

The Effect of Expanded Access to Mental Health Care on Economic Status of Households with a Person with a Mental Disorder in Rural Ethiopia: A Controlled Before-After Study

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Abstract

Background

Poverty and mental illness are strongly associated. The aim of this study was to investigate the economic impact of implementing a district level integrated mental healthcare plan for people with severe mental disorders (SMD) and depression compared to secular trends in the general population in a rural Ethiopian setting.

Methods

A community-based, controlled before-after study design was used to assess changes in household economic status and catastrophic out-of-pocket (OOP) payments in relation to expanded access to mental health care. Two household samples were recruited, each with a community control group: (1) SMD sub-study and (2) depression sub-study. In the SMD sub-study, 290 households containing a member with SMD and 289 comparison households without a person with SMD participated. In the depression sub-study, 129 households with a person with depression and 129 comparison households. The case and comparison cohorts were followed up over 12 months. Propensity score matching and multivariable regression analyses were conducted.

Results

Provision of mental healthcare in the district was associated with a greater increase in income (Birr 919.53, 95% CI: 34.49, 4573.56) but no significant changes in consumption expenditure (Birr 176.25, 95% CI: -1338.19, 1690.70) in households of people with SMD compared to secular trends in comparison households. In households of people with depression, there was no significant change in income (Birr 227.78, 95% CI: -1361.21, 1816.79) or consumption expenditure (Birr -81.20, 95% CI: -2572.57, 2410.15). The proportion of households incurring catastrophic OOP payments at the $\geq 10\%$ and $\geq 40\%$ thresholds were significantly reduced after the intervention in the SMD (from 20.3% to 9.0%, $p=0.002$, and 31.9% to 14.9%, $p<0.001$) and in the depression intervention (from 19.6% to 5.3%, $p=0.003$, and 25.2% to 11.8%, $p=0.015$). Nonetheless, households of persons with SMD or depression remained impoverished relative to comparison groups at follow-up. Households of people with SMD and depression were significantly less likely to be enrolled in community-based health insurance (CBHI) than comparison households.

Conclusions

Our findings support global initiatives to scale up mental healthcare as part of universal health coverage initiatives, alongside interventions to support social inclusion and targeted financial protection for vulnerable households.

Introduction

In low-and middle-income countries (LMIC), severe mental disorders (SMD: psychosis and bipolar disorder) and depression are prioritized for intervention by the World Health Organization [1]. Both SMD and depression are associated with poverty, related to a reduction in earnings, higher health care costs and reduced economic productivity [2-5]. Indeed, healthcare costs are frequently 'catastrophic', defined as medical spending that exceeds some fraction of household income or consumption expenditure in a given period, usually one year [6]. In a recent study from Ethiopia, households of a person with SMD or depression were found to have less income, lower expenditure, to face higher catastrophic out-of-pocket healthcare payments (OOP) [7,8] and to have greater food insecurity than matched controls [9].

There is emerging evidence that well-targeted treatment and prevention programmes for mental illness could avoid years lived with disability, reduce stigma attached to mental illness, increase social inclusion, increase productivity of people with mental disorders [10, 11] and reduce poverty [12]. In a rural Ethiopian district, implementation of an evidence-based mental health care plan increased access to primary care-based mental health care for those living with SMD [13] and was associated with symptom reduction, improved functioning, reduced discrimination, decreased restraint [14] and improved food security in persons with SMD [15]. Expanding access to care for people with depression in India has been found to lead to significantly reduced health care costs [16]. However, most people with SMD or depression in low-income countries do not have access to effective care [17,18]. In a systematic review of randomized controlled trials for the treatment of SMD and depression on economic outcomes, findings were heterogeneous, with about two thirds of studies observing a positive association between change in household income and receipt of mental health interventions and one third provided mixed results for different subgroups [19].

