Shocks, Health, and Transfers: Social Exchange as Social Insurance in Rural Malawi

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Abstract

In resource-deprived settings, individuals are vulnerable to numerous types of shocks and often rely on informal transfers to alleviate the effect of shocks. We examine the effect of shocks on physical and mental health in rural Malawi, and the potentially mediating role of transfers on this relationship. Our results show that both women and men experience decreasing mental health as shocks aggregate, but the effect is greater for women. Shocks continue to be associated with mental health even when we control for the characteristics of transfers, such as the geographical distance from the transfer partner, total number of transfers partners, and the nature of the transfer (financial vs non-financial). Up to a certain point, having more transfer partners and more distant transfer partners has positive mental health benefits for men and women, but greater numbers of transfer partners is associated with worse mental health for both men and women.

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Introduction

In resource-deprived settings, conditions like widespread poverty and a high HIV prevalence are the backdrop against which a growing economic and non-economic vulnerability exists. Economic vulnerability stems partly from shocks that characterize developing areas, such as the death or serious illness of an adult family member; poor crop yields, loss of crops or livestock; loss of income source through job loss, business failure, or withdrawal of outside support; household breakup; or damage to house due to fire or flood (Hyder, Behrman, & Kohler, 2012; Devereux et al., 2006). Such shocks differ from persistent poverty in their unpredictability and in their transitory nature and effects.

Residents of these settings face the additional challenge of lack of formal support systems to alleviate the effects of shocks. Governance institutions in low-income countries are either absent entirely or underdeveloped and unlikely to provide much in the way of shock mitigation (Hyder, Behrman, & Kohler, 2012). As a result, shocks have been shown to affect important features of daily life, such as economic status and consumption patterns (Dercon et al. 2005; Fafchamps, Udry and Czukas, 1998), and also have the potential for devastating consequences (Ferreira & Schady, 2009).

In these settings, informal systems of transfers play a critical role in recovering from shocks. Transfers are exchanges of money, help, or assistance provided by friends, family members, or more distant connections to alleviate the effect of an adverse event. These systems of transfers arise, in part, to provide protection from shocks in environments that lack formal support systems (Platteau, 1997).

While transfers can be effective in reducing the effect of a shock, they are guided by rules that have important impacts on participants. These rules encourage transfers and thus ensure that few are left without support in times of need. At the same time the rules guiding systems of transfers impose a burden on participating individuals: transfers are not simple gifts given out of kindness, they are social obligations that carry expectations of reciprocity (Mauss, 2000). While these transfers may be effective in alleviating the immediate effect of a shock, they come at a cost.

In this paper, we identify the effect of shocks on health, and the mediating role of transfers in this relationship. Our study is set in rural Malawi, where over half of the population lives in poverty, substance farming is common practice (IFAD, 2009), HIV prevalence is high at 8.9% (Malawi National Statistical Office and ICF Macro, 2011), and economic shocks are frequent. In such a setting, health vulnerability to negative economic shocks would seem a foregone conclusion (The World Bank, 2014). However, Malawi has a deeply embedded system of transfer networks which exist, in part, to protect against economic loss (Davies, 2010). Despite their importance, little is known about how these transfer or exchange networks are established and maintained and how they are accessed in times of need. We use a longitudinal dataset to explore (1) the effect of shocks on physical and mental health, and (2) the potentially mediating effect of transfers on the relationship between shocks and health in rural Malawi.

Background: Transfers and Shocks in Malawi

Shocks in Malawi

Shocks related to poor crop output, illness or death, loss of a source of income, and marital dissolution are common in resource-deprived areas in sub-Saharan Africa (Burke, Gong, & Jones, 2011; Beegle, Dehejia, & Gatti, 2006; Davies, 2010; Grant & Yeatman, 2014). Malawi, one of the poorest countries in the world, does not have a formal system of social security, and access to credit is limited (Malawi National Statistical Office and ICF Macro, 2011; The World Bank, 2014; Swaminathan, Salcedo du Bois, & Findeis, 2010). As a result, individuals are vulnerable to negative shocks such as fluctuations in the price of cash crops such as tobacco, drought, flooding, a high marital turnover rate, and a relatively high HIV rate (Diao, Robinson, Thomas, & Wobst, 2002; Everhart, 2007; Reniers, 2003; UNAIDS, 2012).

While some shocks may have an immediate impact on economic status, they may also have significant and long-lasting effects on both mental health and physical health (Mazumdar, Mazumdar, Kanjilal, & Singh, 2014; Thai & Falaris, 2014; WHO, 2011; Evans-Lacko, Knapp, McCrone, Thornicroft, & Mojtabai, 2013; Wahlbeck & McDaid, 2012). The connection between economic shocks and health have been recently established elsewhere: following the 2007 global financial crisis, the WHO (2011) advocated for European legislation to mitigate employment and income loss on the grounds that such losses increase suicides, alcohol abuse, and depression.

While most studies related to health in Africa are concerned with physical health outcomes, recently there has been a focus on the relationship between shocks and mental health. A strength of our study is that it considers the effects of negative shocks and transfers on physical *and* mental health in a rural population in a sub-Saharan African country.

Transfers and social exchange theory

We use social exchange theory to guide our research on transfer behavior in Malawi. Social exchange plays an important role in societies with little or no formal safety net provided by the government (Platteau, 1997). These transfers offer protection: individuals build a set of relationships on which they can draw when they are confronted with a shock. Social exchange theory has been described as a way to connect social theory and social research, with human behavior seen as a particular type of economy (Homans 1958).

