# The Link between Functional Limitations and Mental Health among Mature and Elderly Adults in Rural Malawi

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**Abstract**

Adults age 45+ are not routinely screened for mental disorders in resource-constraint settings such as sub-Saharan Africa (SSA), and the correlates of mental health are poorly documented on the population level. The SSA context is also characterized by high rates of chronic disability and earlier onset of functional limitations that occur at younger ages compared to developed countries. The association between physical health and disability and mental health, specifically depression, is not well documented in SSA. We investigate the link between functional limitations and mental health among adults aged 45+ years in rural Malawi using a unique longitudinal representative dataset that provides extensive socioeconomic and health information, including the SF-12 physical and mental health scores, PHQ-9 depression and anxiety scores. We address the question if poor physical health and duration of disability result in poor mental health and whether gender, familial and contextual characteristics and mechanisms may alter this association.

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# 1 Introduction

Mature adults (defined here as adults aged 45+) represent the most rapidly growing group in sub-Saharan African (SSA) low-income countries. By 2060, the fraction of the population aged 45–65 is expected to exceed that of 15–24 year olds, and the 65+ population alone is expected to represent more than 5% of the SSA population after 2040. Moreover, in the next 50 years, in SSA low-income countries such as Malawi, 80% of the additional persons-years lived among adults as a result of increasing life expectancies (LE) will occur among individuals aged 45+: 4.4 additional years, or 38% of the overall adult LE gain, will occur among individuals aged 45–64, and 5.2 years, or 45% of the adult LE gain, will occur among individuals aged 65+[1].

The resulting population aging in SSA countries will be significantly different from the aging patterns in other developing countries due to the profound health and social implications of the AIDS epidemic (Cohen and Menken 2006; Heuveline 2004; Merli and Palloni 2006; Zaba et al. 2004), including the aging of the HIV epidemic itself (Mills et al. 2012). In addressing the challenges arising from the aging of the population in SSA, mental health among mature adults (age 40+) will be of critical importance. Mental disorders have been identified as one of the leading causes of health disability worldwide, including in low income countries, and are among the most costly health conditions (Satcher and Druss 2010). For instance, unipolar depression was estimated to be the world's second largest cause of disability as of 2010 (Bhana et al. 2010; Lopez et al. 2006; Lund 2010; Skeen et al. 2010). The common combination of poor mental health and chronic physical conditions has been shown to be particularly disabling (Dewa and Lin 2000; Dewa et al. 2007; Kessler and Frank 1997; Lim et al. 2000), a fact that contributes to the strong association and ferocious cycle between poor mental health and poverty (Patel and Kleinman 2003; Patel and Thornicroft 2009). Although the link between poor mental health and functional limitations and chronic disability is well established, the temporal relationship is not well documented particularly in the context of sub-Saharan Africa, where longitudinal data on both physical and mental health are limited. Poor mental health and depressive disorders specifically negatively impact the quality of life, reduce productivity in the work place, and interfere with social and family roles (Cuijpers et al. 2012). The few existing studies addressing the relationship between mental health and quality of life suggest that poor mental health results in—often substantially—decreased work efforts and productivity since it interferes with day-to-day functioning, social participation, communication, comprehension (Dewa et al. 2011; Lerner et al. 2004; Lerner and Henke 2008), and the economic cost of mental illness have been shown to be substantial (including in LICs) (Frankenberg et al. 2007; Friedman and Thomas 2008; Greenberg et al. 2003; Shah and Jenkins 2000). Individuals in poor mental health may be disproportionally exposed to higher rates of poverty, limited access to health care resources and as a result accumulation of chronic health problems accumulating over the life course. In contrast, poor mental health may be not the "cause", but the result from poor physical health, specifically when individuals spend a substantial fraction of their life course in a disabled health status. The latter is often the case in the context of SSA. For instance, Payne et al. (2012) have estimated that the onset of functional limitations in rural Malawi is much earlier compared to developed countries and the rates of recovery from

[1] Authors' estimates based on UN Population Prospects.

moderate or severe limitations decline very rapidly with age so that after age 65 a full recovery from severe functional limitations is not likely. Women at age 45 in rural Malawi are expected to spend 58% of their remaining life with moderate or severe physical limitations, and this fraction rises to 78% at age 65. The estimates for men are respectively 40% and 60%. No previous study in SSA has directly estimated the relationship between poor mental health (i.e., depression) and physical disability in the context of SSA.

