existing strategies to improve HIV testing and counselling by tackling women decision-making capacity.

Methods

We made use of pooled data from the current Demographic and Health Surveys (DHS) conducted from January 1, 2010 and December 31, 2018 in 28 countries in SSA (see Figure 1). DHS is a nationwide survey collected every five-year period across low and middle-income countries. DHS focused on maternal and child health by interviewing women of reproductive age (15 – 49 years) and men between 15 and 64 years. DHS surveys followed the same standard procedures – sampling, questionnaire development and data collection. However, data cleaning, coding and analysis were done in this study for cross – country comparison. The survey employed a stratified two stage sampling technique. The initial stage involves the selection of points or clusters (enumeration areas [EAs]) followed by a systematic sampling of households listed in each cluster or EA. For this study, the women file of the DHS data was used. All the participants were women in their reproductive age (15–49), who were usual members of the selected households and/or visitors who slept in the household on the night before the survey. In this study, only women in unions who had complete information on all the variables of interest were included (N= 195,307). We relied on the “Strengthening the Reporting of Observational Studies in Epidemiology” (STROBE) statement writing the manuscript.

Definition of variables

Outcome variable

The outcome variable was HIV testing. It was derived from the question “have you ever tested for HIV?” and the response was coded as “1=Yes and 0=No”.

Explanatory variables

Thirteen explanatory variables were considered in our study including the key explanatory variable (women’s decision-making on healthcare). It was derived from the question “Who usually makes decisions about healthcare for yourself: you, your (husband/partner), you and your (husband/partner) jointly, or someone else?” The responses were categorised as respondent alone, respondent and husband/partner, husband/partner alone, someone else and other. These were recoded into respondent/woman alone=1, respondent and husband/partner=2, husband/partner alone=3 and someone else and other=4.

Besides, 12 additional variables were included in the study. These are; country, age, educational level, marital status, religion, wealth status, place of residence, parity, occupation, and exposure to mass media (radio, television and newspaper). Apart from country of origin which was predetermined based on the geographical scope of the study, the selection of the rest of the variables were based on their association with HIV testing and counselling in previous studies [6, 7, 8, 20-25]. Marriage was recoded into ‘married (1)’, ‘cohabiting (2)’. Occupation was captured as ‘not working (0)’, ‘managerial (1)’, ‘clerical (2)’, ‘sales (3)’, ‘agricultural (4)’, ‘household/domestic (5)’, ‘services (6)’, and ‘manual (7)’. We recoded parity (birth order) as ‘zero birth’(0) ‘one birth (1)’, ‘two births (2)’, ‘three births (3)’, and four or more births (4)’. Lastly, religion was recoded as ‘Traditionalist (1)’, ‘Christianity (2)’, ‘Islam (3)’, ‘No religion (4)’, and ‘Other(5)’.

Statistical analyses

The data was analysed with STATA version 14.2 for Mac OS. The analysis was done in three steps. The first step was the computation of the prevalence of HIV testing in SSA (see Figure 1). The second step was a cross-tabulation by which we calculated the prevalence and proportions of HIV testing across the socio-demographic characteristics (see Table 1). Then, we conducted a bivariate logistic regression (Model I) and multivariate regression (Model II) analyses to assess the predictors of HIV testing among women in SSA (see Table 2). All frequency distributions were weighted while the survey command (svy) in STATA was used to adjust for the complex sampling structure of the data in the regression analyses. There was multicollinearity between knowing a place for HIV testing and HIV testing uptake. Due to this it was taken out of the analysis. After it was taken out, there was no evidence of multicollinearity among the remaining variables (Mean VIF=1.35, Maximum VIF=1.70, Minimum VIF=1.05). All results of the logistic regression analyses were presented as Crude Odds Ratios (CORs) and Adjusted Odds Ratios (AORs) at 95% confidence intervals (CIs).

Results

Prevalence of HIV testing among women in SSA

Figure 1 shows the prevalence of HIV testing in entity and in each of the 30 SSA countries. Overall, the prevalence of HIV testing was 64.4%. We found that the prevalence of HIV testing ranged from 20.2% in Congo DR to 97.4% in Lesotho and Rwanda.