Transfers come with expectations of reciprocity: those who give expect to eventually receive (Foa and Foa, 1974, 1980). This implies that the partners in the transfer are obligated to, and responsible for, one another (Lavelle & Brockner, 2007), which is central to the notion of kinship in sub-Saharan Africa (Chabal, 2009). The interactions that create obligation and responsibility serve the purpose of minimizing individual and group risk while fostering cooperation (Cropanzano & Mitchell, 2005). That is, social exchange ties people together through mutual obligation that spreads risks and resources while providing security against threats to individual members of the exchange network. This practice, therefore, acts as a hedge against future loss by creating social bonds through the exchange of current resources for non-specific future reciprocation (Blau, 1964).

We see evidence of this in Malawi, where social exchange is the primary form of informal social insurance, and exchange relationships are entered into during times of relative plenty to insure against future loss (Davies, 2007; Swidler and Watkins, 2007). This practice appears to be quite effective in contexts where transfer relationships are normative and extensive (De Weerdt and Dercon, 2006). Therefore, social exchange is not simply a system for establishing and maintaining social ties; rather, the relationships are leveraged for the redistribution of community

resources. This is particularly important in resource-poor settings where economic shocks are frequent.

Transfer expectations

Transfer relationships are bound by complex social rules, one of which is based upon the concept of reciprocity. Two types of reciprocity can be distinguished: balanced and conditional. Social exchange in traditional societies operates under a principle of balanced reciprocity where every contribution is balanced by receipt of a roughly equivalent good or service at a future, perhaps unspecified, point in time (Platteau, 1997). Conditional reciprocity occurs in a system where each participant in the market contributes but only those who experience disaster receive something material from the market (ibid.). Near equivalent reciprocity is implicit, even if the *form* that reciprocity takes is not equivalent (Mauss, 2000). Thus, in Malawi and other poor societies, informal social safety nets that may fall somewhat outside the strict economic understanding of modern insurance market dynamics but well within the framework of implicit and balanced reciprocity that is at the core of social exchange theory.

Not only are transfers expected to be reciprocal, participation is expected to be nearly universal. Reciprocity is central to the concept of kin in sub-Saharan Africa (Chabal, 2009). Further, those who refuse to exchange with individuals who possess relatively fewer resources put themselves at future risk (Homans, 1958). While participation in a transfer relationship is ostensibly voluntary, when community security is dependent upon it, refusing to exchange may have important consequences. For instance, in Malawi, a relatively wealthier individual who does not provide resources to their social network is considered immoral and may be a target of social derision, witchcraft, or excommunication (Swidler & Watkins, 2007; Verheijen, 2011).

Potential harms of transfers

Social exchange is not simply a system for establishing and maintaining social ties; rather, social exchange relationships are leveraged for the redistribution of community resources. As a result, the deprived often find themselves in a situation where control, or the lack thereof, over resources places them in disadvantaged positions and uncertain returns (Peters, 2006). Thus,

although the protective aspects of an informal social safety net are vital, involvement in social networks may also cause distress.

While transfers certainly have positive benefits like smoothing consumption during shocks, they may also have potentially negative health effects due to the burdens imposed by the strong moral obligation to provide and reciprocate. The social expectation to share and repay are so dominant that rural Malawians use strategies to preserve resources: some spend cash as quickly as possible to avoid having to provide monetary assistance to others (Verheijen, 2011). There is a balance between the possession of various goods as displays of economic status with the concern that having resources makes one a target of more requests for assistance and provides justification to be excluded from receiving assistance (ibid.). Rural Malawians appear to accept their obligations to provide for friends and family members, but also devote considerable effort to managing expectations of their ability to provide resources (ibid.).

Reciprocity burdens are not experienced equally by all, but are influenced by gender, age, socioeconomic status, and other characteristics of the transfer partners involved (Kawachi and Berkman, 2001). The extent to which one can access resources in times of need partly depends on providing transfers previously; therefore those with few resources are at a particular disadvantage in developing support networks (Verheijen, 2011). Because the poorest individuals may have little agency in choosing specific transfers partners, they may need to invest more in maintaining their membership (Poulin, 2007; Kawachi & Berkman, 2001) but have fewer resources to build these relationships and less ability to reciprocate.

In Malawi, the brunt of this reciprocity burden may be experienced by women. Cash is typically earned and controlled by men in Malawi while maize, the staple food, is the responsibility of women (Peters, 2006). In this context, food sources like maize provides more insurance have more social protection than cash: which is easily spent or loaned or given away (ibid.). While household control of maize is the domain of women who make decisions about household consumption needs, cash is more likely to be disappear from men's pockets, given to family or friends, and is rarely saved (ibid.). In the case of poorer women, sex may become a currency of unequal exchange out of necessity. Wealthy Malawian men are expected to take on the role of

patron while women may become clients in sexual exchange (Swidler & Watkins, 2007). Women face especially high burdens as clients; more so when they attempt to secure substitute patrons who may provide support should a primary sexual exchange patron be unable to provide (ibid.). Women are at risk of HIV from wealthy men (the group with the highest HIV rate in Malawi), and they are at risk of community disapproval over the violation of fidelity norms despite the widespread acknowledgement that it is a moral obligation for wealthier men to take on poorer women as clients to have a responsibility to the community, and especially to poor women: men do not belong exclusively to their wives (Parkhurst 2010, Swidler and Watkins, 2007).

