**Social Participation and Health in Rural Malawi**

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**Abstract**
The importance of social capital for individual health has long been established, but research in this area often suffers from critical limitations. For one, an important conceptualization of social capital—social participation—and its relationship with health has seldom been examined. Research on social capital and health typically uses cross-sectional data, which makes it challenging to identify whether participation affects health or healthier individuals are more likely to participate. We use two waves of longitudinal data (2008-2010) from rural Malawi to address these limitations. These data contain several measures of social participation, as well as SF-12 measures of physical and mental health. After controlling for possible selection bias, our results differ by gender and between mental and physical health. We find that social participation improves physical health, but greater social participation is associated with worse mental health among rural Malawian women and men.

Keywords: Malawi, mental health, physical health, social capital, social participation, sub-Saharan Africa

## Introduction

Despite the rapid increase in research on social capital and well-being (Kim 2008), few studies have examined the effect of social participation on health. In studying its relationship with health, social capital has been measured in myriad ways: social network characteristics, kinship ties, transfers, social trust, and social support (e.g., Cattell 2001; Moffitt 2002; Rose 2000; Szreter and Woolcock 2004; Wind and Komproe 2012). The relative lack of research on social participation is striking, as it plays a central role in social capital formation (Putnam 2000).

The minimal research on social participation and health often suffers from important limitations, primarily due to the reliance on cross-sectional data (e.g., Helliwell and Putnam 2004; Hyyppä and Mäki 2003; Lindström, Hanson, and Östergren 2001; Veenstra 2000). While a cross-sectional approach can be useful in establishing a basic association between social participation and health, it precludes identifying the *effect* of participation on health. This distinction is important because an association between participation and health could be explained in two ways: social participation could affect individual health and well-being, or individuals of differing health status could be selected into (or out of) social participation. Given the reliance on cross-sectional data, important questions remain in research on social participation and health.

Perhaps unsurprisingly, most research on social capital and health has come from high-income countries (HICs). A developing-country context provides an interesting comparison for several reasons. Although most research finds a positive relationship between social participation and health, this could differ in less-developed settings, in which the higher level of infectious diseases in low income countries (LICs) could be spread through social interaction.

Despite the relatively large amount of research on a few specific threats to mortality (e.g., AIDS, malaria) less is known about factors that affect overall mental and physical health in resource-deprived settings. Many LICs also offer limited or no formal credit and insurance systems, which often means that individuals rely more on the development of social ties for times of crisis. Thus, social participation—and the possibility of developing new ties and accessing their resources in the process—may play a more important role in the daily life of residents of LICs.

We focus on rural Malawi, a sub-Saharan African (SSA) context characterized by high levels of mortality and morbidity. Our data, from 2008 and 2010, contain several measures of social participation and health for over 2,000 men and women. The longitudinal nature of the data, along with several measures of social participation and health, enable us to address several limitations in much of the previous research on social participation and health.

## Background

### Social Participation and Health: A Brief Overview

There is considerable variation in how social capital has been operationalized (see Adler and Kwon 2002 for a review). At its essence, social capital is formed through a multitude of social connections of varying strength and trust. These connections are valuable since they provide individuals or communities with the abilities to access resources in the present and possibly at a time of need in the future (Bourdieu 1986; Coleman 1988; Putnam 2000). With the exception of some theoretical and empirical perspectives suggesting otherwise (de Haas 2010; Portes 1998; Wacquant 1998), most forms of social capital are perceived to benefit individuals in achieving desired outcomes. Aside from the value in having individuals with whom one can socialize or call upon for favors, research has typically found a positive relationship between

social capital and health (Cattell 2001; Kim 2008; Moffitt 2002; Rose 2000; Szreter and Woolcock 2004).

We cannot, of course, comprehensively measure social capital. We instead focus on one of the most important, yet under-explored, aspects of social capital: social participation. Social participation (also referred to as civic engagement) brings people together and offers individuals a multitude of mutual benefits (Putnam 2000). Participation in social organizations and events facilitates the development of ties with otherwise-unknown individuals, resulting in an expanded social network (Feld 1981). These new ties offer individuals the opportunity to access a new set of "embedded" resources (Lin 1999). Thus, greater social participation potentially increases one's access to resources that provide a range of livelihood benefits, including better health.

