Research

Factors Associated with Uptake of HIV Testing in Malawi: A Trend Analysis of the Malawi Demographic and Health Survey Data from 2004 to 2016

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ABSTRACT

Introduction: Malawi is on track to achieving the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90-90-90 targets with the current performance estimated at 91-83-90 against the UNAIDS targets. However, there is need to further understand the socio-demographic characteristics of persons likely to access HIV Testing and Counselling Services (HTS), the entry point into the UNAIDS 90-90-90 cascade.

Methods: This study used secondary data from the Malawi Demographic Health Survey (MDHS) collected between 2004 and 2016. MDHS is a representative cross-sectional survey. The predictor variables included: sex, age, survey year, and region of residence, district of residence, education status, occupation and socio-economic position. Of HIV testing uptake was the primary outcome of this study. Data was analysed using STATAv16.0. Multiple logistic regressions were conducted to determine significant predictors of HTS uptake. Statistical significance was set at P<0.05.

Results: A total of 37829 persons were studied. There was increasing trend in the proportion of persons with HIV testing uptake from 18.4% in 2004/5 to 90.4 % in 2015/16. Multiple logistic regression showed that females were almost three times more likely to go for HTS compared to males (adjusted odds ratio (AOR)=2.52; 95%CI:2.34-2.72; P<0.001). Increasing age and education level were associated with increased likelihood of seeking HTS. Individuals in professional employment were more likely to have an HIV test compared to those in informal employment (AOR=1.21; 95%CI: 1.11-1.33, P<0.001). Individuals with rich socio-economic position (SEP) had higher likelihood of HIV testing than those in poor SEP (AOR=1.10 (95%CI: 1.02-1.18), P=0.01). There was both spatial and temporal increasing trend in the HTS uptake between 2004 and 2016.

Conclusion: There has been an increase in spatial and temporal trends in HTS uptake in Malawi. However, inequalities in HTS uptake still exists especially for those in the informal employment and individuals deemed to have low SEP in the society having lower uptake of HTS. The Malawi HIV programme should implement targeted interventions for sub-groups left behind and also optimize provision of HTS services in order to close the gaps in accessing HTS and consequently maximizing universal uptake of HTS.

Keywords: HIV testing uptake, Malawi, Health System, Malawi Demographic and Health Survey.

INTRODUCTION

The Joint United Nations Programme on HIV/AIDS (UNAIDS) set out the ambitious fast track commitments to end HIV and AIDS as a public health threat by 2030. The Declaration is aligned to the UN 2030 Agenda for Sustainable Development Goal 3: Ensure healthy lives and promote well-being for all at all ages. One of the key components of commitments is for countries to achieve the 90-90-90 HIV treatment targets by 2020 calling for: a) 90% of all HIV positive people will be diagnosed, b) 90% of all those diagnosed will be on treatment and c) 90% of those linked to care will be virally suppressed [1]. The UNAIDS Global AIDS Monitoring Guidelines measure HIV testing target as the number of people who have been diagnosed with HIV divided by the total number of people living with HIV [1]. There are variations in achievement of the UNAIDS 90-90-90 targets due to differences in local HIV prevalence and health system capacity [2].

The proportion of persons that have had an HIV test is sub-optimal amongst many countries. Just as no single HIV prevention method is ideal for all people in all situations, no single HIV testing modality is likely to be acceptable to everyone. Several interventions have been implemented in order to increase HIV testing uptake in Africa. These include Home-Based HIV Counselling and Testing (HBHCT) [3,4], routine testing in healthcare settings [5,6], workplace-based services [7], community-based HIV testing [8], HIV self-testing (HIVST) [9] or mobile HTC clinics [10]. Some of the barriers to HIV testing in sub-Saharan Africa settings include stigma, discrimination and non-confidential testing environments [9,11].

Malawi is on track to achieving the UNAIDS 90-90-90 targets with the current performance estimates 91-83-90 against the targets [12]. However, there is need to further understand the socio-demographic characteristics of persons likely to access HIV Testing and Counselling Services (HTS) since HTS is the entry point into the UNAIDS 90-90-90 cascade. Although several studies have looked at determinants of HTS uptake, there still exists a dearth of knowledge on spatial and temporal analysis of uptake of HTS and its associated factors in Malawi. Therefore, we a) estimated the annual proportions of persons that have ever had HIV testing, b) present the spatial and temporal trends in the proportions of persons that were ever tested for HIV and c) determine the factors associated with likelihood of HIV testing in Malawi using the Malawi Demographic and Health Survey datasets collected between 2004 and 2016.

