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Migration and Health at Older Age in Rural Malawi

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Abstract

The connection between migration and health has long been established, but relatively little is known about this relationship for older persons, particularly in sub-Saharan Africa (SSA). In this paper we examine migration selection with regards to health status among older individuals in Malawi, by testing whether older migrants differ from non-migrants in health status before migration. To do so, we use data from the Malawi Longitudinal Study of Families and Health (MLSFH), a longitudinal panel dataset that includes a relatively large number of individuals at older ages. We focus on three measures: mental health, physical health, and HIV status. We find that the relationship between migration and health selection differs by gender. Older women who are HIV-positive are nearly ten times more likely to migrate compared to their HIV-negative counterparts. For men, those with better mental health are less likely to migrate in the future. These results suggest that, although research in some settings shows that migrants have better health before moving, some older migrants have worse health than their non-migrant peers, and may therefore add to the already-heavy burden on rural health centers in Africa.

Keywords

Migration; ageing; health; Malawi

Introduction

The connection between migration and health has long been established, but relatively little is known about this relationship for older persons, particularly in sub-Saharan Africa (SSA). Migration and health research in SSA has typically focused on individuals of reproductive ages, with particular attention on adolescents and young adults. This is partly due to the health measures of interest in this research, which are more relevant for individuals of reproductive ages, such as HIV infection (Lagarde et al., 2003; Lurie et al., 2003; Welz et

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al., 2007), infant/child mortality (Brockhoff, 1990, 1995b; Ssengonzi, De Jong, & Stokes, 2002), or fertility (Agadjanian, Yabiku, & Cau, 2011; Brockhoff, 1995a; Lee, 1992).

Meanwhile, older adults constitute a substantial and growing population in SSA. In Africa, five percent of the population is aged 60 and older, and this percentage is expected to steadily increase (United Nations, 2015). In the coming decades, the annual growth rate of the 60 and older population in Africa is expected to be higher than in other regions; this population is projected to nearly double in size by 2030, and then double again by 2050 (United Nations, 2011; Velkoff & Kowal, 2007). Some of the above health outcomes are increasingly relevant for older populations in SSA: HIV prevalence, while lower than those of reproductive ages, is non-negligible at older ages and projected to increase with expanded access to HIV anti-retroviral therapy (Freeman & Anglewicz, 2012; Gómez-Olivé et al., 2013; Negin & Cumming, 2010). Hence, research has called for increasing attention to HIV infection at older ages in SSA (Gómez-Olivé et al., 2013).

At the same time, SSA is characterised by high rates of internal migration. Although migration data are limited, populations in SSA have been considered more mobile compared to those of other regions (Byerlee, 1974; Nkamleu & Fox, 2006; UNECA, 2006). Short- and long-term moves are relatively common in many SSA countries (Boerma et al., 2002; Coffee et al., 2005; Kahn et al., 2007), and recent studies have documented increasing rates of migration in some countries (Kahn et al., 2007; Schuyler et al., 2015).

In this research, we investigate the intersection of migration, ageing, and health in the sub-Saharan African country of Malawi. Specifically, we examine migration health selection among older individuals, or whether those who migrate differ from non-migrants in health status before migration. Secondly, since relatively little is known about the factors that influence migration among older adults in SSA, we also identify factors influencing migration for this population.

Background

Migration patterns among older adults

The lack of research on migration patterns of older individuals in SSA is primarily due to data limitations. Common data sources, like Demographic and Health Surveys (DHS), collect very limited information for individuals beyond reproductive ages. While Demographic Surveillance Sites (DSS) collect data for older individuals, this population is seldom the focus of analysis. Furthermore, the limited available data are of questionable quality: eligible older individuals may be systematically missed in some population-based surveys (Randall & Coast, 2016).

Although younger individuals are more likely to migrate in SSA, mobility is not uncommon among older people as well. Across settings, migration propensities are highest at younger ages and tend to decline with age (Beguy, Bocquier, & Zulu, 2010; Collinson, Tollman, & Kahn, 2007; Lu, 2008; Reed, Andrzejewski, & White, 2010). But migration at older ages is non-negligible, both in SSA and elsewhere: research shows that migration at older ages is

less common than in young adulthood, but not uncommon overall (Collinson et al., 2007; Lu, 2008).

