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**Contextual factors associated with knowledge and attitudes of HIV/AIDS among Malawian women of reproductive age**

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## **Abstract**

### **Background**

Increasing the knowledge and attitude towards human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) is key in the management of the condition. However, in Malawi, there is limited information regarding individual- and community-level factors associated with HIV/AIDS knowledge and attitudes. This study examined the contextual factors associated with HIV/AIDS knowledge and attitudes among women of childbearing age (WOCBA) (aged 15–49 years) in Malawi.

### **Methods**

The 2015-16 Malawi demographic and health survey was used to analyze 24,562 WOCBA who were nested in 850 communities. Mixed effects logistic regression models were fitted to estimate the fixed and random effects of individual- and community-level factors on HIV/AIDS knowledge and attitudes.

### **Results**

Approximately 30.9% of the participants had good HIV/AIDS knowledge while 80.5% had good HIV/AIDS attitudes. Among others, at the individual level, woman's age, educational level and household wealth were positively associated with both good HIV/AIDS knowledge and attitudes. At the community level, those from communities with a high percentage of women complaining about the distance to health facility was less likely to have both good HIV/AIDS knowledge and attitudes.

### **Conclusion**

Individual- and community-level factors have been shown to be associated with HIV/AIDS knowledge and attitudes among WOCBA in Malawi. Additionally, residual heterogeneity in terms of HIV/AIDS knowledge and attitudes across communities was observed. Therefore, thorough profiling of communities when designing public health programs and strategies may prove beneficial.

**Keywords:** HIV/AIDS knowledge, attitudes, multilevel, Malawi

## Introduction

The public health importance of Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) cannot be overemphasized, [especially in low-income countries](#). By the end of 2019, HIV/AIDS had claimed more than 32.7 million lives since the start of the epidemic with approximately 38.0 million people living with HIV globally.<sup>1</sup> Furthermore, the same year (2019), approximately 690 000 people were reported to have died from AIDS-related illnesses of which, 300 000 deaths were from eastern and southern Africa.<sup>2</sup> One of the important aspects of HIV/AIDS management is increasing the knowledge of HIV/AIDS among the populace as this could drive appropriate behavioral change. Like many other countries, HIV/AIDS poses a great threat to Malawi's health care system with 980,000 people estimated to be living with HIV/AIDS. Therefore, Malawi developed the 2015-2020 National HIV and AIDS Strategic Plan (NSP) that aimed to consolidate efforts (i.e., HIV programs) aiming to achieve the Joint United Nations Program on HIV and AIDS (UNAIDS) 90-90-90 targets. Coupled with the NSP, the Malawi Ministry of Health (MoH) and its partners have geared their efforts in improving HIV prevention, knowledge, and behavior.<sup>3</sup>

Comprehensive HIV/AIDS knowledge and positive attitudes are fundamental for successful disease prevention, control, and treatment. This is true as reported from previous research. Specifically, these studies have demonstrated the importance of HIV/AIDS knowledge and attitude and the role it plays in improving appropriate behaviors.<sup>4, 5</sup> For example in Nigeria, people that had high knowledge regarding HIV/AIDS were less likely to practice risky sexual behaviors.<sup>4, 6</sup> Despite the importance of knowledge on HIV prevention and appropriate behaviors, limited population-based studies have been conducted to assess the levels of HIV/AIDS-related knowledge and attitudes. For instance, in Kenya,<sup>7</sup> [attaining secondary or university](#) educational level was associated with better HIV/AIDS knowledge. Moreover, such studies have not accounted for community influences on HIV/AIDS knowledge and attitude. Communities tend to influence health outcomes, behaviors, and knowledge.<sup>8, 9</sup> In Malawi, there is scant information on the association between individual and community-level factors and HIV/AIDS knowledge and attitudes. Although studies examining factors associated with HIV/AIDS knowledge have been conducted in other countries,<sup>10, 11</sup> data is still sparse on the same in Malawi. Literature

search revealed a 2004 study that assessed factors associated with HIV/AIDS knowledge in a rural Malawian district.<sup>12</sup> However, the results from the study could not be generalized to the Malawian population. Further, a long time has elapsed since the study was conducted and the dynamics in HIV/AIDS management have changed over time and thus, it is important to understand the most recent situation with regards to HIV/AIDS knowledge/attitude in Malawi.