Figure 1

Socio-demographic Characteristics and Prevalence of HIV Testing

Table 1 summarises the prevalence of HIV testing across the included socio-demographic characteristics. The highest prevalence of HIV testing was among women with higher education (92.9%) and the lowest prevalence was among those who professed the traditionalist religion (32.8%). All the socio-demographic characteristics showed a statistically significant relationship with HIV testing (see Table 1).

Table 1

Association between women's healthcare decision-making and socio-demographic characteristics on HIV Testing in SSA

Table 2 shows results on the association between women's healthcare decision making capacity and socio-demographic factors associated with HIV testing among women in SSA. The results indicate that women who took healthcare decisions alone [COR=3.183, CI=2.880-3.519] or with their partners [COR=2.577, CI=2.335-2.844] were more likely to test for HIV compared to those whose healthcare decisions were taken by others and this persisted after controlling for significant covariates [AOR=1.507, CI=1.321-1.720] and [AOR=1.518, CI=1.334-1.728], respectively (see Model II). With the covariates women aged 20-24 [AOR=1.351- CI=1.273-1.433], richest women [AOR=2.561, CI=2.418-2.713], those with parity 4 or more [AOR=4.788- CI=4.488-5.108], were more likely to test for HIV compared to those aged 15-19, those in the poorest wealth quintile and those with parity 0, respectively. On the other hand, women aged 45-49 [AOR=0.383, CI=0.355-0.413], those with no education [AOR=0.259, CI=0.227-0.294], married women [AOR=0.914, CI=0.879-0.951], those with no religion [AOR=0.771, CI=0.682-0.873], those who are not working [AOR=0.589, CI=0.471-0.737], those in agriculture [AOR=0.571, CI=0.456-0.716], those in rural areas [AOR=0.732, CI=0.707-0.759], those not exposed to newspaper [AOR=0.656, CI=0.510-0.843], those not exposed to radio [AOR=0.757, CI=0.693-0.828], those not exposed to television [AOR=0.631, CI=0.575-0.691] and those in DR Congo [AOR=0.010, CI=0.007-0.013] compared with those aged 15-19, those with higher education, those cohabiting- those belonging to other religious groups, those in clerical, those in urban areas, those who read newspaper almost every day, those who listen to radio almost every day, those who watch television almost every day, and those in Lesotho.

Table 2

Discussion

This study explored the association between women's healthcare decision-making capacity and HIV testing in SSA enlisting the most recent DHS of 28 countries. This study was imperative since HIV testing has been noted as a challenge for some women in SSA [3] whilst some evidence suggest that decision-making capacity plays a significant role in whether a woman will test for HIV or not [11, 26]. We found that women who had high capacity to make decisions relating to their health either alone or with their partners were more likely to test for HIV. This may not necessarily imply that women who did not have the capacity do not prioritise HIV testing, instead it may indicate their inability to translate their thoughts into action. This finding reinforces evidence from Tanzania and Nigeria that empowered women who are

capable of making decisions have higher chances of HIV testing [8, 25]. In line with TGP, the finding indicates that HIV testing among women can occur in empowered women through a reduction in gender inequality, positive societal expectation of women's decision-making capacity in marriage and absence of male dominance. Our finding suggests that efforts to halt HIV and vertical transmission need to target decision-making capacity of women in the household and community level. Additionally, facility-based interventions such as supplying and subsidising the cost of antiretroviral vaccines will be necessary. Active community engagement geared towards women empowerment especially in the areas of decision-making, therefore, needs to be prioritised. A recent systematic review indicated that encouragement from peers could enhance ability of women to undergo HIV test [27] and this is a key community-level strategy. Testing for HIV was high among women from Rwanda. This is not surprising in light of the upsurge in health sector reforms in Rwanda in the past few years [28]. Another factor that might have accounted for the high likelihood of HIV testing may be Rwanda's continual efforts marked by 3.0% stabilised HIV prevalence among the general population and 50% reduction in new HIV infection rate [29]. Rwanda is more likely to further improve in HIV testing and reduction with the introduction of self-HIV-testing kit which can be purchased over the counter [29]. There is the need to encourage women in DR Congo to utilise HTC.