MATERIALS AND METHODS

Study Design

This is a cross-sectional study design in which we conducted secondary analysis of the Malawi Demographic and Health Survey (MDHS) data collected in 2004/2005, 2010, and 2015/2016. The Malawi Government has implemented the MDHS since 1992. The MDHS implemented before 2004 did not include data on HIV biomarkers however such data are available from DHS conducted since 2004. The MDHS has been implemented with support from The International Classification of Functioning, Disability, and Health (ICF); the Government of Malawi; the United States Agency for International Development (USAID), the United Nations Children's Fund (UNICEF), and others stakeholders [13]. In our analysis we used data from the men and women questionnaire in order to determine the proportion of men and women that were ever tested for HIV between 2004 and 2016.

Sampling Procedure

The MDHS uses a multi-stage sampling procedure [14]. The sampling frames have been based on Malawi Population and Housing Census conducted in 1998 (for MDHS conducted in 2004/2005) and 2008 (for 2010 and 2015/2016 MDHS) [15]. The census frame is a complete list of all census standard enumeration areas (SEAs). The MDHS sample was stratified and selected in two stages. Each district was stratified into urban and rural areas;

this yielded a maximum of 56 sampling strata. Samples of SEAs were selected independently in each stratum in two stages. Implicit stratification and proportional allocation were achieved at each of the lower administrative levels by sorting the sampling frame within each sampling stratum before sample selection, according to administrative units in different levels, and by using a probability proportional to size selection at the first stage of sampling [16].

In the first stage, SEAs were selected with probability proportional to the SEA size and with independent selection in each sampling stratum. The SEA size is the number of residential households in the SEA as defined in the 2008 or 1998 MPHC. A household listing operation was implemented in all the selected SEAs. The resulting lists of households served as a sampling frame for the selection of households in the second stage. Some of the selected SEAs were large. To minimise the task of household listing, each large SEA (more than 250 households) selected was segmented.

In the second stage of selection, a fixed number of 30 households per urban cluster and 33 per rural cluster were selected with an equal probability systematic selection from the newly created household listing. All women age 15-49 who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed. In one-third of all sampled households, all men age 15-54, including both usual residents and other persons who stayed in the household the night before the interview, were eligible for individual interview.

Data Management

We extracted and merged the data on demographics and HIV testing history from the 2004/2005, 2010 and 2015/2016 MDHS. The outcome was whether a person ever had HIV testing or not. This was based on self-reported HIV testing uptake in one's lifetime. This was ascertained by asking the participants the question: 'Have you ever tested for HIV?' [13]. The uptake of HIV testing was a binary variable with the responses being yes or no. The 'yes' category included those who have ever tested for HIV in their lifetime while the 'no' category included those who had never tested for HIV in their lifetime [13].

The predictor variables included: age (15–19, 20–29, 30–39, $40-54$ years), sex (male or female), district/region of residence, rural/urban location, occupation/employment, level of education, socio-economic position (rich/poor), religion, ethnic group and survey year (2004/2015, 2010, 2015/2016). We recoded some of the data variables to suit the purpose of the study while for some variables we retained as they are in the original datasets.

Since HIV testing history is asked in both men and female questionnaires, we combined the male and female MDHS datasets in order to come up with a master dataset for each of the survey years. The MDHS makes use of weights so we calculated the weight within each survey year by dividing v005 or mv005 by 1000000. The Stata program used to

generate the datasets can be obtained from the corresponding author.

Data Analysis

Data was analysed using frequencies, proportions, odds ratios (OR) and their associated 95% confidence intervals (95%CI). All statistical analyses in this study were conducted using STATA 15.1 (State Corp., Texas, and USA), using the weighting of variables for household in the dataset. We conducted both bivariate and multivariate analysis of the effect of age, sex, region, and residence, level of education, marital status, and occupation on the binary endpoint of ever testing for HIV. We fitted a multiple logistic regression model of HIV testing uptake using a forward step-wise selection method. Age and sex were entered as a priori variables in the multiple logistic regression models. For a factor to be included in the model, likelihood ratio test (LRT) was used. We took into account clustering of HIV testing by district in our analysis. We also checked for cross-validation of the results from the multivariate model using k-fold validation method [17]. Data was presented using tables and figures. The level of statistical significance was set at $P< 0.05$.