Additionally, discerning the factors associated with HIV/AIDS discriminant attitudes may be crucial in the overall management of HIV/AIDS. It has been observed elsewhere that people living with HIV are stigmatized due to the belief that being infected with HIV is a result of immoral behavior.<sup>13</sup> Therefore, understanding factors associated with HIV/AIDS knowledge and attitudes is vital. Such information would be important to effectively implement programs and strategies that are aimed at improving HIV prevention, knowledge, and behavior.

Regarding gender disparities related to HIV, previous research has demonstrated that women's knowledge about HIV/AIDS is lower than men's, and that women usually become infected at a younger age than men.<sup>14</sup> Additionally, women are at high risk of contracting HIV/AIDS due to issues related to their exposure to gender and economic inequalities in society particularly when negotiating sexual relations.<sup>15</sup> Further, women are at increased risk because of the greater mucus area exposed to HIV during penile penetration.<sup>16</sup> Therefore, women are an important group in terms of HIV/AIDS programming.

We, therefore, assessed the individual- and community-level factors associated with HIV/AIDS knowledge and attitudes among women of childbearing age (WOCBA) (i.e., aged 15 – 49 years) in Malawi using nationally representative sample.

## **Methods**

### ***Study design and data source***

This cross-sectional study used data from the 2015-16 Malawi Demographic and Health Survey (MDHS). Details of the survey methodology have been published elsewhere<sup>3</sup>. Briefly, a two-stage stratified cluster

sampling method was used to sample 850 communities and 25,146 eligible WOCBA. Of the sampled women, 24,562 were successfully interviewed, representing a 98% response rate. The current study was restricted to women who had complete information on all the variables considered (n = 24,008).

### **Measures**

Outcome: Two main outcomes were considered namely, HIV/AIDS knowledge, and attitudes.

To assess HIV/AIDS knowledge, nine items were used and these included; (1) “*Reduce risk of getting HIV: always use condoms during sex*” (yes/no), (2) “*Reduce risk of getting HIV: have one sex partner only who has no other partners*” (yes/no), (3) “*Can get HIV from mosquito bites*” (yes/no), (4) “*Can get HIV by sharing food with person who has AIDS*” (yes/no), (5) “*A healthy-looking person can have HIV*” (yes/no), (6) “*Can get HIV by witchcraft*” (yes/no), (7) “*HIV transmitted during pregnancy*” (yes/no), (8) “*HIV transmitted during delivery*” (yes/no), (9) “*HIV transmitted by breastfeeding*” (yes/no). Items (3), (4), and (6) were reverse coded. The scores ranged from 0–9. Participants with a score of 9 had correct/comprehensive knowledge about HIV/AIDS and were categorized as having “good” knowledge while participants with a score of less than 9 were regarded as having “poor” knowledge.<sup>17</sup>

Attitudinal statements were as follows; (1) “*children living with HIV should be able to attend school with children who are HIV negative*” (yes/no), and (2) “*can buy fresh vegetables from a shopkeeper who has HIV*” (yes/no). The scores were summed up and ranged from 0–2 with those having a score of 2 categorized as “good attitude” while those with a score <2 were categorized as having a “poor attitude”.