In relation to the covariates, the study revealed that HIV testing declines as women advance in age and parity but increases among women with higher educational attainment, those with richest wealth quintile, urban women, women who have knowledge on HIV and those who are exposed to media. The findings on age and parity are consistent with earlier studies conducted in a number of SSA countries. For instance, one study from Namibia reported that the likelihood of HIV testing generally declined as women advanced in age [22]. It is possible that women who are advanced in age and possibly with high parity will feel that they have limited exposure to HIV due to possible decline in sexual intercourse [30]. Such women may feel less motivated to test for HIV. In terms of socio-economic status, education, urban living and wealth status, have been identified as strong predictors for HIV testing in previous studies [21, 23, 25, 31-37]. Education and wealth status are forms of empowerment. Hence, it is not surprising that such women exercise their decision-making capacity in a way that can improve their health status, which is testing for HIV. This indicates that policies on Mother-To-Child-Transmission (MTCT) and plans to halt HIV need to consider measures that can enhance economic standing of women. This is in line with the Health Belief Model which argues that gaining consciousness about a health condition is the first step to inform the needed precaution [37, 38]. Women of high socio-economic status (education and wealth) are also more likely to have knowledge of HIV. This finding is consistent with previous evidence from Burkina Faso and Cambodia that knowledge about HIV have greater implication on whether women will undergo the test or otherwise [23, 39, 40]. Such knowledge, can be obtained from exposure to media, which can enhance HIV testing as indicated in previous studies [38-42].

Strengths and limitations

This study offers a true account of women's decision-making capacity on healthcare and HIV testing emerging from most recent national surveys of 28 countries in SSA. The large sample and rigour of the methodological and analytical approaches are significant strengths of the study. However, the study is not devoid of limitations. The predictors exposed in this study only account for less than half of the variability in HIV testing in SSA and that other factors on the demand and supply side are likely to explain the bigger proportion of the variability in HIV testing across the region. Again, women were only asked if they had tested for HIV without any validation and as a result recall bias could occur. However, these do not outweigh the rigour of the study in light of the acknowledged strengths. Previous studies have established strong associations between knowing a place to get tested, comprehensive knowledge of HIV/AIDS, and discriminatory attitude towards people living with HIV and HIV testing, however, these variables were not consistent across the countries we included in our analysis. Therefore, we did not add them to our study. Knowing a place to get tested showed high level of multicollinearity and was dropped.

Conclusions and policy implications

The study has demonstrated that ensuring women's healthcare decision-making capacity has the propensity to increase HIV testing among women in SSA. SSA countries that seek to improve HIV testing need to incorporate women's healthcare decision-making strategies into the available policies because our study indicates that as more women are able to make decisions in their household relating to their health, their chances of HIV testing increases. In addition to focusing on provision of care (i.e., providing HIV test kits, targeting household and community level structures), prioritising women's decision-making capacities can contribute positively to HIV testing. Much of this effort is required in DR Congo as women from that country had the least likelihood of HIV testing. Other category of women to target when developing measures to increase HIV testing are the poorest and married women, women over 45 years, those not having formal education, agricultural workers, rural women, nulliparous women, women having more than four births and women having limited contact with mass media (television, radio and newspaper). Various context specific mass media channels can therefore be used to reach the identified category of women depending on available resources.

Declarations

Ethical Approval

The DHS surveys obtain ethical clearance from the Ethics Committee of ORC Macro Inc. as well as Ethics Boards of partner organisations of the various countries such as the Ministries of Health. During each of the surveys, either written or verbal consent was provided by the women. Since the data was not collected by the authors of this paper, we sought permission from MEASURE DHS website and access to the data was provided after our intent for the request was assessed and approved on 27th January, 2019.

Consent for publication

All authors have read and approved final manuscript and agreed to be accountable for all aspects of the work.

Competing interests

The authors declare no competing interests in the conduct of this research.

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Authors' Contributions

AS conceived the study. AS designed and performed the analysis. AS, FS, BL, BOA, JKO and FA designed first draft of the manuscript. AS, FS, BL, EB, JKO, BOA, EKA and FA revised the manuscript for intellectual content and gave consent for the version to be published.

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Availability of data and materials

The dataset is freely available at <https://dhsprogram.com/data/available-datasets.cfm>.