Some characteristics of migration likely differ for older individuals. While young-adult migration in SSA is primarily due to marriage and work (Anglewicz, 2012; Boerma et al., 2002; Coffee et al., 2005), the minimal literature on older ages suggests that primary reasons for moving are to return home, either after retirement, being unable to independently maintain the household, marital dissolution (widowhood or divorce), or for palliative care by relatives (Chimwaza & Watkins, 2004; Clark, Collinson, Kahn, Drullinger, & Tollman, 2007; Collinson et al., 2007; Englund, 2002; Falkingham, Chepnengo-Langat, & Evandrou, 2012; Freeman, 2016; Smit, 1998). This type of migration also implies that migration stream may differ by age: whereas young adults often to move to urban centers, rural-to-rural and urban-to-rural migration may be more common among older individuals (Reed et al., 2010).

Migration and health

Migration research has often examined the “healthy migrant hypothesis”, or the tendency for migrants to be healthier than peers (Jasso, Massey, Rosenzweig, & Smith, 2004; Lu, 2008; Palloni & Morenoff, 2001). The health advantage of migrants is due in part to the physical and psychological demands of migration, both in terms of the moving process, as well as being able to successfully maintain residence in the destination: because migration and successful relocation is often challenging, migrants are often relatively healthier (Palloni & Morenoff, 2001).

However, the limited knowledge of migration and health in older age suggests reasons for both positive and negative health selection. On one hand, migration may select relatively healthier older individuals. For older individuals, successful movement and adaptation to a new environment may require better health, just as for younger populations. Indeed, the healthy migrant hypothesis has been supported for older individuals migrating to the U.S. (Fuller-Thomson, Buru-Jeter, Richardson, Raza, & Minkler, 2013; Jaffe et al., 2016). However, there is also reason to believe that migration may select older individuals with relatively worse health. Research in SSA has documented the phenomenon of older individuals returning home to die or for palliative care (Chimwaza & Watkins, 2004; Clark et al., 2007; Collinson et al., 2007), and recent studies have shown that HIV-positive individuals are more likely to migrate than the HIV-negative (Anglewicz, 2012).

Migration health selection may also depend on the reason for migration and migration stream. International and rural-to-urban migration may occur primarily among individuals looking for or starting work (Chalasani, Mensch, & Hewett, 2013), therefore requiring them to be healthier. But rural-to-rural migration may occur after marital dissolution or for climate-related reasons (Anglewicz, 2012), and the same relationship between migration and health selection may not hold. Although there is very little research on migration stream and health in any setting, some studies have shown that urban-to-rural return migrants have worse health outcomes than those who stay in urban destinations (Lu & Qin, 2014; Nauman, VanLandingham, Anglewicz, Patthavanit, & Punpuing, 2015).

Research on migration and health often has important limitations in study design. With cross-sectional data, it is challenging to discern whether differences in health status after migration are due to the effect of migration on health, or due to healthier (or less healthy) individuals being selected into migration. Therefore, to examine migration health selection, one would need information for individuals prior to migration. However, data for older individuals in SSA is rare, and longitudinal panel data for this population is even less common.

Methods

Setting

Malawi provides an instructive context in which to examine migration and health at older ages. The population of Malawi is growing and ageing (United Nations, 2015). The proportion of the population aged 60 years and older in Malawi is expected to increase over the next several decades (United Nations, 2015). Despite the growth of this population, little is known about migration patterns among older individuals in settings like Malawi, or the relationship between migration and health.

As in other countries in SSA, there is a close relationship between migration and HIV infection. Malawi has a high HIV prevalence of 10.6%, with the highest prevalence in the Southern region (14.5%), followed by the Central region (7.6%) and the Northern region (6.6%) (National Statistical Office (NSO) & ICF Macro, 2011). Research has found that migrants are more likely to be HIV-positive than non-migrant counterparts, and this appears to be due to the selection of HIV-positive individuals into migration (Anglewicz, 2012; Anglewicz, VanLandingham, Manda-Taylor, & Kohler, 2016).