Often measured by group memberships, committee meeting involvement, or religious activities, social participation has been shown to be linked with higher levels of happiness, mental health, and self-rated health scores (Helliwell and Putnam; Hyyppä and Mäki 2003; Kawachi, Kennedy, and Glass 1999; Nummela et al. 2008; Phillips 1967; Veenstra 2000; Young and Glasgow 1998); as well as lower rates of heart diseases, cancers, infant mortality (Kawachi et al. 1997), and adult mortality (Dalgard and Håheim 1998; Lochner et al. 2003). There is some variation by age and gender: for example, older women have been found to benefit more from social participation than their counterparts (Lee et al. 2008; Park et al. 2013), and men have also been seen to benefit from the effects of social participation more than some women (Kroll 2011). Nonetheless, the empirical findings display the generally positive relationship between social participation and health outcomes, and suggest that the impacts of social participation mirror those of social integration in a Durkheimian manner (Durkheim 1951 [1897])—and that social connectedness via participation indeed matters.

Social Participation and Health in Sub-Saharan Africa

Social capital in SSA has been operationalized in several ways. Across Botswana, Senegal, South Africa, Tanzania, and Uganda, trust (Madhavan and Landau 2011; Steenkamp 2009), social cohesion (Chipkin and Ngqulunga 2008), strong and weak ties (Liu 2013), membership in formal and informal groups (Maluccio, Haddad, and May 2000), and indices combining these and other elements—like the frequency of inter-ethnic communication (Widner and Mundth 1998) or individual values and attitudes (Narayan and Pritchett 1999)—have been tested as sources of social capital, much like in HIC settings. However, these studies typically evaluate social capital as an outcome, or its impacts on migration or household welfare, and not health. There is some research that has focused on social networks—only *implicitly* invoking the concept of social capital—and their effects on health behaviors. For instance, rural Malawians develop culturally-appropriate strategies to avoid HIV infection through discussions with their friends and neighbors (Gerland 2006; Watkins 2004). Also, research from Kenya shows the relationship between networks, contraceptive-related discussions, and use, but that networks do not necessarily lead to greater adoption of contraception if contraceptive use is widespread (Berhman, Kohler, and Watkins 2002), or if denser networks do not include many contraceptive users (Kohler, Berhman, and Watkins 2001). Thus, the mere presence of networks have equivocal effects on health-seeking behaviors.

Nonetheless, there is a small body of research on social participation—as an explicit operationalization of social capital—in SSA which has shown an inconsistent relationship with health. Binagwaho and Ratnayake (2009) suggest that participation improves health due to strong community bonds that keep individuals accountable to one another for use of anti-

retroviral therapy. Participating in organized clubs in South Africa and Zimbabwe is associated with lower chances of young adults becoming infected with HIV (Campbell, Williams, and Gilgen 2002; Gregson et al. 2004). However, competing evidence shows a higher likelihood of HIV infection with greater group memberships among South African women (Pronyk et al. 2008).

Research in SSA is also limited in its measurement and definition of social participation. Studies have typically defined social participation as group membership. Although this is one important aspect of social participation, it misses some important aspects of social participation. While memberships in community organizations indeed provide opportunities for social participation that could improve health, there are likely to be other social activities (going to the market, attending a wedding, or visiting a traditional healer) that are also important venues for social participation (see Feierman and Janzen 1992).

Nearly all of the research on social participation and health in the SSA context focuses on HIV infection. Although the influence of HIV/AIDS is undeniable, World Health Organization (WHO) estimates show that AIDS contributes slightly less than half of the adult mortality rate in SSA and the other major causes of death include cardiovascular diseases, cancers, injuries, various infections, and maternal conditions (WHO 2008). There is need to examine the relationship between social participation and alternative measures of health in SSA.

Thus, due to the meager research in SSA, limited measures of social participation, and the predominant focus on HIV, we know relatively little about the relationship between social participation and health in SSA.