Independent variables: At the individual level, several factors were considered based on the relevance of previous literature<sup>10, 11, 18</sup> as follows; woman’s age in years (15 – 24, 25 – 34, ≥ 35), educational level (no formal, primary, and secondary and tertiary), parity (primipara, secundipara, and multipara), marital status (married and unmarried), religion (Muslims and others, Catholics, and protestants), perceived distance to health facility (problem vs not a problem), ethnicity (Chewa, Tumbuka, Lomwe, Yao, Ngoni, others). Household wealth was calculated by scoring household items such as ownership of bicycle etc. using principal component analysis. The

scores were then grouped into rich (upper 40%) middle (middle 20%), and poor (lower 40%). Women who had reported watching television or reading newspaper or listening to radio at least once a week were groups as having media exposure otherwise, no exposure.

At community level, key sociodemographic variables were aggregated to come up with community-level factors. Community education, community employment, community wealth, community distance to health facility, and community media exposure were calculated as proportions of women with any education, employed, rich, perceiving distance to health facility as a problem, and exposed to media, respectively. The continuous variables were then grouped into tertiles as low, middle, and high for easy interpretation of the results. Additionally, at community-level, residence (rural, urban), and region (northern, central, and southern) were assessed.

### *Data analysis*

Chi square tests were used to assess distribution of the study characteristics according to HIV/AIDS knowledge, and attitude status, respectively. Spearman's correlations between all the independent variables (the community level continuous variables), and all the dependent variables (HIV/AIDS knowledge and attitude), were assessed. Four multilevel logistic regression models were run for each of the outcome variables:

*Model 1* included the dependent variable(s) only to assess the total variance in HIV/AIDS knowledge and attitude between communities in Malawi.

*Model 2* included the outcome(s) and individual-level variables.

*Model 3* included the outcome(s) and community-level variables.

*Model 4* included the outcome(s) and both individual- and community- level variables.

The fixed effects were reported as adjusted odds ratios (aOR) and 95% confidence intervals (CIs). All models assessed for random effects which were reported in the form of area variance and 95% CI, intraclass correlation coefficient (ICC), proportion change in variance (PCV), and median odds ratio (MOR). The goodness

of fit of the models were assessed using Akaike information criterion with models with smaller values regarded as models with better fit. Finally, all models were checked for multicollinearity using variance inflation factor (VIF) and the models had no multicollinearity problems (all variables had VIF <10).

The “svy” command that considered the clustering and sample weights according to the survey design was used in Stata. All the analyses were performed using Stata version 15.0 (Stata Corp LP, College Station, TX).

### *Sensitivity Analyses*

Several sensitivity analyses were conducted. First, to assess whether categorizing the outcome variables had an impact on the results, we maintained both outcomes (knowledge and attitude) as continuous variables and analyzed them using linear mixed-effect models. Second, we assessed HIV knowledge outcome as a three level variable; absolutely no knowledge (those that scored < 5), fair knowledge (those that scored between 5 and 8), and good knowledge (those that got all the questions correctly i.e., score of 9). Similarly, for attitude, we categorized those with a score of “0” as poor attitude, those with a score of “1” as fair attitude, and those with a score of “2” as good attitude. These three-level outcomes were analyzed using generalized structural equation modeling.

### *Ethical considerations*

Approval to use the dataset was given to the authors by DHS measure. The 2015-16 MDHS survey was approved by National Health Sciences Research Board of Malawi, Institutional Review Board (IRB) of ICF Macro, and Centers for Disease Control (CDC) in Atlanta. Informed consent was obtained at the beginning of each interview.

## **Results**

A total of 24, 008 WCBA nested in 850 communities were analyzed of whom, 31.7% had good HIV/AIDS knowledge while 80.5% had good attitude.



Table 1 reports the distribution of study characteristics according to HIV/AIDS knowledge, and attitude status. Among others, having good HIV/AIDS knowledge was positively associated with being  $\geq 25$  years old, having secondary and tertiary education, being secundipara/multipara, coming from urban residence, being from the central/southern region, having media exposure, from communities with a middle and high percentage of educated women, from rich communities, and from communities with a low percentage of women perceiving distance to health facility as a problem. Similar results were observed as regards to the study characteristics and HIV/AIDS attitude.