Ethical Consideration

The individual consent was conducted by National Statistical Office (NSO) of Malawi during the MDHS 2004/2005, 2010 and 2015/2016. We requested access to use the data from the Measure Demographic and Health Survey, which is a USAID−funded project that assists and fund population and health surveys in countries worldwide. The Malawi MDHS datasets were downloaded from https://www.dhsprogram.com/data/available-datasets.cfm. No further ethical approval was necessary since the study was based on anonymous public use data with no identifiable information on survey respondents.

RESULTS

Characteristics of Malawians assessed for HTS uptake between 2004 and 2016

The characteristics of persons asked about their HIV testing status are shown in **Table 1**. Of the 37829 respondents; 83% (31272) were females, 81% (31303) were resident in rural areas, 85% (32368) were Christians while 2% (501) were of other religions, 48% (19027) were from the southern region while 11% (6060) were from the northern region, 60% (22716) were of poor socio-economic status, 63% (23665) had primary school level of education while 16% (6103) had no formal education, 71% (26879) were casual labourers while 3% (1042) were domestic workers, 33% (10958) were of Chewa ethnic group while 1% (476) were of Ngonde ethnic group. Over the years, there was increasing trend in the number of persons interviewed from 20% to 43%. There was an increasing trend by age from 7% amongst those aged 15-19 years to 21% amongst those aged 25-29 years and then a decreasing trend to 9% amongst those aged 45-49.

Table 1: Characteristics of respondents for the 2004/5, 2010 and 2016/16 Malawi Demographic and Health Surveys in Malawi

Characteristics	n	%
Total	37829	100
Age groups		
15-19	2726	7
20-24	7449	20
25-29	7855	21
30-34	6860	18
35-39	5411	14
40-44	3854	10
45-49	3674	9
Sex		
Male	6557	17
Female	31272	83
Region		
Northern	6060	11
Central	12742	41
Southern	19027	48
Residence		

Urban	6526	19
Rural	31303	81
Highest education level		
None	6103	16
Primary	23665	63
Secondary and above	8061	21
Religion		
Christian	32368	85
Muslim	4960	14
Other	501	2
Ethnicity		
Chewa	10958	33
Tumbuka	3597	8
Lomwe	7120	19
Tonga	1016	2
Yao	4944	14
Sena	1726	4
Nkonde	476	1
Ngoni	4877	13
Other	3115	7
Occupation		
Casual labour	26879	71
Professional	6067	16
Clerical	3841	11
Domestic	1042	3
Socio-economic position		
Poor	22716	60
Rich	15113	40
Survey round		
2004/5	7499	20
2010	14187	38
2015/16	16143	43

Percentage of Persons with HIV testing

Table 2 shows the distributions of persons by HIV testing uptake. Of the 37829 persons, 26885 (71%) have ever had HIV testing. There were variations in the percentage of persons with HIV testing by age, sex, religion, socio-economic position, place of residence, highest education level, religion, occupation and year of the survey. There was increasing trend in the proportion of persons with HIV testing from 55% amongst those in the 15-19-year age group to 76% amongst those in the 30-44-year age group, then a drop to 58% amongst those aged 45 to 49 years.

HIV testing amongst the females was higher than amongst the males **(Table 2).** Similarly, HIV testing in the urban areas was higher than in the rural areas. We also observed a higher HIV testing uptake amongst the persons from richer socio-economic position than those from poor socio-economic position **(Table 2).** There was increasing trend in HIV testing by education from 59% amongst those without formal education to 81% amongst those with secondary and tertiary education.

The highest uptake of testing was observed amongst those in professional occupation (86%) while the least was observed

amongst the domestic workers (55%). There was increasing trend in HIV testing uptake from 18% in 2014/5 to 90% in 2015/15. We observed weak evidence of association between HIV testing uptake and region of residence (P=0.60) as well as HIV testing and ethnicity (P=0.14).