Malawi has experienced high rates of urban population growth in recent decades, which are expected to continue in the coming years (United Nations, 2009). However, the majority of SSA residents still live in rural areas (United Nations, 2009), and intra-rural migration has consistently been the most common spatial migration pattern in SSA overall (compared to rural-urban, urban-urban, and urban-rural) (Oucho & Gould, 1993), and in Malawi in particular (Anglewicz 2012).

Marriage and migration are closely linked in Malawi, and this relationship varies across regions and ethnic groups, and by gender. The Northern region practices a patrilineal tradition, with patrilocal or virilocal residence after marriage (wife moves to husband's house after marriage) and inheritance traced through sons. The Yao, a predominant ethnic group in the Southern region, follow a matrilineal system of descent and inheritance, and residence after marriage is often uxorilocal (husband moves in with spouse). The Central region is less rigid in patterns of land inheritance and migration after marriage (Anglewicz, 2012; Reniers, 2003). Individuals typically move back to their homes after marital dissolution (via divorce or widowhood) (Anglewicz, 2012; Reniers, 2003). Since marriage is nearly universal in Malawi, and Malawi has among the highest divorce rates in SSA (Reniers, 2003), one would expect a close relationship between migration and marriage. Indeed, previous research has found that migration patterns reflect the marital traditions in Malawi, with women more likely to move in the Northern region and less likely in the

Southern (Anglewicz, 2012). Research has also found that the reasons for migration are primarily marriage-related for women and work-related for men (Anglewicz, 2012).

Data

We use a dataset that has the necessary characteristics for studying migration health selection among older adults: a substantial sample of older individuals; longitudinal panel data with migration information; and measures of mental health, physical health, and HIV status. The Malawi Longitudinal Study of Families and Health (MLSFH) started in 1998 with a population-based sample of approximately 1,500 ever-married women and 1,000 of their husbands in three rural sites of Malawi. The MLSFH followed up with all respondents (and any new spouses) in 2001, 2004, 2006, 2008, and 2010 (Kohler et al., 2015). The MLSFH initiated home-based HIV testing for all respondents in 2004, with follow-up testing in 2006 and 2008. More information on the MLSFH study design, sampling, and measures is available in Kohler et al. (2015).

In 2008, the MLSFH added a sample of approximately 800 parents of MLSFH respondents, most of whom were aged 45 and older. To draw this sample, the MLSFH team asked respondents in 2006 to list characteristics of their parents, which were used in 2008 to identify and interview all parents who resided in a MLSFH sample village. Of MLSFH respondents aged 45 or older in 2008, a total of 1,033 men and women were interviewed and tested for HIV. Of these 1,033 respondents, 783 were interviewed again in 2010 and 48 moved elsewhere (the remaining respondents were away temporarily, refused, not found, or other outcome).

Ethical considerations

The data collection and research conducted by the MLSFH was approved by the Institutional Review Board (IRB) at the University of Pennsylvania, and in Malawi by the College of Medicine Research Ethics Committee (COMREC) or the National Health Sciences Research Committee (NHSRC).

Measures

Functional limitations arise at earlier ages in Malawi compared to developed countries, thus a different definition of 'older age' is necessary. A study assessing physical limitations of men and women at ages 45, 55, 65, and 75 years found that disabilities begin at a relatively early age and are more severe than comparable ages in more industrialised settings (Payne, Mkandawire, & Kohler, 2013). Life expectancy at birth in Malawi is less than 60 years, and life expectancy at age 45 is 23.1 years for men and 26.2 for women (WHO, 2015). Healthy life expectancy at birth is lower, at 44 years for men and 46 years for women (Salomon et al., 2012). Therefore, previous research has identified 45 as an appropriate cutoff point for examining ageing in Malawi (Payne et al., 2013), which is what we use in this research.