<Insert Table 1>

Table 2 lists the correlation between the continuous variable and the associations ranged from positive and negative very weak to moderate correlation among the various variables.

<Insert Table 2>

#### *Factors associated with HIV/AIDS knowledge*

Table 3 displays factors associated with HIV/AIDS knowledge. Results from model 4 will be emphasized as it displayed a better fit (i.e., lower AIC). Compared with women aged 15 – 24 years, those aged 25 – 34 years [aOR: 1.18, 95% CI 1.08 – 1.29] and  $\geq 35$  years [aOR: 1.11, 95% CI 1.01 – 1.23] had increased odds of having good HIV/AIDS knowledge. Women who had attained primary [aOR: 1.43, 95% CI 1.29 – 1.60] and secondary/tertiary [aOR: 2.73, 95% CI 2.41 – 3.10] education were more likely to have good HIV/AIDS knowledge compared with those who had no formal education. Household wealth was associated with HIV/AIDS knowledge such that women from rich households [aOR: 1.15, 95% CI: 1.06 – 1.25] exhibited increased odds of having good HIV/AIDS knowledge. Additionally, those that did not perceive distance to health facility as a problem [aOR: 1.09, 95% CI: 1.01 – 1.16] and had media exposure [aOR: 1.21, 95% CI: 1.13 – 1.29] were more likely to have good HIV/AIDS knowledge compared with those who perceived distance to health facility as a problem and those who did not have media exposure, respectively. Detailed results of factors associated with HIV/AIDS knowledge are listed in Table 3.

<Insert Table 3>

### *Factors associated with HIV/AIDS attitude*

Among others, being aged 24 – 34 years [aOR: 1.35, 95% CI: 1.20 – 1.51] and  $\geq 35$  years [aOR: 1.39, 95% CI: 1.23 – 1.57] was associated with increased likelihood of having good HIV/AIDS attitudes compared with being aged 15 – 24 years. Women with primary [aOR: 1.61, 95% CI: 1.44 – 1.79] and secondary and tertiary education [aOR: 3.73, 95% CI: 3.21 – 4.32] were more likely to have good HIV/AIDS attitudes compared with those having no formal education. Compared with primipara women, secundipara [aOR: 1.30, 95% CI: 1.15 – 1.47] and multipara [aOR: 1.39, 95% CI: 1.21 – 1.59] exhibited higher odds of good HIV/AIDS attitudes. At community level, those from communities with a middle [aOR: 1.40, 95% CI: 1.23 – 1.60] and high [aOR: 1.48, 95% CI: 1.26 – 1.74] percentage of educated women were more likely to have good HIV/AIDS attitude compared with those from communities with a low percentage of educated women. Detailed results for factors associated with good HIV/AIDS attitude are displayed in Table 4.

<Insert Table 4>

### *Measures of variation*

Table 3 and 4 also lists the results of measures of variation. In model 1 for both outcomes, significant variation in HIV/AIDS knowledge ( $\sigma^2 = 0.40$ , 95% CI 0.34 – 0.46) and attitude ( $\sigma^2 = 0.52$ , 95% CI 0.45 – 0.61) across communities was observed. This underscored the importance of using multilevel approach for modelling. The ICC values for HIV/knowledge and attitude outcomes were 10.8% and 13.6%, respectively thus highlighting that the variation in terms of these outcomes could be attributed to unobserved community characteristics. These values slightly reduced (i.e., the ICC for model 4 was 8.3% and 7.9% for HIV/AIDS knowledge and attitudes, respectively, indicating the individual- and community level variables considered in this study reduced the variance in terms of the outcome. This was supported by the increasing PCV values (i.e., from 20.0% in model 2 to 27.5% in model 4 for HIV/AIDS knowledge outcome, and 36.5% in model 2 to 46.2% in model 4 for HIV/AIDS attitude outcome) suggesting that the variables included in the final models explained, to a larger

extent, the variation in the odds of having good HIV/AIDS knowledge and attitudes, respectively. Further evidence of community heterogeneity and the community effects were similar for both outcomes [MOR: 1.67 and 1.66 for HIV/AIDS knowledge and attitudes, respectively].