Table 2: Proportion of persons from Malawi that had an HIV test between 2004 and 2016

Characteristics	Total n (%)	Ever tested for HIV		P-value*
		No n (%)	Yes n (%)	
Total	37829 (100)	10944 (29)	26885 (71)	
Age groups				<0.001
15-19	2726 (100)	1190 (45)	1536 (55)	
20-24	7449 (100)	2014 (26)	5435 (74)	
25-29	7855 (100)	1930 (25)	5925 (75)	
30-34	6860 (100)	1685 (24)	5175 (76)	
35-39	5411 (100)	1371 (26)	4040 (74)	
40-44	3854 (100)	1265 (33)	2589 (67)	
45-49	3674 (100)	1489 (42)	2185 (58)	
Sex				<0.001
Male	6557 (100)	2667 (42)	3890 (58)	
Female	31272 (100)	8277 (27)	22995 (73)	
Region				0.6
Northern	6060 (100)	1380 (28)	4680 (72)	
Central	12742 (100)	3984 (30)	8758 (70)	
Southern	19027 (100)	5580 (29)	13447 (71)	
Residence				0.003
Urban	6536 (100)	1481 (25)	5045 (75)	
Rural	31303 (100)	9463 (30)	21840 (70)	
Highest education level				<0.001
None	6103 (100)	2518 (41)	3585 (59)	
Primary	23665 (100)	6883 (29)	16782 (71)	
Secondary and above	8061 (100)	1543 (19)	6518 (81)	
Religion				<0.001
Christian	32368 (100)	9003 (29)	23365 (71)	
Muslim	4960 (100)	1712 (31)	3248 (69)	
Other	501 (100)	229 (48)	272 (52)	
Ethnicity				0.14
Chewa	10958 (100)	3368 (30)	7590 (70)	
Tumbuka	3597 (100)	900 (27)	2697 (72)	
Lomwe	7120 (100)	2060 (27)	5060 (73)	
Tonga	1016 (100)	231 (32)	785 (68)	
Yao	4944 (100)	1709 (31)	3235 (69)	
Sena	1726 (100)	422 (28)	1304 (72)	
Nkonde	476 (100)	126 (36)	350 (64)	

Ngoni	4877 (100)	1272 (29)	3605 (71)	
Other	3115 (100)	856 (29)	2259 (71)	
Occupation				
Casual labour	26879 (100)	8532 (32)	18347 (68)	
Professional	6067 (100)	812 (14)	5255 (86)	
Clerical	3841 (100)	1075 (28)	2766 (72)	
Domestic	1042 (100)	525 (45)	517 (55)	<0.001
Socio-economic position				<0.001
Poor	22716 (100)	7028 (31)	15688 (69)	
Rich	15113 (100)	3916 (27)	11197 (73)	
Survey round				
2004/5	7499 (100)	6237 (82)	1262 (18)	
2010	14182 (100)	3209 (24)	10978 (76)	<0.001
2015/16	16143 (100)	1498 (10.0)	14645 (90)	

Factors associated with HIV testing Uptake of Malawians between 2004 and 2016

The factors associated with HTS uptake are shown in Table 3. Multiple logistic regression analysis showed that age, sex, highest education level, religion, type of occupation, socio-economic status and year of survey round were the factors associated with HTS uptake. After adjusting for sex, residence, highest education level, religion, socio-economic status and year of survey round; there was a decreasing trend in HTS uptake by age **(Table 3)**. Also, after adjusting for age, residence, highest education level, religion, socio-economic status and year of survey round; females were almost three times more likely to have been tested for HIV than males (AOR= 2.52, 95%CI: 2.34-2.72, P<0.001). However, the adjusted estimates showed that there was weak evidence of association between residence of a respondent and HTS uptake (AOR= 0.95, 95%CI: 0.87-1.05, P=0.36). We also observed that increasing level of education was associated with increasing likelihood of HTS uptake although there was no effect-modification **(Table 3).**

After adjusting for age, sex, residence, highest education level, socio-economic position and year of survey round; individuals of other religions were less likely to have HIV testing as compared to Christians or Muslims (AOR= 0.59, 95%CI: 0.48-0.74, P<0.001). From the multivariate analysis,

we found that individuals in professional employment were more likely to have HIV testing uptake compared to individuals not in professional jobs **(Table 3).** Also, individuals from rich socio-economic status were more likely to have had an HIV test than those from poor socio-economic status (AOR= 1.10, 95%CI: 1.02-1.18, P<0.001). After adjusting for age, sex, residence, highest education level, religion and socio-economic status, there was an increasing trend in number of people tested for HIV between 2004/5 and 2015/16.