Required reciprocity is not the only source of potential stress involved with transfer network membership. In Malawi, exchange relationships are fragile, at risk of being undermined by the deaths or departures of transfer partners, especially relatively wealthier partners (Swidler & Watkins, 2007). While the maintenance of exchange networks is at least partially motivated by a need for insurance against future calamity, increased stress is likely as individuals must invest resources in the maintenance of networks with uncertain payoffs—the future benefits cannot be guaranteed (Nikìema, Haddad, & Potvin, 2007). Similarly, exchanges can carry with them psychological tolls of mounting debt and obligation (Kawachi and Berkman, 2001).

Transfer network composition

A critical component of transfer activity is the size and composition of one's transfer network. Marriage, family structure and ethnicity influence general transfers patterns in Malawi (Verheijen, 2011; Weinreb 2002, Weinreb 2006), but partners who are sought in time of crisis differ from immediate family in several important characteristics. In this research, we focus on transfers partners whom rural Malawians turn to in the case of a shock or crisis, as opposed to the regular transfers that occur within the immediate family.

To most effectively protect from vulnerability, individuals typically seek to increase the extent of their social exchange networks in size, variety, and kin proximity. Not surprisingly, a key characteristic of transfer networks is their size: the size of a transfer network is related to an individual's ability to benefit from the network (Rosenzweig, 1988). In addition to size, research

suggests that geographical distance to transfer partners is significantly related to an individual's ability to benefit from a transfer network when the individual experiences a shock (Davies 2007; Fafchamps & Gubert, 2007; Murgai et al., 2002). Because shocks can be individual (e.g., loss of a source of income), or community-wide (e.g., drought), both the number of transfer partners *and* the distance to one's transfer partners are likely to be important. Individuals often establish and maintain transfer relationships beyond their proximal and affinal kin to find a replacement for a missing normative transfer partner (a deceased parent or the lack of a maternal aunt) and to spread risk and maximize potential payoffs (Weinreb, 2001). It is also risky to have only a small, localized exchange network, since everyone in the community will experience the same economic shock (drought, crop price volatility, e.g.). Thus, people often develop exchange relationships with partners who are less closely related to them (or are even fictive kin) or less proximally located (Silvey & Elmhirst, 2003; Eloundou-Enyegue, 2002). Greater distance, however, presents challenges with maintaining the partnership due to less frequent interaction and less regular transfers (Verheijen, 2011). As a result, many of these factors that define network composition may be beneficial in some contexts but have a negative effect in others (Wetterberg, 2007).

This leads us to expect that network composition factors are non-linearly associated with health outcomes. For example, a small number of transfer partners may be beneficial without causing a large reciprocity burden; however, as the number of transfer partners or distance to transfer partners mounts, reciprocity burdens are likely to increase. In this case, adding an additional or more distant exchange partner may improve a health outcome but adding many may leave an individual overwhelmed by a steep reciprocity burden or pessimistic about indefinite payoffs.

Hypotheses

We test three hypotheses to explore the relationship between shocks, social exchange, and physical and mental health.

Hypothesis 1: The relationship between shocks and mental health is negative while there is no relationship between shocks and physical health. The trauma of shocks has a strong effect in

decreasing mental health but physical health does not suffer because social exchange networks provide material support for medical care.

Hypothesis 2: The relationship between mental health and shocks should disappear when transfer characteristics are included; transfer characteristics will be positively associated with mental health. The positive effect of transfers counteracts the negative effect of shocks. Physical health remains unassociated with shocks.

Hypothesis 3: The relationship between mental health and shocks should disappear when transfer characteristics are included; transfer characteristics will be negatively associated with mental health. Transfers negatively affect mental health because exchanges are accompanied by the stress of reciprocity obligations and uncertain payoffs. Physical health remains unassociated with shocks.

Data and Methods

Sample and measures

We use a dataset from rural Malawi with several unique features that enable us to address our research questions. As described above, we are interested in the effect of shocks on mental and physical health, and the mediating role of transfers in this relationship. An analysis of these research questions requires rich longitudinal panel data with (1) measures of shocks commonly affecting rural Malawians, (2) measures of both physical and mental health; and (3) detailed information on transfers.

Data from the Malawi Longitudinal Study of Families and Health (MLSFH, formerly the Malawi Diffusion and Ideational Change Project) meet these requirements. In 1998, the MLSFH began collecting data for 1,532 women and 1,065 of their spouses from approximately 120 villages in three regions in Malawi: Balaka (Southern region), Mchinji (Central), and Rumphi (Northern) (Kohler *et al.*, 2014). The MLSFH study followed these men and women over time, collecting data in 2001, 2004, 2006, 2008, 2010 and 2012. Several new samples were added during this period: (1) new spouses were added at each wave of data collection for respondents marrying in between waves, (2) approximately 1,000 adolescents were added to the sample in 2004 due to

the aging of the cohort and the lack of unmarried younger respondents in the cohort, and (3) about 550 parents of respondents were added to the sample in 2008 to facilitate the exploration of inter-generational dynamics.

We used data from the fifth (2008) and sixth (2010) waves of MLSFH, as these data capture essential features of our analysis. In both of these waves, the MLSFH collected information on health status, economic shocks, and transfer activity. Limiting the sample to those interviewed in both 2008 and 2010 yields 2162 respondents, 60.2% of whom are female (n = 1302) and 39.8% of whom are male (n = 860).