The Malawian Context

Malawi is an appropriate setting for our research for several reasons. As with many countries in SSA, Malawi is characterized by high morbidity and mortality, as evidenced by its life expectancy of 51.6 years (UN 2013). Malawi is also one of the more densely populated African nations (although certainly not the most densely populated) with an estimate of 151 people/km$^2$ (World Bank 2011) which could facilitate social interaction among its residents, if nothing else. Recent research shows that another measure of social capital, social networks, play an important role in everyday life in Malawi (Helleringer and Kohler 2005; Kohler, Behrman, and Watkins 2007; Watkins 2004)—but social *participation* has not been examined in this context. This literature also shows that, as in many other settings in SSA, the predominant focus of social participation has been with regards to HIV infection in Malawi, as opposed to general health.

## Data

The Malawi Longitudinal Study of Families and Health

We use data from the Malawi Longitudinal Study of Families and Health (MLSFH).[1] The MLSFH was designed as a couples' survey, targeting a population-based representative sample of approximately 1,500 ever-married women aged 15-49 and 1,000 of their husbands in three rural sites of Malawi. The first follow-up in 2001 included all respondents from the first wave, along with any new spouses. The MLSFH followed-up with all respondents in 2004, 2006, 2008 and 2010. In addition to new spouses, the MLSFH added to its sample in two waves: a target sample of 1,500 young adults (15-29) in 2004, and a target sample of approximately 800

[1] Between 1998 and 2004 the MLSFH was known as the Malawi Diffusion and Ideational Change Project (MDICP).

parents of existing MLSFH respondents in 2008. A description of MLSFH data and sampling technique is presented in Watkins et al. (2003) and Kohler et al. (2014); Bignami-van Assche, Reniers, and Weinreb (2003), Anglewicz et al. (2009), and Kohler et al. (2014) provide assessments of MLSFH data quality. The MLSFH study was approved by the IRB at the University of Pennsylvania and the Malawi National Health Sciences Research Council (NHSRC).

We use the two most recent rounds of MLSFH data (2008 and 2010) in this analysis. Our longitudinal approach to data analysis limits the sample to 2,328 individuals (1,411 women and 917 men) who were interviewed by MLSFH in both 2008 and 2010, and provide complete (i.e., non-missing values) for all variables of interest. Any such longitudinal approach should consider the possibility of attrition bias. There are 667 individuals who were interviewed in 2008 but not re-interviewed in 2010. Of these 667 who were not re-interviewed, the most prominent reasons for attrition are migration (42.2%), temporary absence (16.0%), death (10.1%), and refusal (8.1%). To evaluate whether these 667 individuals systematically bias the sample, we compare 2008 participation measures for individuals interviewed in both 2008 and 2010 with those interviewed only in 2008 (Appendix Table 1). Results of this analysis show relatively few differences in social participation between individuals who were re-interviewed and those who left the MLSFH sample by 2010.

There are several features of the MLSFH data that enable us to contribute to the literature on social participation and health. First, the MLSFH data contain a range of common social activities in Malawi and elsewhere in the region, including both a variety of venues (i.e., markets, funerals, dramas, etc.) and village committee participation. Second, the MLSFH includes robust measures of mental and physical health (from the SF-12, described below),

which offers several advantages over single-item ratings of health. Finally, the longitudinal nature of the data enables us to establish the time-order of events between social participation and health. Unlike the cross-sectional analyses that are common in this area of research, the longitudinal data allows us to identify the effect of social participation on physical and mental health without the potential bias of selection of individuals with better (or worse) health into more (or less) participation.

Measures

For our health outcomes we use the SF-12 summary measures of mental and physical health. The SF-12 measure has been extensively validated as an accurate measure of mental and physical health (Ware, Kosinski, and Keller 1996), as seen in its wide applicability across cultural contexts (Gandek et al. 1998). While self-reported health measures may be endogenous to behaviors (Dwyer and Mitchell 1999) they are robust compared to objective health indicators (Baker, Stabile, and Deri 2004; Miilunpalo et al. 1997). In comparison to other studies that have only used subjective indicators of health, our use of the more-robust SF-12 measures is a more rigorous test of the relationship between social participation and health. Also, while most studies on the relationship between social participation and health have subjectively and objectively evaluated *physica*l health, virtually none have examined how social participation could affect mental health.