The crude and adjusted estimates of the effects of the characteristics of individuals are shown in Table 3. As for the characteristics that satisfied inclusion in the model, there was an overall change of 35% between the crude and adjusted estimates of the effects of the characteristics of individuals on HTS uptake implying that there was confounding. There were variations in confounding by respondent characteristics **(Table 3).** The highest average change in the adjusted effects was by occupation of respondent (59%) followed by respondents age (52%) while the least change was on socio-economic status (6%) followed by religion of the respondent (12%). We also observed that the year of survey round was an effect modifier for HTS uptake **(Table 3)**. The fitted model has the root mean square error of 1.51 after cross-validation with 5-folds.

Table 3: Factors Associated with HIV testing Uptake for Malawians in the 2004/5, 2010 and 2016/16 Malawi Demographic and Health Surveys

Characteristics	Crude		Adjusted	
	OR (95%CI)	P-value*	OR (95%CI)	P-value*

Age groups				
15-19	1		1	
20-24	2.23 (2.03-2.45)	<0.001	3.69 (3.28-4.15)	<0.001
25-29	2.46 (2.24-2.70)	<0.001	4.36 (3.87-4.90)	<0.001
30-34	2.45 (2.23-2.70)	<0.001	3.74 (3.31-4.22)	<0.001
35-39	2.33 (2.11-2.58)	<0.001	3.19 (2.81-3.61)	<0.001
40-44	1.60 (1.44-1.78)	<0.001	2.30 (2.02-2.62)	<0.001
45-49	1.15 (1.03-1.27)	0.01	1.55 (1.37-1.77)	<0.001
Sex				
Male	1		1	
Female	1.99 (1.88-2.11)	<0.001	2.52 (2.34-2.72)	<0.001
Region				
Northern	1			
Central	0.58 (0.29-1.13)	0.11		
Southern	0.71 (0.38-1.33)	0.29		
Residence				
Urban	1		1	
Rural	0.74 (0.69-0.79)		0.95 (0.87-1.05)	0.36
Highest education level				
None	1		1	
Primary	1.62 (1.52-1.72)	<0.001	1.39 (1.28-1.51)	<0.001
Secondary and above	2.57 (2.37-2.78)	<0.001	1.97 (1.75-2.21)	<0.001
Religion				
Christian	1		1	
Muslim	1.03 (0.95-1.12)	0.43	1.09 (0.98-1.22)	0.1
Other	0.50 (0.41-0.60)	<0.001	0.59 (0.48-0.74)	<0.001
Ethnicity				
Chewa	1			
Tumbuka	1.09 (0.96-1.24)	0.17		
Lomwe	1.07 (0.98-1.18)	0.15		
Tonga	0.80 (0.65-0.98)	0.03		
Yao	1.06 (0.96-1.16)	0.24		
Sena	1.02 (0.85-1.20)	0.86		
Nkonde	0.83 (0.64-1.07)	0.16		
Ngoni	1.10 (1.00-1.22)	0.04		
Other	0.96 (0.85-1.07)	0.45		
Occupation				
Casual labour	1		1	
Professional	2.85 (2.63-3.09)	<0.001	1.21 (1.10-1.33)	<0.001
Clerical	1.15 (1.07-1.24)	<0.001	1.04 (0.94-1.15)	0.46

Domestic	0.46 (0.41-0.52)	<0.001	0.96 (0.80-1.16)	0.67
Socio-economic position				
Poor	1		1	
Rich	1.17 (1.12-1.23)	<0.001	1.10 (1.02-1.18)	0.01
Survey round				
2004/5	1		1	
2010	16.86 (15.64-18.17)	<0.001	19.39 (17.89-21.01)	<0.001
2015/16	49.08 (45.09-53.42)	<0.001	55.68 (50.81-61.02)	<0.001