To measure physical and mental health, the MLSFH used the SF-12, which is among the most widely used measures for rapid subjective health self-assessment worldwide (Jenkinson, Tarani, Coulter, & Bruster, 2001). SF-12 results are normed for a particular population, with the mean score for both mental and physical set to 50 (ibid.), which makes the test useful for comparing raw health status within a country though it is not necessarily meant to compare health status between countries.

The MLSFH also collected data on shocks by asking respondents if they experienced any of the following in the previous two years: (a) death or serious illness of an adult family member or someone who provides support to the family; (b) poor crop yields, loss of crops, or loss of livestock; (c) loss of income source like job loss, business failure, or withdrawal of outside support; (d) household breakup; or (e) damage to house due to fire or flood. These particular shocks were identified as the most important and common among rural Malawians via a pilot study prior to data collection in 2008. To measure these shocks, we created a new variable tallying the number of shocks each respondent reported experiencing over the previous two years.

In this research, the transfers partners included are those whom the respondent considered the most important resources in the event of a shock, as opposed to the most frequent or proximate source of economic or non-economic transfers (described in Weinreb 2006; Weinreb 2006). Respondents were asked to list up to 10 people who they would approach for assistance in case

of a crisis. For these transfers partners, respondents were asked to describe several characteristics, including physical distance between the respondent to the transfer partner, e.g. whether the partner was in the same household, compound, village, traditional authority, district, and up to anywhere beyond a respondent's district. Respondents were asked both about financial transfers and about non-financial transfers (collecting firewood, cooking, caregiving, helping with farming activities).

We created variables to represent the most important features of these transfer partners (as identified by the literature on transfers and shocks (Davies 2007; Fafchamps & Gubert, 2007; Murgai et al., 2002; Rosenzweig, 1988)), including (1) the total number of financial and non-financial transfer partners and (2) the average physical distance from respondents to transfer partners based on type of transfer[2]. Physical distance to exchange partners is a measure of the risk involved in establishing and maintaining a social exchange network: the further an exchange partner is from an individual, the greater the likelihood that such a relationship requires more investment but has less certainty in terms of payoff.

Analytic Methods

We start by presenting background characteristics for all respondents, by sex, for each MLSFH year, 2008 and 2010. We also present summary measures for two of the measures of primary interest here, physical and mental health, and number of economic shocks. Next, we present basic characteristics of transfer partners, including overall number of financial and non-financial partners and physical distance to financial and non-financial transfer partners.

We are interested in the effect of economic shocks on health, and the mediating role of transfers in this relationship. To examine these relationships, we run several multivariate regressions. We acknowledge that analyses on shocks, transfers and health are likely to be affected by endogenous characteristics that affect these measures. Our covariates help control for some important factors that likely affect shocks, health and transfers; but there are likely several sources of unobserved characteristics that we cannot control for, such as genetic composition,

[2] Although the literature suggests that distance and size of the transfer network are particularly important, we also tested several other characteristics of transfers partners, such as sex, age, and relationship to respondent. Our final approach does not include these measures since they were not significantly associated with shocks or health.

risk-taking propensity, or other traits that may affect why some individuals may experience economic shocks at different rates than others. For example, personality characteristics like introversion can be associated both with mental health and involvement in social exchange networks (Kawachi and Berkman, 2001). These unobserved characteristics have important implications for our regression analysis.

To address the possibility of unobserved characteristics that may affect transfers, health and shocks, we use fixed effects models to control for unobserved time-invariant characteristics that may be importantly involved in these relationships. We also considered random effects models to examine the relationship between shocks and health; and used Hausman tests to compare the fixed and random effects models. Since Hausman tests indicated that random effects would be inappropriate for most models and fixed effects models are less affected by biases (Allison, 2005), we relied on results of the fixed effects regressions and show only these results.

We run our regressions in two steps. First, we take SF-12 mental or physical health status as the outcome variables and number of shocks as the independent variable of interest. In addition to these variables of primary interest, we also include other sets of measures in these regressions. We include a quadratic term for total number of shocks because we expect that the more shocks an individual experience, the less they are able to cope with those shocks (Ferreira & Schady, 2009; Devereux, Baulch, Macauslan, Phiri, & Sabates-Wheeler, 2006). Since household wealth[3] and marital status are likely to affect both vulnerability to shock and health, we include these measures in the regressions. Age, education level, and place of residence, though also widely documented in the literature as factors that vary with health, are not included because these characteristics are time-invariant and we use fixed-effects regression, which controls for all time-invariant characteristics. Health status also varies by sex so we run our regressions separately for men and women.

Our complete model, after omitting time-invariant characteristics such as region, education, and age, can be expressed in the following form:

[3] Household economic status was measured using a constructed wealth index based on ownership of 14 household durable assets, achieved by using principal component analysis (Filmer & Pritchett, 2001)

$$H_{it} = \beta_0 + X_{it}\,\beta_1 + S_{it}\,\beta_2 + T_{it}\,\beta_3 + \varepsilon_{it},$$

where H_{it} is either the physical or mental health status of individual *i* at time *t*, X_{it} represents a set of background characteristics including marital status and wealth, and ε_{it} is the error term.