The present analysis makes an important contribution to the emerging literature on mental health and chronic conditions in sub-Saharan Africa by drawing on innovative and rich new data collection from rural Malawi that includes extensive longitudinal information on health, specifically mental health, as well as demographic, socioeconomic and family characteristics of mature men and women living in a context characterized by high poverty, and high morbidity and mortality. Given the limited knowledge about patterns and determinants of mental and physical health in this region, the primary goal of our analysis is to (*a*) First, document the link between mental health outcomes, specifically level of depressive symptoms, and physical functional limitation among men and women age 45+ living in a poor high HIV prevalence context; (*b*) Second, to estimate the temporal sequence of this association and investigate if poor physical health and duration of disability result in poor mental health; (*c*) Third, to which extent gender, familial and contextual characteristics and mechanisms such as the availability of larger supportive networks may alter the relationship between poor physical health and poor mental health outcomes in the context of rural Malawi? These aspects have not been investigated in this context and thus the paper will provide important knowledge about a neglected health dimension in sub-Saharan Africa.

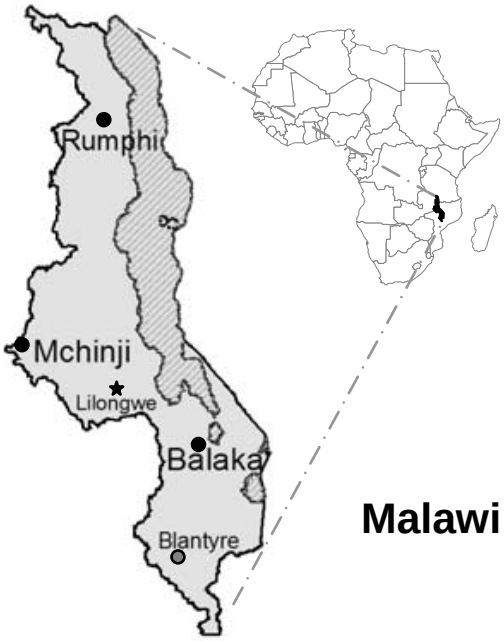
## 2 Data and Methods

### 2.1 The Malawi Longitudinal Study of Families and Health (MLSFH)

Data used in this analysis comes from the Malawi Longitudinal Study of Families and Health (MLSFH; formerly, Malawi Diffusion and Ideational Change Project), a longitudinal panel study with survey waves in 1998, 2001, 2004, 2006, 2008 and 2010 that is implemented in three sites in rural Malawi: Rumphi (in the northern region), Mchinji (in the central region), and Balaka (in the southern region) (see Figure 1). The primary goals of the MLSFH are to identify and understand the mechanisms used by Malawian households in rural areas to cope with the multi-dimensional consequences of the HIV/AIDS epidemic.

In the beginning of the study in 1998, a sample of 1,541 ever-married women aged 15-49 and 1,065 of their spouses were interviewed. In 2001, respondents were re-interviewed, along with any new spouses since 1998. In 2004, the study added two new components to the data collection: an additional sample of approximately 1,500 adolescents, and free HIV testing and voluntary counseling for the HIV test results to all respondents. Since then, MLSFH conducted repeated biomarker-based HIV tests (Obare 2010; Obare et al. 2009), currently identifying 314 HIV+ individuals and collected also information on access to and utilization of antiretroviral treatment (ART). The MLSFH returned for a fourth wave of survey data collection and a second round of HIV testing in 2006, and it followed-up in 2008 with a fifth round of survey data collection, including

**Figure 1: Study sites in the Malawi Longitudinal Study of Families and Health (MLSFH)**




the collection of an extensive intergenerational transfer data, and a 3rd round of HIV testing and counseling. In the last three rounds of data collection, 2006, 2008 and 2010, about 4,000 individuals were interviewed by the MLSFH. Mature adults (age 40+) in MLSFH are overrepresented because of the aging of the longitudinal sample and the addition of a *parent sample* in 2008 that includes all respondents' living parents. An important addition of the MLSFH since 2006 has been the addition of the SF-12 mental and physical health scores, which is discussed in more details below, that provides a standardized inter-temporally comparable indicator of both physical and mental health.