Spatial and temporal trends in the proportions of Malawians that had HIV test between 2004 and 2016

The spatial and temporal trends in the uptake of HIV testing amongst Malawians between 2004 and 2016 are shown in **Figure 1**. There was an increasing trend in the HTS uptake from 19% in 2004/5 to 91% in 2015/16 (P<0.001). We also noted that all districts had their HTS uptake increase between 2004 and 2016. In 2004/5, Neno had the highest HTS uptake (86.1% with a 95%CI: 82.7-89) while Rumphi had the least HTS uptake (6.0% with a 95%CI: 2.9-12.1). In 2010, Likoma had the highest HTS uptake (91.7% with a 95%CI: 88.6-94.0). In 2015/16, Neno had the highest HTS uptake (95.6% with 95%CI: 93.4-97.1) while Mangochi had the lowest uptake (81.0% with 95%CI: 78.0-83.8). There was high heterogeneity in the uptake of HTS in the Malawi population. There was a decreasing trend in heterogeneity of HTS uptake from 99% in 2004/5 to 84% in 2015/16.
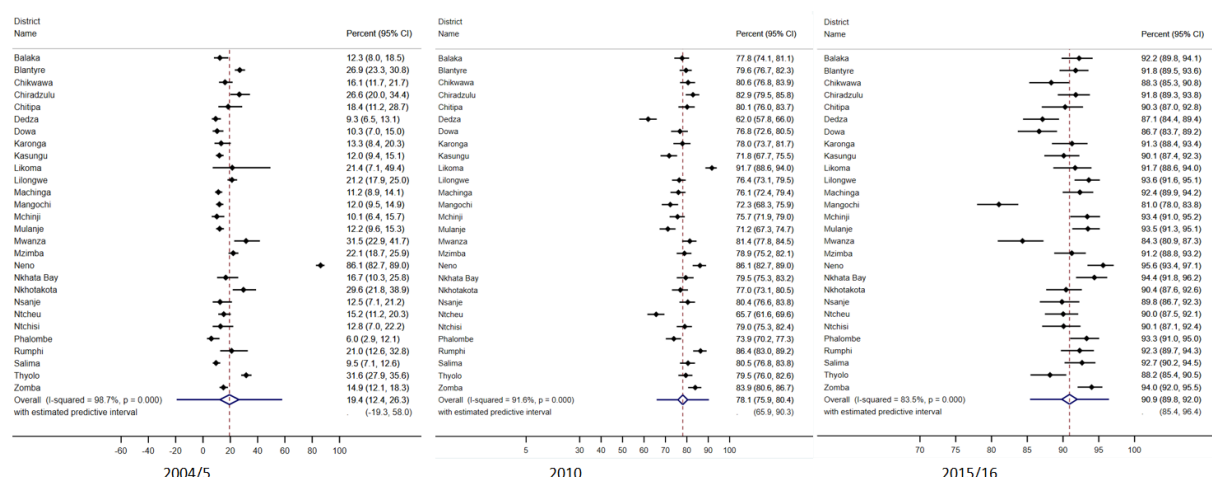

Figure 1: Spatial and Temporal Trends in the Proportions of Malawians Testing for HIV in the 2004/5, 2010 and 2016/16 Malawi Demographic and Health Surveys

DISCUSSION

To our knowledge this is the first national analysis of the factors associated with HIV testing uptake based on nationally representative survey data between 2004 and 2016. The following were some of the key findings: (a) HIV testing uptake increased significantly between 2004 and 2016, (b) females had higher HTS uptake than males, (c) individuals with richer socio-economic status had higher HIV testing uptake than their counterparts from poor socio-economic status, (d) individuals not in professional employment have lower likelihood of HIV testing uptake, (e) increasing level of education was associated with increasing uptake of HIV testing, (f) those aged 15-19 years were less likely to have ever been tested for HIV compared to the other ages, (g) and persons that were neither Muslims nor Christians were less likely to have been tested for HIV.