In the first set of two regressions, we focus on S_{it}, which represents a vector of shock-related characteristics. We do not consider T_{it}, which represents a vector of transfer-related characteristics, in the first set of regressions. We run this regression to test our first hypothesis that the total number of shocks is negatively associated with health status.

For the second set of regressions we add measures of transfers (T_{it}), which includes the overall number of financial and non-financial transfers and the average distance from the respondent to financial and non-financial transfer partners. We include a quadratic term for total number of non-financial transfer partners and distance to financial transfer partners, as described above. We run this regression twice for men and women with physical health as the outcome variable the first time and mental health as the outcome variable the second time.

We considered several other transfer characteristics such as total number of financial or non-financial transfers, total number of financial exchange partners, relationship of exchange partners to respondent, perceived wealth as compared to respondent wealth, and religious congregation of exchange partner. However, we did not include these characteristics in the fixed effects model because they were not significantly associated with physical or mental health status.

As noted above, the relationship between health outcomes and the number of and distance to transfers partners may be non-linear; adding an additional transfer partner or a more distant partner may improve outcomes but adding several may increase the reciprocity burden to the point of diminishing returns for an individual. Therefore, we include quadratic terms for shocks, for total number of non-financial transfer partners, and for distance to financial transfer partners. We are able to calculate a “turning point”, the place along the curve where the independent variable changes direction in its impact upon the outcome variable. We use the following formula to estimate the turning point:

$$-\beta[\text{linear term}] / (2 * \beta[\text{quadratic term}])$$

Results

Among the 2,162 respondents interviewed in both 2008 and 2010, each of the three regions of Malawi is approximately equally represented (Table 1). The first round of the MLSFH was in 1998; the respondents were women 15-49 and their husbands, if any. By 2008, the sample had aged: nearly two-fifths were 45 years old or older, far larger than the proportion 49 or older ten years earlier. Only 20% of men and 8% of women have more than primary school education. Nearly 90% of men and nearly 80% of women were currently married. Although men and women reported equal wealth in 2008, in 2010 men were significantly wealthier than women, consistent with research showing that men in Malawi tend to over-report household assets compared with women in both MLSFH and DHS (Miller, Zulu & Watkins, 2003).

Regarding our measures of interest, the reported number of shocks increased significantly for both men and women between 2008 and 2010. Men and women in the sample experienced about the same number of shocks in each wave: there is not a statistically significant difference between the frequency distribution of shocks reported by men and women in 2008 or 2010. This may not be surprising, since many of the MLSFH men and women in the MLSFH sample are married to each other and therefore reside in the same household, which suggests that reporting of shocks is reliable among MLSFH respondents.

At the same time, both men and women experienced significant declines in physical and mental health for between 2008 to 2010. Declines in health are expected as individuals age, of course, but an additional decline could be explained by the increase in shocks experienced in 2010. We examine this possibility below.

Turning to transfers (Table 2), MLSFH respondents reported increases in transfers that correspond to increases in the number of shocks. The number of financial transfer partners increased from 4.5 to 5.4 among men and from 4.3 to 5.2 for women. Non-financial transfers also increased for both men and women between 2008 and 2010. Men reported an average of 4.5

non-financial transfer partners in 2010, a significant increase from 4.0 partners in 2008; . Similarly, women reported a significant increase from an average of 4.8 in 2008 to 5.4 in 2010. Interestingly, women reported significantly more non-financial transfer partners than financial transfer partners in each year ($p<0.01$ for each year), whereas men reported significantly more financial transfer partners than non-financial transfer partners in each year ($p<0.01$ for each year), consistent with previous research finding that men have more control over cash while women have more control over household functions (Peters, 2006).

During this period of declining health and increasing shocks, we also see dramatic changes in transfer partner characteristics (Table 2). In 2010, when more shocks were experienced, the proportion of women's intra-village and intra-compound financial transfers increased significantly at the expense of intra-household transfers, transfers with exchange partners from respondents' traditional authority areas, and transfers with exchange partners in large cities or from elsewhere outside a respondents' district ($p<0.01$). The pattern is different for men. The proportion of men's intra-compound and intra-village transfers increased significantly at the expense of transfers with exchange partners from respondents' traditional authority areas and transfers with exchange partners in large cities or from elsewhere outside a respondents' district (all $p<0.05$).

As with financial transfer partners, we found significant differences in the profile of non-financial transfer partners by distance from respondents between 2008 and 2010, but only for women. In 2010, when more shocks occurred, changes in the distance to men's non-financial transfer partners were not significant. However, women's intra-village non-financial transfers increased significantly at the expense of transfers with exchange partners from respondents' districts and transfers with exchange partners in large cities or from elsewhere outside a respondents' district (all $p<0.01$).

Multivariate results

Our first fixed effects multivariate models examine the effect of shocks on mental and physical health (Tables 3 & 4). Although we find no effect of shocks on physical health, shocks are significantly associated with mental health for men and women. For women, an additional shock

between 2008 and 2010 is associated with a decline in mental health of 0.39 points for women and 0.35 points for men on the SF-12 scale. In each case, the quadratic term is significant, indicating a non-linear relationship. The quadratic term is negative, indicating a convex curve and a turning point along that curve where mental health status begins to decline. We calculate the turning point and find that mental health declines begin after two shocks for men (turning point = 2.2) and after one shock for women (turning point = 1.3). This evidence supports our first hypothesis that shocks are negatively and non-linearly associated with mental health outcomes, although not with physical health.