In all waves of the MLSFH, the most common reason for non-interview was migration out of the sample area. Our measure of migration is a binary indicator of whether the respondent who was interviewed in 2008 had migrated by 2010. Migration by 2010 was measured by friends and family members in the origin village who reported that the respondent had

permanently moved out of the MLSFH sample village by 2010. Individuals who did not move permanently between 2008 and 2010 are considered “non-migrants” (although some of these individuals may have moved previously, and we control for migration prior to 2008 in our analysis). As elsewhere, we find that although the likelihood of migration declines with age, migration is not negligible among older individuals. Approximately 11% of respondents aged 44 or less in 2008 migrated elsewhere by 2010, compared to approximately 6% of individuals aged 45 and older.

We focus on three health measures in this research: mental health, physical health, and HIV status. The measures for mental and physical health status are derived from the Short-Form-12 (SF-12). The SF-12 uses twelve questions about various aspects of health to create composite measures of mental and physical health (Ware, Kosinski, & Keller, 1996). The scores range from 0–100, with higher scores representing better overall health status (Peltzer & Pengpid, 2012). The SF-12 has been found to be a valid and reliable measure for overall physical and mental health status, including for older adults (Cernin, Cresci, Jankowski, & Lichtenberg, 2010; Pettit et al., 2001), and has been validated in developing settings similar to Malawi (Gandek et al., 1998; Obtel et al., 2013; Payne et al., 2013; Ware et al., 1996). Another health measure of interest is HIV status. Research has found in Malawi that HIV-positive individuals are more likely to migrate than those who are HIV-negative (Anglewicz, 2012), but this has not been tested for older individuals.

In addition to health-related measures, we identify other characteristics that influence migration in older age. Some of these measures are basic demographic controls, such as age, region of residence, education, wealth, and marital status. For wealth, the MLSFH uses a continuous wealth index score that is obtained through principal components analysis using measures of asset ownership (e.g., radio, television, bicycle) (Chin, 2010; Filmer & Pritchett, 2001). In addition to the demographic controls, we examine the influence of previous migration experience, number of living offspring, household size, and religious affiliation. The household has been found to be an important source of social, instrumental, and financial support in this setting (Cliggett, 2005; Hoddinott, 1992, 1993), which may influence migration. Number of living offspring may also be associated with migration: for older individuals, having more offspring increases the chances that one or more are living close by, and therefore they may not need to move to seek care. Previous migration has been shown to predict future migration in some studies (Lu, 2008). We measure this with the question ‘Since you were age 15, have you stayed outside this District for 6 months or more?’ Finally, some studies have shown that migration patterns are closely tied to religious status (Mberu et al., 2013). We measure religious affiliation in five groups: Muslim, Catholic, Mission Protestant (including Anglican, Baptist, and Presbyterian), New Mission Protestant (including Church of Christ, Jehovah’s Witness, and Seventh-Day Adventist), and Pentecostal/African Independent Church (AIC)/other, which is a similar categorisation previously used in religion-focused research in Malawi (Trinitapoli, 2011).

Analytical methods

We seek to identify migration health selection for older individuals in Malawi. To do so, we compare 2008 health measures with migration status by 2010; therefore, health status is

measured before migration, and we can examine if individuals who migrate by 2010 had different health status in 2008.

We conduct our analysis in three stages. First, we examine bivariate relationships between our health measures (from 2008) and migration (measured in 2010). Next, we conduct multivariate logistic regression analysis, using a lagged dependent variable approach, where the dependent variable is the binary indicator of having moved by 2010, and independent variables are all from the 2008 MLSFH. We begin with a pooled gender model, and then test whether the relationship between migration and health differs for men and women by including interaction terms between mental health and gender, and physical health and gender. In our final models, we examine factors predicting future migration separately for men and women.

Results

As shown in Table 1, mobility is not uncommon among older MLSFH respondents: similar percentages of older men and women moved between 2008 and 2010, at approximately 6%; and many men and women moved prior to 2008 (60% of women and 46% of men previously lived outside the district). HIV infection is relatively low in this population, at 5.5% for men and 3.7% among women. For both men and women, the highest percentage is in the lowest wealth quintile. Following with marital and migration patterns, the largest percentage of men is from the Northern region and the largest percentage of women is from the South.