Despite the accumulating evidence, previous intervention studies have often failed to include key economic outcomes (i.e. household income, consumption expenditure and catastrophic out-of-pocket payments) or to examine economic impacts of scale-up of mental health care in routine low resource settings. In LMICs the implementation of the WHO mhGAP (mental health gap action program) [1] that aims to expand access to mental healthcare through integration into general healthcare using task-sharing models is under way. In a review including 33 studies, WHO mhGAP had been implemented in varying global contexts and the mhGAP intervention guide had been used for training, clinical practice and to estimate total and incremental costs of scaled-up mental health service provision using economic models [20]. However, the impact of integrated district mental health programmes on economic outcomes of affected households in resource poor settings was seldom evaluated. This has limited the conclusions that can be drawn and weakened advocacy for increased investment in mental health.

To address these evidence gaps, the aim of this study was to evaluate the household economic impact of an integrated district level mental health programme using WHO mhGAP on people with SMD and depression in rural Ethiopia. We hypothesized that expanded access to evidence-based care in routine settings would yield improvements in household income, consumption expenditure and reduce catastrophic OOP health care payments for affected households.

Methods

Context of the study setting

Sodo district is in the Gurage zone, Southern Nations, Nationalities and Peoples' Region of Ethiopia, about 100 km south of the capital city, Addis Ababa. Sodo is a rural district organized in 58 villages (or '*kebeles*') with a total population of about 162,000 [21]. It was the setting for an implementation research project (the Programme for Improving Mental health care; PRIME) which evaluated the impact of integrating care for priority mental disorders into primary healthcare [22]. As part of PRIME, a participatory process was undertaken with stakeholders to develop, implement and evaluate a district level mental health care plan (MHCP) for people with depression, psychosis, epilepsy and alcohol use disorders [21]. Linked to PRIME, the Emerald project (Emerging mental health systems in low-and middle-income countries) aimed to investigate health system strengthening required to support implementation of the plan [23].

The mental health care plan (MHCP) intervention packages

The MHCP intervention packages have been described previously [21, 22]. In brief, the interventions were based on integration of mental health at three levels of the health system: the district health care organization (health system level), the health facility, and the community [22]. The aim of the community-level MHCP intervention packages was to improve access to care and social inclusion through community awareness-raising and stigma reduction, community case detection, support to continue engagement in care, and community-based rehabilitation. For this purpose, health extension workers, members of the health development army (a network of health volunteers), faith and traditional healers and community leaders were trained. The intervention was delivered through workshops and awareness-raising events. Building on their routine activities, the health extension workers were trained to provide outreach and adherence support to people with mental disorders. Community leaders and key informants were trained in case detection. The community advisory board brought together community leaders, multi-sectoral representation (e.g. police, education, non-governmental organisations), religious healers and caregivers/people with mental illness. The board played an important role in awareness-raising. Information leaflets were disseminated to households in the community to increase awareness.

At the health care facility level, the intervention packages focused primarily on building the capacity of clinical staff to detect and treat mental disorders using evidence-based guidelines. For this task, sensitization of all staff and training of clinicians was conducted for two weeks aimed at case detection, prescription of psychotropic medications, provision of basic psychosocial care, referral and ongoing care using the WHO mhGAP-Intervention Guide (mhGAP-IG) [1]. At the district organisation level, the intervention packages included sensitization, advocacy, resource allocation and monitoring and supervision to ensure ownership and sustainability. There were no direct interventions targeting improvements in economic status or catastrophic OOP health expenditure for households with persons with SMD and depression.

Study design and participants

A community-based, controlled before-after study design was used to assess changes in economic outcomes and catastrophic OOP healthcare payments at the household level over 12 months. Two household samples were recruited, each with its own comparison group: the SMD sub-study and the depression sub-study. In the SMD sub-study, 290 households containing a member with SMD and 289 comparison households without a person with SMD were enrolled at baseline between January and August 2015. A follow-up interview was conducted during January and August 2016 (Figure 1). For the depression sub-study, the baseline interviews took place between March and November 2015 and enrolled 129 households which included a person with depression and 129 households without depression. The follow-up survey was conducted between March and November 2016 (Figure 2).