The increasing trends in HIV testing in Malawi may be attributable to several interventions aimed increasing HTS. Some of the interventions that were implemented© are: voluntary HIV testing and Counselling (VCT), Antenatal Care HIV testing, self-HIV testing, provider-initiated testing and counselling (PITC), family-centred testing and counselling, home-based testing and counselling, outreach and school-linked HTC among school-going population [18,19]. There are also similar studies that showed increased HIV testing uptake in Malawi [18] and in Sub-Saharan Africa [20] over 2004 to 2016as a result of implementation of several interventions aimed at increasing the uptake of HIV testing. Although there are important strategies like Community-Based HIV testing; Home-Based HIV testing; Antenatal Care HIV testing; HIV testing incentives and HIV Self-testing aimed at improving HIV testing among men in sub-Saharan Africa [19,20], men still have lower HIV testing uptake than women [21,22]. Therefore, there is need to strengthen targeted

facility-based and community testing of all key and priority populations and leverage such innovative testing strategies like moonlight, integrate HTS with sexual and reproductive health services and other key health services, implementations of targeted men-friendly HTS, as well as strengthen capacity of the health system and optimizing delivery of HTS. This will increase the avenue to cater for more options in reaching the male population since the female populations often have more avenue of being reached with HIV testing from ANC HIV testing, Under-five Care Clinic HIV testing just to mention but a few.

Similar to other studies, we also found association between HIV testing uptake and the socio-economic factors: residence, level of education, socio-economic position, and employment type. A systematic review conducted in sub-Saharan Africa found that HIV testing uptake was higher in the urban areas than in the rural areas, HIV testing increased by level of education and also by socio-economic position of the individual [21]. With those in professional employment accessing HIV testing more than those in informal employment could be due to those in professional employment being covered by some health insurance as stated by Mundiwa and Namondwe [20] or could also be due to those in professional employment being granted time access HTS- this may not be the case with those in informal employment.

We also found that adolescent girls and young women and men, especially those aged 15-19 years were less likely to have HTS than their older counterparts [20,21]. The age pattern of HIV testing implies that there is need to target the younger population with HIV testing and counselling services. Some of the strategies to be employed in reaching the teenagers include: provision of learner-centered life skills educations that covers comprehensive sexuality education, including HIV prevention. School-based HIV testing and counselling which protects the rights of learners and maintains privacy and confidentiality of learners, including integrating of HTS and child immunization services in designated child-health centers and health posts could be another avenue for increasing HIV testing uptake. The school-based HTS could be achieved through combining it with blood-based testing whereby the learners donate blood to the Malawi Blood Transfusion and getting HIV testing at the same time. This strategy was more preferred amongst teenagers in Nigeria [23] and could be replicated in Malawi.

Under the Malawi National HIV response, the faith-based organisations are involved in spreading the HIV prevention strategies to their faith members. Thus, it is not surprising that individuals who are not affiliated to the major faith groups, Christians and Muslims were less likely to have undertaken an HIV test than non-affiliates – faith groups continue to play an important role in combating the HIV and AIDS epidemic. Given the role of HTS services in HIV treatment and care, it is imperative that leveraging Social and Behavioral Change Communication (SBCC) strategies could play a pivotal role in disseminating messages about HIV prevention, including HTS. In addition, targeted SBBC strategies could equally help to increase uptake of HTS services especially among those in the informal sector and low SEP [24].

This paper contributes to literature by exposing predictors of HTS uptake as well as consideration of programmatic changes in the delivery of HTS through utilizing targeted means of delivering HTS to underserved sub-groups. In addition, the paper also highlights the need for multi-sectoral response to HIV and AIDS through engaging both formal and informal employment sectors, and faith-based communities in the fight against AIDS epidemic.

The MDHS is one large and nationally represented survey, and thus the findings can be generalized. However, a limitation of the MDHS data especially in the context of outcome variable is that responses are self-reported and thus there is an inherent reporting bias. Furthermore, the analysis only included the persons aged 15 and above leaving out the paediatric population since paeds are not included in HIV assessment in the MDHS.

CONCLUSION

In conclusion, this study shows increasing spatial-temporal trend in HTS uptake in Malawi from 2004 to 2016. However, inequality in HTS uptake still exists with individuals in professional jobs or rich SEP having higher HTS uptake than those in informal employment or those with poor SEP respectively. Targeting men, those aged 15 to 19 years, and those in informal employment will reduce disparities in accessing HTS and consequently maximizing universal uptake of HTS.

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