Bivariate tests show that several measures are strongly associated with future migration, including one health measure (Table 2). Most notably, we see that older individuals who were HIV-positive in 2008 were 2.73 times more likely to migrate by 2010 than those who were HIV-negative (95% CI 1.02–7.35). We also see a relationship with wealth: respondents in the middle wealth quintile were significantly more likely to move than the poorest individuals. Region of residence was also importantly associated with migration, where residents of the Central region were more likely to move than those from the north. Those with more children and larger households were less likely to migrate by 2010.

Our multivariate results show similar patterns, as well as some new associations (Table 3). After controlling for other characteristics in the main effects model, we find that being HIV-positive in 2008 is associated with 3.69 greater odds of migration than the HIV-negative (95% CI 1.20–11.30), and we see that individuals in the middle wealth quintile had 3.46 greater odds of migration by 2010 than those in the lowest wealth quintile (95% CI 1.31–9.15). We also find new associations between religious status and migration, where Mission Protestants and those in the Pentecostal/AIC/other group were less likely to migrate than Muslim respondents. Primary education or higher was also positively associated with future migration, but the relationship is statistically significant only at the 90% level.

In the full model, we find evidence of significant differences by gender. The interactions terms for gender and health are both statistically significant, which shows that, at the same level of physical health and mental health, the likelihood of migration is significant different for men and women. But the exact relationship differs for mental and physical health, where

at the same level of mental health women are more likely to move, and the same level of physical health women are less likely. The main effects of mental and physical health are also statistically significant, which shows that among men, those with better physical health are more likely to migrate, and those with better mental health are less likely to migrate.

Finally, we turn to the final set of regressions, where the relationship between migration and health is conducted separately by gender (Table 4). For women, we see that being HIV-positive in 2008 is associated with a greater than nine times odds of migrating by 2010 than the HIV-negative (95% CI 1.98–47.58), but we do not find a statistically significant result between HIV status and migration for men. However, mental health is associated with migration for men, in which a one unit increase in mental health is associated with 9% lower odds of migration.

We also find differences by gender in other factors that are associated with future migration among older individuals. The relationship with age and migration is in opposite directions for men and women, where the likelihood of migration increases with age for women and decreases for men. The relationship with wealth appears only for women, where those in the middle and second highest wealth quintiles are more likely to migrate than are the poorest. Among men, household and religious factors were important, where men from larger households were less likely to move, and Mission Protestants and those in the Pentecostal/AIC/other group were less likely to migrate than Muslim respondents.

Discussion

We find that health and migration are strongly associated for older individuals in Malawi. But the exact relationship between migration and health differs by gender. There is some evidence of negative health selection: older women who are HIV-positive are nearly ten times more likely to migrate compared to their HIV-negative counterparts. However, for men, those with better mental health are less likely to migrate in the future, and those with better physical health are more likely to migrate.

We also find differences by gender in other factors that predict migration among older adults in rural Malawi. For women, it appears that age and wealth are strong predictors of migration. Women in the middle wealth quintile are more likely to migrate than the poorest women, which likely reflects their greater ability to afford costs associated with migration (while wealthier women may not need to migrate due to greater resources). For men, religious affiliation, age, and household size are the most important characteristics predicting migration. The relationship with household size is not surprising, given that men rely on household members, particularly women, for care in older ages (Kendall & Anglewicz, 2016).

Overall, our results are similar to findings from the limited research on migration and health in SSA and other settings. Previous research has found that HIV-positive individuals are more likely to migrate than those who are HIV-negative, but for a younger population (Anglewicz, 2012); we find here that the same is true for older individuals as well, although only for women. Differences in the relationship between migration and HIV infection by

gender are compatible with research showing that HIV-positive status is associated with greater likelihood of divorce and lower likelihood of remarriage for women only (Anglewicz & Reniers, 2014), which is consistent with women moving home after marital dissolution. This is also consistent with research showing that HIV-positive residents of SSA often return to rural homes to be cared for by family members (Chimwaza & Watkins, 2004; Clark et al., 2007; Collinson et al., 2007)-although they may not currently be physically sick, since we do not find that those with worse physical health are more likely to move.