References

1. Global HIV & AIDS statistics. 2018 fact sheet
2. National Bureau of Statistics (NBS) [Tanzania], and ICF Macro. Tanzania Demographic and Health Survey 2010. Dar es Salaam, Tanzania: NBS and ICF Macro.2011
3. Sharma M, Ying R, Tarr G, Barnabas R. Systematic review and meta-analysis of community and facility-based HIV testing to address linkage to care gaps in sub-Saharan Africa. *Nature*. 2015, 528(7580):S77. <https://doi.org/10.1038/nature16044>.
4. Mwangala S, Moland KM, Nkamba HC, Musonda KG, Monze M, Musukwa KK, Fylkesnes K. Task-shifting and quality of HIV testing services: experiences from a national reference hospital in Zambia. *PloS one*. 2015, 10(11):e0143075.
5. Ashaba S, Kaida A, Coleman JN, Burns BF, Dunkley E, O'Neil K, Kastner J, Sanyu N, Akatukwasa C, Bangsberg DR, Matthews LT. Psychosocial challenges facing women living with HIV during the perinatal period in rural Uganda. *PloS one*. 2017, 12(5):e0176256.
6. Gourlay A, Wringe A, Todd J, Cawley C, Michael D, Machelamba R, Reniers G, Urassa M, Zaba B. Factors associated with uptake of services to prevent mother-to-child transmission of HIV in a

- community cohort in rural Tanzania. *Sex Transm Infect.* 2015, 91(7):520-7.
7. Miller M. Determinants of Women's Empowerment and HIV Status in Sub-Saharan Africa. 2011, (Thesis Colorado College) Colorado, USA.
 8. Bashemera DR, Nhembo MJ, Benedict G. The role of womens empowerment in influencing HIV testing. <https://dhsprogram.com/pubs/pdf/WP101/WP101.pdf>
 9. Behal A. Education, Women Empowerment and Related Issues. *International Educational E-Journal.* 2011;1.
 10. Remien RH, Chowdhury J, Mokhbat JE, Soliman C, El Adawy M, El-Sadr W. Gender and care: access to HIV testing, care and treatment. *Journal of acquired immune deficiency syndromes (1999).* 2009, 51(Suppl 3):S106.
 11. Dellar RC, Dlamini S, Karim QA. Adolescent girls and young women: key populations for HIV epidemic control. *Journal of the International AIDS Society.* 2015, 18:19408.
 12. Connell, R. *Gender and Power.* Stanford, CA: Stanford University Press; 1987.
 13. Wingood GM, DiClemente RJ. Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health education & behavior.* 2000 Oct;27(5):539-65.
 14. Pulerwitz J, Gortmaker SL, DeJong W. Measuring sexual relationship power in HIV/STD research. *Sex roles.* 2000 Apr 1;42(7-8):637-60.
 15. Bloom SS, Negroustoueva S. Compendium of gender equality and HIV indicators.
 16. Fanta W, Worku A. Determinants for refusal of HIV testing among women attending for antenatal care in Gambella Region, Ethiopia. *Reproductive health.* 2012, 9(1):8.
 17. Subedar H, Barnett S, Chaka T, Dladla S, Hagerman E, Jenkins S, Matshimane G, Mangold K, Msimanga B, Pooe R, Schultz L. Tackling HIV by empowering adolescent girls and young women: a multisectoral, government led campaign in South Africa. *Bmj.* 2018, 7:363:4585.
 18. Gómez-Suárez M, Mello MB, Gonzalez MA, Ghidinelli M, Pérez F. Access to sexual and reproductive health services for women living with HIV in Latin America and the Caribbean: systematic review of the literature. *Journal of the International AIDS Society.* 2019, 22(4):e25273
 19. Orza L, Bass E, Bell E, Crone ET, Damji N, Dilmitis S, Tremlett L, Aidarus N, Stevenson J, Bensaid S, Kenkem C. In *Women's Eyes: Key Barriers to Women's Access to HIV Treatment and a Rights-Based Approach to their Sustained Well-Being.* *Health and human rights.* 2017, 19(2):155.
 20. Sambah F, Baatiema L, Appiah F, Ameyaw EK, Budu E, Ahinkorah BO, Oduro JK, Seidu AA. Educational attainment and HIV testing and counselling service utilisation during antenatal care in Ghana: Analysis of Demographic and Health Surveys. *Plos one.* 2020 Jan 15;15(1):e0227576.
 21. Obermeyer CM, Neuman M, Hardon A, Desclaux A, Wanyenze R, Ky-Zerbo O, Cherutich P, Namakhoma I. Socio-economic determinants of HIV testing and counselling: a comparative study in four African countries. *Tropical medicine & international health.* 2013, 18(9):1110-8.