Since rural Malawians rely on transfers to alleviate the effect of shocks, one might expect that the negative impact of shocks on health will disappear once we control for transfers. Next, we examine whether transfers mediate the negative impact of shocks on health among rural Malawians. Overall, we find that even after including several characteristics of transfers, the relationship between shocks and mental health persists for both men and women (Tables 5 & 6). Thus, transfers do not appear to alleviate the negative impact of shocks on mental health.

We also find three compelling associations between transfer characteristics and health outcomes that, to the best of our knowledge, have not previously been documented. First, we find that the total number *of non-financial transfer partners* is significantly associated with men's mental health, with women's mental health ($p=0.001$) (Table 6),. In addition, the relationship for each is non-linear: the quadratic coefficient is negative indicating a convex curve and a turning point along that curve where mental health status begins to decline as the number of transfer partners increase. For men, the turning point where men's mental health begins to decline is when a man has more than four non-financial exchange partners (turning point = 4.7); for women, it is when she has more than five non-financial exchange partners (turning point = 5.9). These findings confirm the literature on reciprocity burdens but add new nuance. Women's mental health improves with each new source of non-financial help she is able to access until she reaches a point where more help begins to result in decreasing mental health, perhaps because individual distress increases as reciprocity burdens begin to mount. Moreover, these findings in part support our hypotheses, since they demonstrate an association between exchange characteristics

and mental health status even if they do not erase the association between shocks and mental health status.

Second, we find a significant association between distance to non-financial exchange partners and health. Physical distance to non-financial exchange partners is negatively and linearly associated with women's mental health, but not with men's mental health. Women appear to experience declining mental health when physical distance from non-financial exchange partners increases. While our findings above emphasize the association between the number of partners and mental health, this finding highlights the importance of being able to access one's exchange network. This finding suggests that both lack of nearby local support and anxiety over the ability to access more distant sources of help have a negative association with women's mental health.

Finally, we find that physical distance to financial exchange partners is marginally associated with women's mental health but not associated with men's mental health. Here the quadratic coefficient is positive, indicating that women's mental health begins to improve to be when a woman has to look beyond her own household for financial exchange partners. This finding defies easy interpretation but may support previous research delineating control over household resources where men control cash and women control maize (Peters, 2006). That is, women may enjoy decreasing levels of stress if they are able to achieve some amount of agency by securing cash without needing to ask their husbands and neighbors for it.

Discussion

Taken together, our findings reinforce what has been discussed in the literature but so far, to the best of our knowledge, has not been empirically demonstrated. In particular, our three findings regarding transfer characteristics suggest a worthwhile line of research that previously has been underdeveloped. Previous research on social networks and mental health has tended to focus on the benefits of network participation (Kawachi and Berkman, 2001). Our research confirms this but adds nuance to our understanding of exchange network dynamics, especially of network size and of distance to transfer partners. We find that mental health for men and women suffers as shocks aggregate. We expected to find that this effect would be attenuated once we accounted for the transfer characteristics because previous research has shown that health shocks are insured

completely in settings where exchange networks are the norm (De Weerdt and Dercon, 2006). Instead, we find independent associations between mental health and several transfer characteristics. We explore these findings in light of the literature on social exchange, transfer networks, and mental health.

First, consistent with the social exchange literature, we find that mental health improves when the number of an individual's non-financial transfer partners increases. Additionally, we find that, at least for women, physical health also improves once an individual has more than 4 non-financial transfer partners. However, we find that once the number of exchange partners exceeds four (for men) or five (for women), mental health begins to decline. This finding suggests a link between the literature on network participation and the literature on reciprocity and informal insurance by providing evidence of the relationship between reciprocity burdens and mental health (Platteau, 2010; Nikìema, Haddad, & Potvin, 2007; Swidler and Watkins, 2007, Kawachi and Berkman, 2001).

Second, consistent with the literature on social exchange network composition in other low-income countries, we find that distance to exchange partners is important (Fafchamps & Gubert, 2007; Murgai, Winters, Sadoulet, & de Janvry, 2002; Rosenzweig, 1988). However, we report a nuanced relationship between network composition and mental. In Malawi, we find that it is distance to women's non-financial exchange partners that is most important. The further away a woman is from those she can rely on for help around the house, for help with child-rearing, or for borrowing maize in a time of need, the poorer that woman's mental health.

Finally, we add additional context to the literature on the relationship between household economics and transfer network participation in low-income countries (Swidler and Watkins, 2007; Peters, 2006; Poulin, 2007; Miller and Watkins, 2003). Because women and men control different aspects of household resources, the ability to find and maintain financial transfer partners, especially for women, is an important aspect of the relationship between mental health and transfer characteristics. While the relationship between mental health and distance from transfer partners is non-linear, we find that once women are able to develop financial transfer partners beyond their own households, they benefit from better mental health.

There are some important caveats with this research. While fixed effects regression provides a powerful tool to address unobserved factors associated with health, shocks, and transfers, it is possible that decreasing health status could cause an economic shock. For instance, if an HIV+ respondent begins to manifest clinical symptoms, the respondent may lose employment or a spouse, both of which could create a negative economic shock. That said, theory and literature on this topic suggests that the primary pathway is that shocks affect health, and it is important to note that regressing shocks on health status with a full set of controls revealed no significant associations between shocks and health status. Another limitation is that there is an assumption of exogeneity between independent variables in fixed effects models. It is plausible, though, that wealth and shocks in the models may be endogenous. However, it is more likely that increased wealth insulates a respondent from the worst effects of the shock than from the shock itself. For example, a wealthier respondent may be able to obtain higher quality care for his HIV but his wealth does not necessarily protect him from HIV infection in the first place, especially given that in Malawi HIV rates are highest among the wealthy, (Parkhurst, 2010). At any rate, if this is the case, the independent variables are exogenous with one another and predictive of health status.