Our results also fit within research on the health of older individuals in Malawi. As elsewhere, we find that household and family structure are important determinants of health among older men, which appears to be due to the support that larger families and households can provide for aging individuals (Kendall, 2016; Kendall & Anglewicz, 2016). In contrast, older women are often burdened with caregiving responsibilities and may therefore not benefit directly from larger families or households (Kendall, 2016; Schatz, 2007). Similarly, household composition has also been found to be associated with mental health outcomes like stress in older age (Cliggett, 2005; Hoddinott, 1992, 1993; Ice, Sadruddin, Vagedes, Yogo, & Juma, 2012). Other determinants of migration are similar to findings elsewhere: although other studies have found lower likelihood of migration among Muslims (Mberu et al., 2013), the greater likelihood for Muslim men to migrate is likely explained by the fact that the Yao ethnic group, which is predominantly Muslim, practice a matrilineal tradition when the husband moves to his wife's home upon marriage (and returns home after marital dissolution) (Reniers, 2003).

This research also reinforces the importance of study design and measures in examining migration and health. Cross-sectional data that compares the health of migrants and non-migrants would not be able to distinguish between migration selection and the effect of migration on health. Here we demonstrate the importance of longitudinal data with pre- and post-migration information, and show that there are significant differences in the health status of older individuals prior to migration, which may contribute to the impact of migration on health. In addition, we demonstrate the importance of measuring mental health with regards to migration, which is a health outcome that is relatively uncommon in migration and health studies.

Our results suggest that older migrants in Malawi may represent a vulnerable population, as we find evidence of worse health among some migrant groups. Although individuals of reproductive ages are the primary focus of HIV infection programs, HIV infection is also relevant at older ages (Freeman & Anglewicz, 2012; Gómez-Olivé et al., 2013; Negin & Cumming, 2010). Older HIV-positive migrants may be particularly difficult to connect to antiretroviral therapy due to their mobility, unless the purpose of the move is to seek treatment. This is even more challenging for mental health, as services to treat mental illness are not well established in Malawi.

Our study has several limitations. Although the MLSFH data include larger numbers of older individuals than other studies, there are small sample sizes for some characteristics, such as the number of HIV-positive, and the number of overall migrants. Also, in this research we focus only on permanent migration among older individuals; research elsewhere

has shown that circular migration and short-term migration may also be importantly related to health outcomes (Anglewicz et al., 2016; Beguy et al., 2010; Clark et al., 2007).

Nonetheless, our research represents one of the first papers to empirically examine the relationship between migration and health in SSA, and future research is needed to better understand this phenomenon. For example, we do not examine the impact of migration on health, or changes in health status after migration. This is an important issue, as the mental health of men may improve after migration, if they move in order to receive care from friends or family members. Similarly, older HIV-positive women may move due to marital dissolution, or to gain easier access to HIV treatment, which has different implications for health.

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Table 1

Background characteristics in 2008 and migration status in 2010 of MLSFH women and men aged 45+ years in 2008

	Mean or Percentage	
	Women (n = 464)	Men (n = 367)
Migration status in 2010		
Interviewed in 2010 survey	94.2%	94.3%
Moved by 2010 survey	5.8%	5.7%
Mean SF-12 mental health score	51.3	55.0
Mean SF-12 physical health score	48.6	50.6
Mean Age	57.6	58.1
HIV-positive	3.7%	5.5%
Wealth index quintiles		
1 (poorest)	24.4%	22.1%
2	20.5%	15.8%
3	18.8%	21.8%
4	17.9%	19.9%
5 (wealthiest)	18.5%	20.4%
Education		
No school	47.8%	19.9%
Primary level or higher	52.2%	80.1%
Region of residence		
North	32.3%	35.4%
Central	29.7%	32.7%
South	37.9%	31.9%
Previously lived outside district	59.7%	46.3%
Marital status		
Currently married	66.0%	97.6%
Divorced, separated, or widowed	34.1%	2.5%
Mean number of living offspring	5.3	6.6
Mean household size	3.6	4.2
Religious affiliation		
Muslim	26.3%	24.3%
Catholic	18.5%	16.9%
Mission Protestant	25.7%	21.3%
New Mission Protestant	9.1%	12.3%
Pentecostal / AIC / other	20.5%	25.3%