We operationalize our key predictors—different forms of social participation—using three sections of the MLSFH survey. These measures were created from common social activities in Malawi during the time, and thus represent the important venues for social participation. The first set of measures is based on the following question: "How many times *in*

*the last month* have you been to: (1) a funeral, (2) a drama performance, (3) a beer place, (4) a place where people dance, and (5) a market. Our second set of measures are similar, but based on information from the number of times *in the last year* that respondents have attended a (1) wedding, (2) drama about family planning, and (3) political meeting. Lastly, we consider the most conventional operationalization of social participation—group memberships. This third measure is constructed based upon whether respondents were members of seven possible village committees, including committees for (1) development, (2) health, (3) funerals, (4) the market, (5) the Chief's council, (6) District development, and (7) HIV/AIDS.

These three sets of measures allow for a much more complete evaluation of social participation than most studies. While previous research has mostly used group membership as a proxy for social participation, we cannot be certain that this alone adequately represents social participation in the Malawian context; for example, memberships might be nominal rather than an accurate representation of social participation. Monthly and yearly estimates of participation in a range of activities at least conceptually offer a more realistic depiction of social participation in the Malawian context since these activities are common and widely attended by community members. However, the monthly and yearly measures might not be directly linked to one's health two years later. Of course, in the literal sense, it is unlikely that market attendance in June 2008 would affect one's health in July of 2010. Moreover, there would inevitably be variation in these estimates of social participation in different months (which could only be known through repeated monthly or time-use surveys). We believe, though, that these measures offer insight into the lifestyle and social routines that could affect health later on.

To examine the relationship between social participation and health, we first use each individual measure of participation in the past month or year, and then construct a summary of

the overall number of instances of participation for all venues. For group membership we only use the summary measure. In these analyses we also consider age, region of residence, level of education, marital status, and number of individuals in the household as control measures that are potentially associated with both participation and health.[2]

**Methods**

A central feature of our methods is to distinguish between selection and effect with regards to social participation and health. To do so, we take advantage of the longitudinal nature of the MLSFH data. If we can be sure that the social participation occurred before the measure of health, any selection effect on the analysis should be modest. Thus, we run OLS multivariate regressions in which the dependent variables are the 2010 SF-12 measures of mental and physical health, and the key independent variables are the 2008 measures of social participation. It is important to acknowledge, however, that good or bad health can persist over time, in which case the selection of individuals with systematically different health status into participation could occur before 2008. To reduce this possibility, we also include a baseline (i.e., 2008) measure of mental and physical health in these regressions.

We present several sets of regressions, separately for men and women. We begin with separate regressions for each of (1) the five measures of participation in the past month (funeral, drama, bar, dance, market), and (2) the three measures of participation in the past year (wedding, drama about family planning, political meeting). We then present separate regressions for the summary measures of monthly and annual participation, and the summary measure of village

[2] We also tested several other measures in these regressions, such as wealth, HIV status, perceived HIV status, number of children, and ethnicity. These variables were not significantly associated with health in most models and were therefore not included in the final set of models.

committee participation. As described above, we also control for age, region of residence, level of education, marital status, and number of individuals in the household in each regression.

## Results

Descriptive Statistics

Table 1 provides information on the characteristics of our sample. The sample size is 2,328, of which 1411 (60.6%) are women and 917 (39.4%) are men. Men are older than women by an average of approximately two years. Respondents are evenly distributed by region, as per the study design; about one third of respondents reside in each of Mchinji (Central Region site), Balaka (Southern Region site), and Rumphi (Northern Region site). Women have less education than men and are less likely to be currently married (compared to divorced, separated or widowed), but average household size is similar by gender. Physical and mental health declined over time between 2008 and 2010 for both men and women.