As with any longitudinal study, attrition is a potential limitation. We tested for attrition bias and found some differences between those interviewed in both 2008 and 2010 and those interviewed only in 2008 (see Appendix). Those who only completed the survey in 2008 were marginally better educated at the secondary or higher level and they were distributed among Malawi's three regions differently than those who completed the survey in both years. Attriters experienced 0.1 more shocks than those interviewed in both waves ($p=0.0933$). However, attriters were not significantly different from those interviewed in both 2008 and 2010 in terms of age, marital status, physical or mental health status, or wealth.

A final limitation of this study is that the retrospective nature of the MLSFH transfer questions may overlook the more frequent and smaller transfers that seem to take place on a nearly daily basis in rural Malawi. Due to the retrospective nature of the MLSFH, the data may miss the very frequent small transfers that may form the basis of transfer behavior in low-income settings

(Weinreb, 2001; Platteau, 1997), making it difficult to use the MLSFH transfer data to explore how transfer behaviors mediate the relationship between health and shocks. Given this limitation, the current study can be said to support the association between transfers and health but it requires further study. To address these limitations, we propose a series of brief repeated surveys that track the day-to-day small transfers of rural Malawi women, collecting at the same time data on respondents' relationships to the transfer partner, what was exchanged (e.g., money, household help, food, soap or luxury item, sex, fertilizer, seeds), why the exchange occurred (e.g., illness, repayment, loss of income, crop loss, expectation of future help, drought, disaster, funeral, wedding, birth of a child), and what sort of repayment expectations exist. A more nuanced understanding of transfer behavior in concert with the demographic, health, economic, and shock data from the MLSFH could further our understanding of both the positive and negative aspects of a complicated form of social exchange and it could highlight new points of intervention for health programs in Malawi.

Table 1: Background Characteristics for MLSFH Men and Women, 2008 & 2010

	Men		Women	
	2008	**2010**	**2008**	**2010**
Mean number of shocks	**1.7**	**2.3*** **	**1.5**	**2.4*** **
Sex		39.8%		60.2%
Age				
Under 25		15.5%		17.5%
25-44		41.6%		47.4%
45+		42.9%		35.1%
Region				
North		38.6%		33.3%
Central		32.2%		30.6%
South		29.2%		36.2%
Education				
No education		12.2%		28.5%
Primary education		67.4%		63.5%
Secondary or higher education		20.4%		8.0%
Marital status				
Married	88.4%	88.3%	79.8%	77.3%***
Not married	11.6%	11.7%	20.2%	22.7%
Health score				
Physical health	52.6	50.0***	51.2***	49.0***
Mental health	55.9	53.7***	53.0***	51.3***
Household wealth score	0.05	0.27***	0.04	-0.13***
N=		860		1302

Notes: *Malawi Longitudinal Study of Families and Health; T-test of change between 2008 to 2010 significant at *p<0.10, **p<0.05, ***p<0.01.

Table 2: Characteristics of Transfer Partners for MLSFH Men and Women, 2008 & 2010

	Men		Women	
	2008	**2010**	**2008**	**2010**
Mean number of financial transfer partners	4.5	5.4***	4.3	5.2***
Mean number of non-financial transfer partners	4.0	4.5***	4.8	5.4***
Total transfers by distance to financial transfer partner				
Same household	1.1%	1.0%	1.4%	0.9%***
Same compound	15.0%	17.8%***	18.0%	20.2%***
Same village	35.0%	37.2%**	33.8%	38.6%***
Same traditional authority	26.9%	24.8%**	20.9%	19.6%*
Same district	8.3%	7.9%	10.1%	7.7%***
Lilongwe, Blantyre, elsewhere	13.8%	11.3%***	15.7%	12.9%***
Total transfers by distance to non-financial transfer partner				
Same household	1.5%	1.3%	1.3%	1.0%*
Same compound	18.8%	20.6%*	22.1%	22.9%
Same village	37.3%	39.5%*	38.2%	43.0%***
Same traditional authority	24.8%	23.2%	19.9%	19.0%
Same district	7.6%	6.6%	8.0%	6.4%***
Lilongwe, Blantyre, elsewhere	9.9%	8.8%	10.4%	7.7%***

Notes: *Malawi Longitudinal Study of Families and Health; p-values: *<0.10, **<0.05, ***<0.01; p-values represent t-test significance of changes from 2008 to 2010.

Table 3: Fixed Effects Regression Results for the Effect of Shocks on Physical Health, MLSFH* Men and Women, 2008-2010

	Men		Women	
Physical Health	Coefficient	Std. Error	Coefficient	Std. Error
Background characteristics				
Not married (reference)	-	-	-	-
Married	-0.01	1.16	-2.56***	0.90
Household wealth	0.11	0.25	0.20	0.23
Shocks				
Total number of shocks	0.22	0.70	-0.13	0.59
Total number of shocks squared	-0.15	0.15	0.04	0.13
MLSFH wave				
2008 MLSFH wave (reference)	-	-	-	-
2010 MLSFH wave	-2.32***	0.44	-2.26***	0.33

Notes: *Malawi Longitudinal Study of Families and Health; p-values: *<0.10, **<0.05, ***<0.01

Background characteristics like age, education, and region of residence were not included in the fixed effects model because those variables are time-invariant in this sample. An expanded measure of marriage (separating never married from divorced/widowed) yielded the same results as above. Wealth was measured using principal components analysis of household assets.