Table 2

Bivariate logistic regression results for relationship between 2008 sociodemographic and health characteristics and 2010 migration status for MLSFH respondents aged 45+ years in 2008

	Odds Ratio (95% Confidence Intervals) (n = 831)	
Female	1.02	(0.57, 1.83)
SF-12 mental health score	1.00	(0.97, 1.03)
SF-12 physical health score	1.02	(0.98, 1.06)
Age	0.99	(0.96, 1.02)
HIV-positive	2.73 **	(1.02, 7.35)
Wealth index quintiles		
1 (poorest - <i>reference</i>)	-----	-----
2	1.28	(0.44, 3.73)
3	3.23 **	(1.31, 7.93)
4	2.23	(0.85, 5.80)
5 (wealthiest)	0.68	(0.20, 2.37)
Primary level of education or higher		
No school (<i>reference</i>)	-----	-----
Primary level or higher	1.70	(0.87, 3.32)
Region		
North (<i>reference</i>)	-----	-----
Central	2.19 **	(1.06, 4.49)
South	1.04	(0.46, 2.31)
Has previously lived outside district	0.85	(0.48, 1.52)
Marital status		
Currently married (<i>reference</i>)	-----	-----
Divorced, separated, or widowed	0.78	(0.36, 1.71)
Number of living offspring	0.86 **	(0.77, 0.97)
Household size	0.89 *	(0.78, 1.02)
Religious affiliation		
Muslim (<i>reference</i>)	-----	-----
Catholic	1.32	(0.54, 3.19)
Mission Protestant	0.87	(0.35, 2.15)
New Mission Protestant	2.63	(1.10, 6.32)
Pentecostal / AIC / other	0.70	(0.27, 1.85)

Notes:

*
p < 0.10,

**
p < 0.05,

p < 0.01.

Table 3

Multiple logistic regression results for relationship between 2008 sociodemographic and health characteristics and 2010 migration status for MLSFH respondents aged 45+ years in 2008

	Odds Ratio (95% Confidence Intervals) (n = 831)			
	Main effects model		Full model	
Female	1.46	(0.70, 3.03)	1.67	(0.00, 693.76)
SF-12 mental health score	0.98	(0.95, 1.02)	0.94 ^{**}	(0.90, 1.00)
SF-12 physical health score	1.02	(0.98, 1.06)	1.08 [*]	(1.00, 1.16)
Age	1.00	(0.96, 1.03)	1.00	(0.96, 1.04)
HIV-positive	3.69 ^{**}	(1.20, 11.30)	3.40 ^{**}	(1.08, 10.73)
SF-12 mental health score×female	-----	-----	1.08 ^{**}	(1.00, 1.16)
SF-12 physical health score×female	-----	-----	0.92 [*]	(0.84, 1.01)
Wealth index quintiles				
1 (poorest - <i>reference</i>)	-----	-----	-----	-----
2	1.16	(0.38, 3.55)	1.37	(0.44, 4.30)
3	3.46 ^{**}	(1.31, 9.15)	4.00 ^{***}	(1.47, 10.89)
4	2.37	(0.83, 6.76)	2.51 [*]	(0.86, 7.36)
5 (wealthiest)	0.94	(0.23, 3.80)	1.01	(0.25, 4.17)
Primary level of education or higher				
No school (<i>reference</i>)	-----	-----	-----	-----
Primary level or higher	2.19 [*]	(0.99, 4.85)	2.21 [*]	(1.00, 4.89)
Region				
North (<i>reference</i>)	-----	-----	-----	-----
Central	2.27 ^{**}	(1.00, 5.15)	2.26 [*]	(0.99, 5.15)
South	0.47	(0.13, 1.72)	0.48	(0.13, 1.79)
Has previously lived outside district	0.68	(0.36, 1.28)	0.66	(0.35, 1.26)
Marital status				
Currently married (<i>reference</i>)	-----	-----	-----	-----
Divorced, separated, or widowed	0.76	(0.30, 1.93)	0.74	(0.29, 1.92)
Number of living offspring	0.90	(0.79, 1.03)	0.91	(0.79, 1.04)
Household size	0.87 [*]	(0.74, 1.03)	0.86 [*]	(0.73, 1.02)
Religious affiliation				
Muslim (<i>reference</i>)	-----	-----	-----	-----
Catholic	0.41	(0.11, 1.55)	0.41	(0.11, 1.58)
Mission Protestant	0.24 ^{**}	(0.06, 0.99)	0.25 [*]	(0.06, 1.07)
New Mission Protestant	0.84	(0.22, 3.21)	0.89	(0.23, 3.47)
Pentecostal / AIC / other	0.22 ^{**}	(0.05, 0.96)	0.21 ^{**}	(0.05, 0.93)