In 2012, a sub-sample of respondents aged 45 and above was interviewed and the survey focused specifically on mental health and cognitive limitations. In addition, all respondents were tested for HIV, and 59 respondents above age 45 were tested positive. Specifically, in addition to collecting again information on the SF-12 physical and mental health scores, the survey administered instruments to measure the presence and severity of depression (PHQ-9), presence of anxiety, visual/constructional abilities, memory, and grip strength.

Table 1 shows descriptive statistics for the respondents age 45+ interviewed in 2010.[2] Because of the history of the project described above, the sample includes larger number of women (N=1,024) than men (N=787). Men are slightly older than women (about 1.2 year older), and the majority of men (about 94%) are married compared to women of which only 66% are currently married. The majority of the respondents have completed primary schooling, but men are on average better educated than women. For instance, about 12% of men have secondary education, but only 3% of women fall into this category. Men report higher mental and physical well-being as measured by the SF-12 compared to women. On average, women are poorer compared to men as reflected by the mean of the wealth score calculated on the basis of their assets and household

[2]Since we are still in the process of data cleaning of the newest data collection from the summer 2012, we were not able to compute the table for 2012 in time for this abstract submission.

**Table 1: Descriptive statistics for MLSFH wave 6 (Respondents age 40+)**

| | Females | Males | Total |
|---|---|---|---|
| # of observations | 1024 | 787 | 1811 |
| SF12 mental health score | 50.07 | 52.91 | 51.30 |
| | (10.50) | (9.387) | (10.13) |
| Age | 55.81 | 56.28 | 56.01 |
| | (12.58) | (12.12) | (12.38) |
| Currently married | 0.656 | 0.935 | 0.777 |
| Schooling level (completed) | | | |
| *No schooling* | 0.410 | 0.177 | 0.309 |
| *Primary level* | 0.555 | 0.707 | 0.621 |
| *Secondary level* | 0.0343 | 0.116 | 0.0697 |
| Wealth score | -0.332 | 0.307 | -0.0535 |
| | (2.089) | (2.058) | (2.099) |
| SF12 physical health score | 45.63 | 48.39 | 46.83 |
| | (10.50) | (9.903) | (10.33) |
| HIV pos | 0.0596 | 0.0574 | 0.0586 |
| | (0.237) | (0.233) | (0.235) |
| Subjective likelihood of being HIV positive | | | |
| *No likelihood* | 0.642 | 0.676 | 0.657 |
| *Low* | 0.252 | 0.265 | 0.258 |
| *Medium* | 0.0679 | 0.0413 | 0.0562 |
| *High* | 0.0387 | 0.0173 | 0.0293 |
| Probabilistic expectation of being | | | |
| HIV positive (# of beans) | 1.748 | 1.650 | 1.705 |
| | (1.961) | (1.986) | (1.972) |
| Significant hocks experienced during 2-years prior to survey | | | |
| # of shocks | | | |
| *0* | 0.00500 | 0.00655 | 0.00567 |
| *1* | 0.0539 | 0.0511 | 0.0527 |
| *2* | 0.196 | 0.201 | 0.198 |
| *3* | 0.742 | 0.735 | 0.739 |
| Recent sickness/death of | | | |
| family member | 0.380 | 0.309 | 0.349 |
| Region of residence | | | |
| *Central* | 0.301 | 0.338 | 0.317 |
| *South* | 0.377 | 0.346 | 0.363 |
| *North* | 0.322 | 0.316 | 0.320 |
| SF12 version 2 | 0.322 | 0.316 | 0.320 |

**Table 2: SF12 mental health scores and selected mental health differentials for MLSFH respondents aged 40+**

| | 2006 | 2008 | 2010 |
|---|---|---|---|
| # of respondents aged 40+ | 1,129 | 1,637 | 1,838 |
| SF12 mental health: mean | 54.77 | 52.97 | 51.26 |
| std. deviation | (8.57) | (9.44) | (10.15) |
| Difference: female vs. male | -2.26** | -4.15** | -2.74** |
| HIV+ vs. HIV– | -2.39* | -0.52 | -2.23† |
| above vs. below age 50 | -0.70 | -2.06** | -2.73** |
| married vs. not marr. | 3.81** | 4.45** | 3.93** |

*p*-values: † $p < .10$; * $p < .05$; ** $p < .01$.
2008 and 2010 MLSFH data include *parent sample.*

goods. The majority of men and women have experienced significant economic shocks during the last 2-years proceeding the survey (i.e., between 2008 and 2010). For instance, 74% of respondents report experiencing 3 shocks during this period. In addition, about 40% of women and 1% of men experienced recent sickness or death of close family member.