Table 4: Fixed Effects Regression Results for the Effect of Shocks on Mental Health, MLSFH* Men and Women, 2008-2010

	Men		Women	
Mental Health	Coefficient	Std. Error	Coefficient	Std. Error
Background characteristics				
Not married (reference)	-	-	-	-
Married	2.46*	1.40	0.95	1.06
Wealth	0.46	0.46	-0.33	0.27
Shocks				
Total number of shocks	1.56*	0.82	1.00	0.69
Total number of shocks squared	-0.35*	0.18	-0.39***	0.15
MLSFH wave				
2008 MLSFH wave (reference)	-	-	-	-
2010 MLSFH wave	-2.33***	0.42	-1.23***	0.39

Notes: *Malawi Longitudinal Study of Families and Health; p-values: *<0.10, **<0.05, ***<0.01

Background characteristics like age, education, and region of residence were not included in the fixed effects model because those variables are time-invariant in this sample. An expanded measure of marriage (separating never married from divorced/widowed) yielded the same results as above. Wealth was measured using principal components analysis of household assets.

Table 5: Fixed Effects Regression Results for the Effect of Shocks on Physical Health with Transfer Variables, MLSFH* Men and Women, 2008-2010

	Men		Women	
Physical Health	Coefficient	Std. Error	Coefficient	Std. Error
Background characteristics				
Not married (reference)	-	-	-	-
Married	0.13	1.16	-2.55*	0.90
Wealth	0.08	0.25	0.21	0.23
Shocks				
Total number of shocks	0.21	0.68	-0.19	0.59
Total number of shocks squared	-0.14	0.15	0.05	0.13
Transfer characteristics				
Total number of non-financial transfer partners	-0.05	0.33	0.44	0.31
Total number of non-financial transfer partners squared	-0.00	0.03	-0.05*	0.03
Distance to financial transfer partner	-1.12*	0.67	0.33	0.53
Distance to financial transfer partner squared	0.20*	0.11	-0.12	0.09
Distance to non-financial transfer partner	-0.18	0.24	0.13	0.27
MLSFH wave				
2008 MLSFH wave (reference)	-	-	-	-
2010 MLSFH wave	-2.24***	0.35	-2.22***	0.34

Notes: *Malawi Longitudinal Study of Families and Health; p-values: *<0.10, **<0.05, ***<0.01

We tried additional measures in these models, such as comparative wealth and same religious congregation, but removed them since their inclusion didn't change the results of interest, as described above. Background characteristics like age, education, and region of residence were not included in the fixed effects model because those variables are time-invariant in this sample.

Table 6: Fixed Effects Regression Results for the Effect of Shocks on Mental Health with Transfer Variables, MLSFH* Men and Women, 2008-2010

	Men		Women	
Mental Health	Coefficient	Std. Error	Coefficient	Std. Error
Background characteristics				
Not married (reference)	-	-	-	-
Married	2.37*	1.39	1.02	1.06
Wealth	0.49	0.30	-0.33	0.27
Shocks				
Total number of shocks	1.58*	0.82	1.02	0.69
Total number of shocks squared	-0.36**	0.18	-0.40***	0.15
Transfer characteristics				
Total number of non-financial transfer partners	1.01**	0.40	1.24***	0.36
Total number of non-financial transfer partners squared	-0.11***	0.04	-0.11***	0.03
Distance to financial transfer partner	1.21	0.81	-0.46	0.62
Distance to financial transfer partner squared	-0.16	0.13	0.17*	0.10
Distance to non-financial transfer partner	0.04	0.29	-1.07***	0.31
MLSFH survey				
2008 MLSFH wave (reference)	-	-	-	-
2010 MLSFH wave	-2.20***	0.42	-1.22***	0.39

Notes: *Malawi Longitudinal Study of Families and Health; p-values: *<0.10, **<0.05, ***<0.01

We tried additional measures in these models, such as comparative wealth and same religious congregation, but removed them since their inclusion didn't change the results of interest, as described above. Background characteristics like age, education, and region of residence were not included in the fixed effects model because those variables are time-invariant in this sample.

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Appendix: Attrition Analysis

Table A1: Differences in characteristics between respondents interviewed in 2008 and 2010 and those interviewed only in 2008

	Completed Survey in	
	2008 & 2010	2008 Only
Mean Age in 2008	41.8	41.1
Region		
Central	31.2	36.4***
South	33.4	38.0***
North	35.4	25.6***
Education		
No Education	25.1	25.2
Primary Education	63.2	60.5*
Secondary or Higher	11.7	14.3**
Marital Status		
Married	83.2	81.0
Not married	16.8	19.0
Health Status in 2008		
Physical Health	51.7	51.8
Mental Health	54.1	54.2
Wealth Score	0.04	-0.06
Total Shocks	1.7	1.8*

Individuals interviewed in 2008 only are significantly different from those interviewed in both waves at p-value: *<0.10, **<0.05, ***<0.01.