Notes: Other potentially-relevant measures were tested but not included if they were not statistically significant or did not change the substantive interpretations: land ownership, number of times married, ethnicity, and polygamous union;

*
 $p < 0.10$,

**
 $p < 0.05$,

 $p < 0.01$.

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Table 4

Multiple logistic regression results for relationship between 2008 sociodemographic and health characteristics and 2010 migration status for MLSFH women and men aged 45+ years in 2008

	Odds Ratio (95% Confidence Intervals)			
	Women (n = 464)		Men (n = 367)	
SF-12 mental health score	1.02	(0.97, 1.07)	0.91 ***	(0.86, 0.97)
SF-12 physical health score	1.00	(0.95, 1.05)	1.06	(0.98, 1.14)
Age	1.04 *	(0.99, 1.09)	0.92 **	(0.85, 1.00)
HIV-positive	9.72 ***	(1.98, 47.58)	1.59	(0.26, 9.77)
Wealth index quintiles				
1 (poorest - <i>reference</i>)	-----	-----	-----	-----
2	1.01	(0.18, 5.58)	1.97	(0.35, 11.10)
3	4.71 **	(1.09, 20.27)	2.81	(0.59, 13.37)
4	3.70 *	(0.81, 16.87)	1.87	(0.32, 10.91)
5 (wealthiest)	1.35	(0.19, 9.50)	0.65	(0.05, 8.19)
Primary level of education or higher				
No school (<i>reference</i>)	-----	-----	-----	-----
Primary level or higher	1.86	(0.69, 4.98)	5.28 *	(1.00, 27.94)
Region				
North (<i>reference</i>)	-----	-----	-----	-----
Central	1.87	(0.62, 5.63)	4.01 *	(0.92, 17.51)
South	0.44	(0.08, 2.51)	0.50	(0.06, 4.31)
Has previously lived outside district	0.77	(0.32, 1.80)	0.62	(0.21, 1.84)
Marital status				
Currently married (<i>reference</i>)	-----	-----	-----	-----
Divorced, separated, or widowed	0.53	(0.18, 1.56)	0.98	(0.06, 16.92)
Number of living offspring	0.87	(0.71, 1.08)	1.00	(0.82, 1.22)
Household size	0.91	(0.73, 1.13)	0.73 **	(0.54, 0.99)
Religious affiliation				
Muslim (<i>reference</i>)	-----	-----	-----	-----
Catholic	0.77	(0.12, 4.72)	0.19	(0.02, 1.67)
Mission Protestant	0.46	(0.07, 3.06)	0.08 **	(0.01, 0.99)
New Mission Protestant	0.82	(0.11, 6.15)	0.74	(0.10, 5.52)
Pentecostal / AIC / other	0.40	(0.05, 3.02)	0.09 *	(0.01, 1.02)

Notes: Other potentially-relevant measures were tested but not included if they were not statistically significant or did not change the substantive interpretations: land ownership, number of times married, ethnicity, and polygamous union;

* p < 0.10,

** p < 0.05,

*** p < 0.01.