In 2008, men reported participating in a greater number of total events (15.4) in the past month than women (10.2), on average. While men and women both attended about the same number of funerals (3.7 and 3.5) and dances (0.3 and 0.3), men more frequently attended dramas (1.1 to 0.3), bars (2.5 to 0.3), and markets (7.8 to 5.8). Of the number of activities respondents were asked to list that they attended in the previous year, men participated more on average than women (5.2 to 2.7 events) and in each domain—weddings (1.8 to 0.7), dramas about family planning (1.4 to 0.7), and political meetings (2.0 to 1.3). Lastly, men participated in 1.6 groups, and women participated in 0.8, on average.

-Insert Table 1 about here-

Table 2 shows results for the multivariate analysis: health is the dependent variable and independent variables of interest are the measures of social participation. In the interest of space, we do not show coefficients for control variables in the model (age, region of residence, marital status, level of education, and household size). If a result between social participation and health is not statistically significant at the $p<0.10$ level (or below) in Table 2, we denote this with the letters "NS". We display regression coefficients and significant level in the case of a significant relationship.

Physical Health

In Table 2, we see that even after controlling for physical health in 2008 (along with other controls), greater aggregate social participation (the combination of funerals, drama performances, bars, dances, and the market) predicts better physical health for women ($p<0.05$) and men ($p<0.10$) in 2010. When examining these forms of social participation individually, however, it appears that the physical health benefits are primarily driven by trips to the market for women and attending a dance for men. Greater participation over the course of the year is associated with better physical health for women in 2010—but not for men. That said, both men and women experience physical health benefits from attending family planning dramas. More group memberships—being on a village development committee, a health committee, a market committee, a district development committee, a village HIV/AIDS committee, and participating in a funeral group or Chief's council in 2008—do not predict better physical health in 2010 for women or men.

Mental Health

Compared with physical health, social participation in 2008 exerts a much different influence on mental health in 2010. Greater social participation in the previous month (either individual measures or aggregate) does not predict one's mental health in 2010. However, the aggregate score of participation in the past year indicates that greater social participation in 2008 predicts *lower* SF-12 mental health scores for women ($p<0.05$) and men ($p<0.10$) in 2010. Wedding attendance predicts lower mental health scores in 2010 for men ($p<0.10$) while attending a political event predicts lower mental health for women ($p<0.05$). Contrary to its effects on physical health, family planning drama attendance predicts lower mental health for women ($p<0.10$), although the effects are positive for men ($p<0.05$). Finally, and once again, being a member of a greater number of groups in 2008 also does not predict SF-12 mental health scores in 2010.

-Insert Table 2 about here-

**Discussion**

Our results generally differ by gender, the duration of the measurement of social participation, and by health outcome. For example, whereas we find no associations between participation in the previous month and mental health, greater participation in the previous month seems to improve the physical health of men and women. In contrast, we find an association between 2008 yearly social participation activities and both mental and physical health, in which greater participation improves physical health (for women only) and leads to declines in mental

health for women and both declines *and* improvements for men, depending on the measure. The exact activity or venue differs in importance by gender in many cases, although men and women share the importance of overall monthly activities on physical health, family planning dramas in the past year, and total annual activities. Also, many of the measures not significantly associated with health are similar between men and women.

Several of these relationships are surprising and unexpected. Given that most research has found benefits of social participation for health (Helliwell and Putnam 2004; Hyyppä and Mäki 2003; Lindström, Hanson, and Östergren 2001; Veenstra 2000), it is interesting to note the overall negative effect of social participation over the past year on mental health for both men and women. Furthermore, the fact that family planning drama attendance has opposite effects on mental health between men and women is also fascinating.

Since many of these results are unexpected (in the context of the existing literature), it is challenging to identify explanations. Some results seem clear: the lack of significance of committee participation is perhaps more straightforward, as many of these committees may not meet on a regular basis and thus would have a fairly minimal effect on health status. The overall positive effect of activities on physical health is consistent with the literature and our hypothesis. But other results are puzzling—and therefore, qualitative research on this topic would likely prove illuminating.