Table 1 shows that about 6% of the sample is HIV+ based on the biomarker test results. However, a substantial fraction of the respondents reports some likelihood to be infected with the virus. For instance, around 25% of women and 27% of men report low likelihood of being HIV+, but almost twice as many women (11%) compared to men (6%) report medium or high likelihood to be HIV+. When the respondents' expectations to be infected with the virus are assessed by the innovative probabilistic method (# of beans), about equal fractions of men and women expect to be HIV+ (around 17%).

## 2.2 Measurement of Mental and Physical Health and Well-Being

Beginning in 2006, MLSFH collected detailed longitudinal information on mental health as measured by the SF-12 scale. The SF12-scale is a multipurpose short form survey with 12 questions selected from the SF-36 Health Survey. Higher SF-12 scores reflect better mental health. SF-12 is a widely used measure of social/emotional functioning, subjective well-being and overall health-related quality of life that has been implemented and validated in many different contexts (Fischer and Corcoran 2007; Fleishman et al. 2006; Macran et al. 2003; Ware et al. 2001; Ware Jr et al. 1996). Longitudinal information with at least 3 measurements of SF-12 is available for about 1,250 respondents age 45+ in MLSFH.

Longitudinal trends in the SF-12 mental health scores for respondents age 40+ are summarized in Table 2[3]. Mental health in rural Malawi has continuously declined since 2006, from a mean of 55 in 2006 to a mean score of 51 in 2010. Women above age 40 have lower SF12 scores compared to men, and this difference in mental health is statistically significant is all 3 years considered in this analysis. In all years, HIV+ respondents reported lower mental health compared to HIV- individuals, but this difference between the two groups was not statistically significant in 2008.

[3]We are in the process of data cleaning of the collected data during the summer 2012 and were not able to include in this extended abstract the most current data. However, the data will be available for analysis within 3 weeks and will be included in the final version of the paper.

Elderly individuals above age 50 have worse mental health compared to men and women aged 40 to 50 years. In addition, married men and women report better mental health compared to the non-married, a trend that is observed since 2006. In summary, Table 2 suggests that mental health in Malawi worsened over time and differs significantly across groups in the population.

**New data and measures on mental health, cognitive function and physical performance** In the summer of 2012, MLSFH collected new data and measures on mental health, cognitive function and physical performance among MLSFH respondents age 45 and above. The cleaning and processing of these data will be completed within 3 weeks, and thus we are not able to provide preliminary statistics for this extended abstract. Below we provide a description of the newly collected instruments that will be used for the final version of this paper.

To assess depression and cognitive function of elderly individuals in rural Malawi, we will use measures that have been widely used to study these outcomes specifically among HIV+ individuals in multi-national studies and that will substantially improve the measurement of mental health compared to the SF-12 scores. Specifically, MLSFH administered to respondents age 45+ for the first time the PhQ-9 depression instrument that allows to screen for the presence of depressive symptoms as well as estimating their severity. Moreover, the team collected also information on the presence of anxiety using the patient health questionnaire. In our analysis, we will use both, the PHQ-9 depression instrument as well as the SF-12 mental health scores to measure mental well being of the respondents. Although both measurements are highly correlated, they reflect different aspects of mental wellbeing: SF-12 mental health score correspond more to the general mental well-being of an individual, while the PHQ-9 depression instruments allows to assess depression and it's severity on a clinical level.