Recruitment procedures

The recruitment methods and data collection procedures for the two sub-studies have been previously described [7]. Briefly, the sample for the SMD sub-study comprised households of community-ascertained people with possible SMD who attended the local health centre for treatment and were confirmed to have SMD (schizophrenia or other primary psychotic disorder or affective psychotic disorder) by psychiatric nurses using a semi-structured clinical interview (Operational Criteria for Research, OPCRIT) [24]. A census register of all households in the study area, developed by PRIME [25], was used as a sampling frame to select a comparison group of households. The comparison household was matched to the household of a person with SMD based on respondent characteristics (household head vs. other position in household), age (± 5 years), gender, *gott* (residential unit within the village) and household size. If there was more than one match for a case in a *gott* we used a lottery method for selection.

Sample two (for the depression sub-study) comprised households of people attending the health centre who were identified by primary care staff as either having a probable diagnosis of depression or who screened positive on the Patient Health Questionnaire, nine item version (PHQ-9) and were thought to require treatment [26]. The primary care workers had a clinical guideline (mhGAP) to assist them with their assessment [1]. The PHQ-9 has been validated in Ethiopia in primary care attendees in health centres in a district neighbouring the location of the current study [27]. The culturally validated cut-off to indicate probable depression is a PHQ-9 score of 5 or more. The control sample was drawn among people who attended the health centers on the same day as the person with depression but who did not have a primary care worker diagnosis of depression and who had a PHQ score < 5 , matched to the participant with depression by gender, age (± 5 years) and *gott*.

Inclusion criteria for households with a person with SMD or depression were: age 18 years and older, household included person identified by the psychiatric nurse or PHC worker as having SMD or depression, planning to stay resident in the district for the subsequent 12 months, and provided informed consent. The

comparison households were included based on the same criteria that were used to select the cases but with no family member with a suspected or confirmed mental health problem.

Sample Size

The sample size for the SMD sub-study was powered to detect a difference in household income level based on a South African study [2] with alpha = 0.05 and a power of 80%. Using the two-sample test of the mean sample size formula and allowing for loss-to follow-up, the required sample size was 300 per group. For the depression sub-study, based on a study from India [28] which found catastrophic expenditures were 14.6% and 4.9% for households that had members with depression and those that did not, respectively, to detect a risk ratio of 2.97 the resulting sample size was estimated to be 147 per group.

Primary outcome variables: the primary outcomes were change in economic status (income and consumption expenditure) and catastrophic OOP health care payments between enrollment (T1) and 12 months follow-up (T2)

Primary explanatory variables: Mental health status within the household (i.e. including a person living with SMD or depression vs. matched control households without affected persons)

Data collection and instruments

Household socioeconomic data were collected using an adapted and abbreviated version of the World Health Organization SAGE (Study of global AGEing and adult health) survey instrument, previously used in a study on health and ageing in six LMICs [29]. The SAGE instrument contains information on a variety of individual and household socio-economic attributes such as consumption expenditure, income, assets, outstanding debts, household demographics, employment, health conditions and household coping strategies when experiencing financial difficulty.

Disability was assessed using the 36-item fully structured interviewer administered version of the World Health Organization Disability Assessment Schedule second version (WHODAS-II) [30]. Total WHODAS-II polytomous summary score ranged from zero to 100, with higher numbers indicating greater impairment of day-to-day functioning. The Amharic version of this instrument was validated for people with SMD in Ethiopia previously [31]. The Brief Psychiatric Rating Scale- Expanded (BPRS-E) was used to assess symptom severity in people with SMD. The BPRS-E is a 24-item observer-rated symptom scale covering four domains of symptoms of SMD (positive symptoms, negative symptoms, anxiety and depressive symptoms, and manic excitement or disorganization) and gives an overall indication of clinical symptom severity [32,33] and can detect improvement in response to an intervention [34].