22. Muhinda JC, Pazvakawambwa L. HIV Testing among Women in Namibia: Patterns and Determinants. *Biomedical Journal of Scientific & Technical Research*. 2017, 1(3):571-8.
23. Kirakoya-Samadoulougou F, Jean K, Maheu-Giroux M. Uptake of HIV testing in Burkina Faso: an assessment of individual and community-level determinants. *BMC public health*. 2017, 17(1):486.
24. Iwelunmor J, Blackstone S, Jennings L, Converse D, Ehiri J, Curley J. Determinants of HIV testing and receipt of test results among adolescent girls in Nigeria: The role of assets and decision-making. *International journal of adolescent medicine and health*. 2018.
25. Iddrisu AK, Opoku-Ameyaw K, Bukari FK, Mahama B, Akooti JJ. HIV Testing Decision and Determining Factors in Ghana. *World Journal of AIDS*. 2019, 9(2):85-104.
26. Wand H, Whitaker C, Ramjee G. Geospatial models to assess spatial variation of HIV infections among women in Local communities of Durban, South Africa. *International Journal of Health Geographics*. 2011, 10(1):28.
27. Nnko S, Kuringe E, Nyato D, Drake M, Casalini C, Shao A, Komba A, Baral S, Wambura M, Chagalucha J. Determinants of access to HIV testing and counselling services among female sex workers in sub-Saharan Africa: a systematic review. *BMC Public Health*. 2019, 19(1):15. doi: 10.1186/s12889-018-6362-0.
28. Sayinzoga F, Bijlmakers L. Drivers of improved health sector performance in Rwanda: a qualitative view from within. *BMC health services research*. 2016, 16(1):123.
29. Ngabonziza, D. Rwanda launches oral HIV self-testing method. 2017, <https://ktpress.rw/2017/11/rwanda-launches-oral-hiv-self-testing-method/>
30. Koumans HE, Harrison A, House DL, Burley K, Ruffo N, Smith R, ...Nesheim RS. Characteristics associated with lack of HIV testing during pregnancy and delivery in 36 U.S. states, 2004-2013. 2018, *Int J STD AIDS*. 29(12), 1225–1233. doi:10.1177/0956462418780053
31. Muyunda B, Musonda P, Mee P, Todd J, Michelo C. Educational Attainment as a Predictor of HIV Testing Uptake Among Women of Child-Bearing Age: Analysis of 2014 Demographic and Health Survey in Zambia. *Frontiers in public health*. 2018, 6.
32. Ziraba AK, Madise NJ, Kimani JK, Oti S, Mgomella G, Matilu M, Ezeh A. Determinants for HIV testing and counselling in Nairobi urban informal settlements. *BMC public health*. 2011, 11(1):663.
33. Yaya S, Bishwajit G, Danhondo G, Seydou I. Extent of knowledge about HIV and its determinants among men in Bangladesh. *Frontiers in public health*. 2016, 4:246.
34. Henderson ER, Subramaniam DS, Chen J. Rural-urban differences in human immunodeficiency virus testing among US adults: findings from the behavioral risk factor surveillance system. *Sexually transmitted diseases*. 2018, 45(12):808-12.
35. WHO. Country Responses: Nigeria. 2019. <https://www.who.int/workforcealliance/countries/nga/en/>
36. Yaya S, Uthman OA, Okonofua F, Bishwajit G. Decomposing the rural-urban gap in the factors of under-five mortality in sub-Saharan Africa? Evidence from 35 countries. *BMC public health*. 2019, 19(1):616.

37. Becker MH. The health belief model and personal health behavior. Health education monographs. 1974, 2:324-473.
38. Rosenstock IM. Historical origins of the health belief model. Health education monographs. 1974, 2(4):328-35
39. Yi S, Tuot S, Chhoun P, Pal K, Chhim K, Ngin C, Brody C. Sexual behaviors, HIV knowledge, HIV testing attitudes and recent HIV testing among female entertainment workers in Cambodia: A cross-sectional study. PloS one. 2018, 13(7):e0198095.
40. Fairchild AL, Bayer R, Green SH. The two faces of fear: A history of hard-hitting public health campaigns against tobacco and AIDS. Am J Public Health. 2018, 108:1180-1186