To measure cognitive function among HIV+ and HIV– elderly, we will use the International HIV Dementia Scale (IHDS). IHDS is a screening measure of cognitive impairment that includes memory registration for four common objects and subsequent recall of the four objects, motor speed involving the rapid tapping of the thumb and first digit of the non-dominant hand (NDH), and speed of information processing/executive functioning measured by repetition of a three-position alternating hand sequence (Sacktor et al. 2005). A prior study in Uganda established optimal cut-off value for the IHDS in SSA as 9.5 (Sacktor et al. 2005), which will serve as a guideline for this study. We will also use a modified version of the the Montreal Cognitive Assessment (MoCA) (Nasreddine 2011), a 10-minute cognitive screening tool developed for the detection of cognitive impairment by health care professionals without specific training in neurology/neuropsychology. The MoCA is a one-page 30-point test that has been widely used in international settings (including in SSA) that complements the IHDS and measures of short-term memory recall, executive function, sustained attention, serial subtraction, and orientation to time and place.

**New data on physical performance** To assess the physical performance of the elderly, we measured grip strength in both hands using a handheld dynamometer, which is inexpensive, easily portable and easy to use in home-based settings (Frederiksen et al. 2006). Grip strength is an estimate of the isometric strength in the upper extremity, but it correlates highly with other muscle groups and is often seen as a measurement of overall strength Rantanen et al. (1994). It is a strong

predictor of functional limitations, limitations in ADL, morbidity and mortality (Nybo et al. 2001; Rantanen et al. 2000). Grip strength was easy to administer in the context of rural Malawi compared to other measures of physical performance such as climbing stairs, walking on a flat surface, etc. In addition, we collected information about arthritis-like symptoms and visual and hearing problems.

In addition to instruments described above, MLSFH contains detailed information on subjective well-being (e.g., self-reported health), subjective expectations of life expectancy (Delavande and Kohler 2012), and detailed measures of HIV risk perceptions since 1998 (Delavande and Kohler 2009, 2012). This longitudinal and exceptionally rich information on mental health and well-being of the mature population in rural Malawi is accompanied by detailed demographic and socioeconomic data on the respondents, including (*d*) marital history and sexual-partnership histories; (*e*) detailed measures of economic and social shocks experienced by respondents and their households, including mortality of family members, crop failures/income losses, changes in health of individuals and their family members (since 1998); and (*f*) extensive information on social networks and social capital, including participation in social groups (since 1998) and unique information about family networks, intergenerational transfers and resource sharing in extended family networks (since 2006) (Behrman et al. 2002, 2009; Kohler et al. 2007, 2011). This combination of longitudinal mental health data among elderly respondents and their family/household members, along with detailed data on actual/perceived HIV status, risk behaviors and social/economic/demographic contexts provide an exceptional opportunity to investigate the patterns of mental health in a high risk disease environment such as rural sub-Saharan Africa.

## 3 Methods

The collection of the data for this project has been completed in July 2012, and the data are available. The first part of the paper will present descriptive analyses of the mental health (PHQ-9, Prime MD), cognitive function, functional limitations for the mature adults by age, gender, HIV status and socioeconomic characteristics. Non-parametric estimates of the age pattern of mental health, cognitive ability and functional limitations will be estimated using LOESS. The correlation of PHQ-9 and Prime-MD, which are only available in the 2012 data, and the SF-12, which is available in the MLSFH data since 2006, will be investigated. Associations between physical and mental health will be explored using multiple regressions and other appropriate multivariate methods. In addition, we will investigate to which extent declines in physical health and increased physical limitions during 2010-12 is associated with poor mental health and/or depression in 2012.

## 4 Summary and Discussion

Mental health represents a neglected health dimension in low-income and resource-constraint settings such as the countries in sub-Saharan Africa. The patterns and the determinants of mental health are poorly understood albeit the increasing public health relevance and urge to understand and document mental well-being of the populations in this region. Specifically, understanding the interaction of mental well-being with the presence physical limitations and disability is of a

critical importance that can affect health policies and international aid efforts in SSA. The present analysis represents a first attempt to describe the relationship between mental health patterns and physical health in the context of SSA using unique longitudinal data from rural Malawi. We focus on mature adults above age 45, who are often disconnected from the resource-limited health care systems and especially older adults are a subject of discrimination and limited access to health resources.

In summary, this analysis will represent a first step to understand the determinants of mental health and physical functioning of mature and elderly individuals in a high-risk HIV/AIDS environment. Given the current state of the literature that provides only a very poor understanding of the prevalence, patterns and determinants of poor mental disabling chronic health outcomes in sub-Saharan context, our analyses will make an important contribution to the emerging literature on mental health and physical well-being in high-HIV prevalence contexts in sub-Saharan Africa.

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