That said, unlike much of the previous research on this topic, it seems unlikely that selection plays an important role in interpreting our results. The most notable results in the literature, suggesting that higher levels of social participation are linked to a variety better health outcomes, have been marred by the use of cross-sectional data (Helliwell and Putnam 2004; Hyyppä and Mäki 2003; Lindström, Hanson, and Östergren 2001; Veenstra 2000) which has left

many selectivity concerns regarding the endogeneity between being healthy and able to participate in social events. Our longitudinal data from Malawi allow us to reduce this endogeneity by accounting for both health and social participation in the wave previous in order to get a better assessment of the potential effects of social participation on health in the second wave. Additionally, we use considerably more-robust self-reported health measures in the SF-12 physical and mental scales than those found in prominent works depicting the relationship between social participation and self-reported health (ie. Helliwell and Putnam; Hyyppä and Mäki 2003; Kawachi, Kennedy, and Glass 1999; Nummela et al. 2008; Phillips 1967; Veenstra 2000; Young and Glasgow 1998). Thus, our findings lend support, strengthen, and build upon previous research proposing a causal relationship between social participation and health, even if the direction of effects are not completely what we predicted.

We also expand the scope of social participation beyond the conventional measure of the number of group memberships an individual has, to include more active and culturally relevant forms of social participation found in Malawi such as funerals, drama performances, bars, places to dance, markets, weddings, and political meetings. By comparing aggregate and separate measures (at least for the informal forms of social participation), we show that both greater social participation on the whole *and* specific events and types of social participation influence one's health. Therefore, participating in *any* type of social group or event does not necessarily translate into better mental and/or physical health outcomes; we bring to light intriguing and important gender differences in the process as well.

It is important to note that, while adding some new features and findings to the field, there are important limitations of this research. As stated above, we do not attempt to comprehensively measure social capital. While social participation is a theoretically vital

process in social capital formation (Putnam 2000), it does not exhaustively capture one's social capital. Thus, other aspects of social capital, such as trust, transfers, or networks, could exert different influences on individual health. Furthermore, funerals, drama performances, bars, dances, markets, weddings, and political meetings are all commonly frequented social settings in which rural Malawians are able to participate in, while membership in village committees represents the type of social participation commonly used in the literature. But, we cannot be certain that we are capturing all important forms of social participation in Malawi. For example, going to the local water source, maize mill, or health clinic could represent venues for social participation that are important for respondents but not measured in the MLSFH data. While we benefit from longitudinal data, our use of lagged physical and mental health variables in our analyses can only diminish the effect of selection into being able to participate in social events and subsequent health outcomes based on one's health status; we cannot account for potentially important variables that could moderate and mediate the extent to which social participation predicts health outcomes and these results are biased as such. Hence, we are limited in the degree to which we can claim social participation *causes* positive or negative effects on physical and mental health. Finally, any research using longitudinal data is potentially affected by attrition bias. As noted above, our analysis of attrition (Appendix Table 1) does not suggest any substantial bias presented by those lost to follow-up.

Despite these limitations of the MLSFH, our measures of social participation, and analytical approach, we believe that these longitudinal data offer rare and valuable insight into the ways in which social participation influences health outcomes, while reducing selection effects that often leave the direction of this relationship unclear. Additionally, given the cultural importance of social interactions in Malawi—a place characterized by conditions of high

morbidity and mortality—these data allow us to evaluate how a pertinent aspect of individuals' social livelihoods influences their lives more-literally. In sum, our results suggest that some forms of social participation benefit one's health, but we caution that there are also potentially negative health consequences as a result of participating in certain types of social events.