### *Sensitivity Analyses*

Results were similar when the outcomes were maintained as continuous variables (i.e., HIV knowledge and attitude scores). When we categorized the outcome variables into three-level variables, the results were fairly consistent albeit greater associations were observed among the selected variables and having good knowledge or attitude, respectively (All sensitivity analyses results are displayed in the supplementary file attached – Table S4 – Table S4).

### **Discussion**

This is the first studies to examine individual- and community-level influences on HIV/AIDS knowledge and attitude among Malawian WOCBA. Community variations in terms of HIV/AIDS knowledge and attitude were revealed. The study demonstrated that if a woman moved to a community with a higher probability of HIV/AIDS knowledge and attitude, the median increase in the odds of having good HIV/AIDS knowledge and attitude is 1.69-fold. Indeed, living in communities in which a high percentage of women complained of the distance to a health facility was associated with reduced likelihood of having good HIV/AIDS knowledge and attitude.

The proportion of having good HIV/AIDS knowledge was 31.7% while having a good HIV/AIDS attitude was 80.5%. The proportion of HIV/AIDS knowledge is lower than the 62% reported in Bangladesh<sup>10</sup> suggesting that more efforts to increase the levels of HIV/AIDS knowledge in Malawi are needed. However, it is important to note that the Bangladesh study restricted their analysis to married women while in this current study all WOCBA were included. Additionally, the 80.5% proportion of good HIV/AIDS attitude is greater than the 55.0% reported in Pakistan<sup>11</sup> Therefore, public health programs in Malawi should work to maintain and strengthen good HIV/AIDS attitudes among WOCBA.

Older WOCBA were more likely to exhibit good HIV/AIDS knowledge and attitudes. This is consistent with previous studies in Pakistan<sup>11</sup> and Nigeria<sup>19</sup>. Age disparity in accessing health information and services has been demonstrated elsewhere<sup>20</sup> and may ultimately influence health knowledge and attitudes. It is therefore that more effort should be placed on youth-targeted HIV/AIDS programs in Malawi. Further, the association that older WOCBA were associated with better attitude may underscore generational differences that may influence people's attitudes. Hence, it is important that programs aimed at improving HIV/AIDS should consider age differences and tailored messages should be designed. Our study findings reveal that educated women were more likely to have both good HIV/AIDS knowledge and attitude. Women who are educated may comprehend health education messages better than those without formal education.<sup>21</sup> Secundipara and multipara women were more likely to have good HIV/AIDS knowledge and attitudes. Women who have given birth a couple of times are more likely to have better HIV/AIDS knowledge than those with no prior experience of giving birth. In Malawi, the antenatal care visits have incorporated an HIV testing component which essentially includes educating and counseling women on issues related to HIV/AIDS<sup>22</sup> thus raising their knowledge and improving their attitudes.

Household wealth was associated with increased odds of having good HIV/AIDS knowledge and attitudes. Household wealth may act as a precursor to better access to resources, services, and information regarding HIV/AIDS. It has been demonstrated elsewhere that low socioeconomic status is associated with poor educational attainment which in turn,<sup>18</sup> may influence knowledge and attitudes related to HIV/AIDS. Consistent with a study in sub-Saharan Africa,<sup>23</sup> media exposure was associated with an increased likelihood of having both good HIV/AIDS knowledge and attitudes. Mass media is, therefore, an effective tool in transmitting knowledge related to HIV/AIDS in Malawi. There were disparities in terms of HIV/AIDS knowledge and attitude among different ethnic groups in Malawi. This underscores the importance of understanding the sociocultural aspects of HIV/AIDS. Cultural beliefs and practices may influence HIV/AIDS knowledge and attitude as such, tailored programs that engage traditional leaders from different cultural groupings should be enhanced.