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## Tables

**Table 1: Background characteristics, 2008/10 MLSFH women and men**

| | Women | Men |
|---|---|---|
| **2008 Mean age** | 40.5 | 42.6 |
| **2008 Region of residence** | | |
| Mchinji | 30.8% | 33.0% |
| Balaka | 35.4% | 29.1% |
| Rumphi | 33.8% | 37.9% |
| **2008 Level of education** | | |
| No education | 31.9% | 14.0% |
| Primary | 61.5% | 66.5% |
| Secondary or higher | 6.6% | 19.5% |
| **2008 Marital status** | | |
| Currently married | 79.5% | 88.0% |
| Widowed/divorced/separated | 19.2% | 3.2% |
| Never married | 1.3% | 8.8% |
| **2008 Mean household size** | 5.0 | 5.2 |
| **2008 Mean SF-12 mental health** | 53.0 | 55.9 |
| **2008 Mean SF-12 physical health** | 51.2 | 52.6 |
| **2010 Mean SF-12 mental health** | 51.3 | 53.8 |
| **2010 Mean SF-12 physical health** | 48.9 | 50.0 |
| **2008 Mean monthly activities** | | |
| Funeral | 3.5 | 3.7 |
| Drama | 0.3 | 1.1 |
| Bar | 0.3 | 2.5 |
| Dance | 0.3 | 0.3 |
| Market | 5.8 | 7.8 |
| Total monthly | 10.2 | 15.4 |
| **2008 Mean annual activities** | | |
| Wedding | 0.7 | 1.8 |
| Family Planning Drama | 0.7 | 1.4 |
| Political meeting | 1.3 | 2.0 |
| Total annual | 2.7 | 5.2 |
| **2008 Mean committee participation** | 0.8 | 1.6 |
| N= | 1411 | 917 |

**Table 2: Multivariate regression results for the association between 2008 social participation and 2010 health, MLSFH men and women**

| | Women | | Men | |
|---|---|---|---|---|
| | **Physical** | **Mental** | **Physical** | **Mental** |
| **Monthly activities** | | | | |
| Funeral | NS | NS | NS | NS |
| Drama | NS | NS | NS | NS |
| Bar | NS | NS | NS | NS |
| Dance | NS | NS | 0.40** | NS |
| Market | 0.07** | NS | NS | NS |
| Total monthly | 0.05** | NS | 0.04* | NS |
| **Annual activities** | | | | |
| Wedding | NS | NS | NS | -0.03* |
| Family Planning Drama | 0.90*** | -0.07* | 0.10* | 0.13** |
| Political meeting | NS | -0.09** | NS | NS |
| Total annual | 0.03* | -0.06** | NS | -0.04* |
| **Committee participation** | NS | NS | NS | NS |
| N= | 1411 | | 917 | |

Notes: "NS"= not significant at p<0.10 or lower; ***p<0.01, **p<0.05, *p<0.10.
Models also controlled for age, region of residence, level of education, marital status, household size, and mental or physical health in 2008. We also tested several other measures in these regressions, such as wealth, HIV status, perceived HIV status, number of children, and ethnicity. These variables were not significantly associated with health in most models and were therefore not included in the final set of models.

**Appendix Table 1: Analysis of attrition bias: differences in 2008 participation measures between individuals interviewed in 2008 and 2010 and those interviewed only in 2008, MLSFH men and women**

| | Women | | Men | |
|---|---|---|---|---|
| | **Non-attrition** | **Attrition** | **Non-attrition** | **Attrition** |
| **Monthly activities** | | | | |
| Funeral | 3.5 | 3.2* | 3.7 | 3.6 |
| Drama | 0.3 | 0.3 | 1.1 | 1.1 |
| Bar | 0.3 | 0.2 | 2.5 | 2.0 |
| Dance | 0.3 | 0.3 | 0.3 | 0.3 |
| Market | 5.8 | 4.7*** | 7.8 | 8.5* |
| Total monthly | 10.2 | 8.6*** | 15.4 | 15.5 |
| **Annual activities** | | | | |
| Wedding | 0.7 | 0.6 | 1.8 | 0.8 |
| Family Planning Drama | 0.7 | 0.4 | 1.4 | 1.1 |
| Political meeting | 1.3 | 1.3 | 2.0 | 1.2** |
| Total annual | 2.7 | 2.3 | 5.2 | 3.1** |
| **Committee participation** | 0.8 | 0.8 | 1.6 | 1.5 |
| N= | 1411 | 384 | 917 | 283 |

Note: ***p<0.01, **p<0.05, *p<0.10