Women that perceived distance to a health facility as not a problem were more likely to exhibit good HIV/AIDS knowledge. This may suggest that these women have good access to health care services including

health education messages that may help increase their knowledge regarding HIV/AIDS. This was also observed at the community level where women from communities with a high percentage of women complaining of the distance to a health facility were less likely to have good HIV/AIDS knowledge and attitudes. Issues to do with health care services access are crucial as women may receive reliable information from trained health professionals.<sup>24</sup>

Those from the central and northern region were more likely to have both good HIV/AIDS knowledge and attitude. HIV/AIDS programs should aim to raise awareness in the northern region of Malawi. Further, at the community level, community education was associated with HIV/AIDS knowledge and attitudes. Community influences are important in designing effective public health interventions. Women residing in communities with a high proportion of educated women are more likely to be influenced by the actions of other women within the same communities through different ways in which they may interact. This may include educated women educating other women within the same communities on issues related to HIV/AIDS. There were residual community effects that were observed suggesting that a wide range of community factors may influence HIV/AIDS knowledge and attitude in Malawi.

#### *Policy/Program implications*

A number of sociodemographic factors were associated with HIV/AIDS knowledge and attitude. This is vital information for public health programs aimed at addressing disparities related to HIV/AIDS management (behaviors etc.) as they can target the disadvantaged groups identified in this current analysis. Additionally, empowering women through improving their access to education and small-scale businesses may help improve their access to information and services thereby improving HIV/AIDS knowledge levels. As the study revealed unmeasured community effects even after adjusting for both individual- and community-level factors, thorough profiling of communities in designing public health programs may go a long way in addressing issues that bring about variations in terms of HIV/AIDS knowledge and attitude across communities.

#### *Strength and limitations*

As this was a cross-section design, causality could not be inferred. Other unmeasured characteristics, that may have not been collected by MDHS such as the presence of HIV programs within communities, which may account for the observed community heterogeneity were not controlled for. Our analysis was unable to distinguish between those with absolutely no knowledge from those with some knowledge which may have biased our results as the samples of those with absolutely no knowledge were very small. Additionally, although some important information may have been lost by categorizing our outcome and independent variables, the sensitivity analyses that were conducted by using the outcome variables as continuous variables yielded fairly consistent results suggesting that categorization of the outcome variables had minimal impact on the results. Nevertheless, most of the independent variables were collapsed and informational loss may have occurred hence results should be interpreted carefully. This study used a large sample of WOCBA which was nationally representative therefore strengthening the generalizability of the results to the wider population of Malawian WOCBA.

## **Conclusions**

This study has shown that individual- and community- level factors are associated with HIV/AIDS knowledge and attitude. Accurate and good HIV/AIDS knowledge is important in improving HIV/AIDS prevention, and management however, results from this study revealed a low proportion of WOCBA in Malawi had good HIV/AIDS-related knowledge. The use of mass media in raising HIV/AIDS awareness may prove crucial to Malawi. Additionally, HIV/AIDS programs should take into consideration the individual- and community-level factors identified in this study.

## **Funding**

None

## **Conflicts of interest**

None declared

## key-points

- Both individual- and community-level factors were associated with HIV/AIDS knowledge and attitudes.
- Community heterogeneity in HIV/AIDS knowledge and attitudes suggest the need for programs that takes into consideration the community characteristics.
- The use of mass media in disseminating HIV/AIDS knowledge should be strengthened in Malawi.

## Abbreviations

HIV: Human Immunodeficiency Virus; AIDS: Acquired Immunodeficiency Syndrome; MMR: aOR: adjusted odds ratio; CI: confidence interval; MDHS: Malawi demographic health survey; ICC: intraclass correlation coefficient; PVC: proportional change in variance; AIC: Akaike information criterion.

## Availability of data and material

The study used, with permission, data from the International Classification of Functioning, Disability, and Health (ICF). The data is publicly available upon request from the ICF on (<https://dhsprogram.com/data/available-datasets.cfm>).

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