All instruments were translated into Amharic and pilot tested in a district neighbouring the location of the current study area before use. Household Interviews were conducted by trained data collectors and supervisors within 2 to 4 weeks of screening and recruitment by PRIME. The interview was administered to the head of the household. In the absence of the head of the household the most knowledgeable person on household finance was interviewed. Repeat contact attempts were made for up to three visits to household participants who were unavailable. Completed questionnaires were checked for completeness and consistency. Identified incomplete responses and errors were sent back to the field for verification before data entry.

Household income

Income is the value of household agriculture and livestock output, wages, rental property, trade, savings and grants, transfers from families, community groups, government and from other sources for a different time periods (either daily, weekly, monthly or annually). Income from different sources were summed and converted to their annual equivalents and adjusted for household size and composition using a standard (equivalence) scale, the modified OECD scale. This information helps to establish household members are equalized or made equivalent by weighting each according to their age and household position. Accordingly, the scale scores 1 to the first adult, 0.5 to the second and each subsequent person aged 14 years and over and 0.3 to each child aged under 14 years [35].

Household consumption expenditure

Our measure of consumption expenditure was consumption of food produced by the household or purchased in the market-place or given in kind to the household and consumption of non-food items for daily use, consumption of consumer durables, consumption of health care goods, consumption related to transfers out to the community. The survey collected the monetary value of 36 food items consumed in the last seven days and consumption expenditure of 34 non-food items in the past month or year, depending on the item. All consumption expenditures were then converted to their annual equivalents in terms of Ethiopian Birr and in per adult equivalent terms [35].

Catastrophic OOP health care payments

In the literature, a number of possible thresholds to define catastrophic expenditure have been proposed [6, 36 - 39]. The most widely used is expenditure that amounts to 10 percent or more of total household expenditure, with the rationale that this represents an approximate threshold at which the household is forced to sacrifice other basic needs [40, 41]. Other studies have used the cutoff value of 40 percent or more of non-food expenditure [42, 43]. In this study, catastrophic OOP payments for health care were measured as the percentage of households incurring health payments in excess of 10% of total

household consumption expenditure and $\geq 40\%$ of a household's capacity to pay (i.e. non-food expenditures) over one year [6]. We broke down the consumption aggregate into food and non-food consumption expenditures to estimate the household's capacity to pay.

Age of the head of the household, sex, education, residential location (rural/urban), severity scores of mental health symptoms, disability scores and duration of treatment engagement were considered as potential confounding factors. Level of engagement with mental health care was measured by the number of contacts made during the 12-month follow-up period. This information was extracted from a follow-up registry.

Statistical Analysis

We fitted two separate regression models to address two questions

1. Hypothesis-driven analysis that the change in economic status in households of people with SMD or depression will be greater than secular trends in the general population.

2. An exploratory analysis to examine baseline factors associated with change in economic status in households of people with SMD or depression (i.e. not including the comparison groups).

For the first question, the primary analysis of change in economic status (income, consumption expenditure) and catastrophic OOP health care expenditures were conducted using summary statistics. Chi squared test (χ^2), Wilcoxon rank sum (Mann–Whitney U test), Wilcoxon signed-rank test, proportions and Student's *t* statistics were used. However, before further analysis, propensity scores (PS) were estimated for each treated and comparison subject by means of a probit regression model including potential confounders (age, gender, education, residence and household size). The estimated score was then used to match each household of a person with SMD or depression with comparison households (with no affected person) using a kernel matching estimator [44]. An important precursor to ensure the quality of matches is to impose what is known as “the common support condition” [45]. The common support is the overlapping region of the propensity score for the two groups to be compared (supplementary figures 1 and 2). The regression adjusted estimates were used to identify the independent effects of the district MHCP on household income and consumption expenditure for households of persons with SMD or depression versus comparison households.

For the second question we used Ordinal Least Square (OLS) regression estimates to identify factors associated with changes in income or consumption expenditure in households of people with SMD or depression. The regression analyses were adjusted for household demographic, economic and clinical characteristics. Regression analyses were preceded by normality, multicollinearity and omitted variable bias tests [46]. Variance inflation factor tests confirmed that multicollinearity was minimal (all variance inflation factors < 3.0). All data were analyzed using STATA software, version 14.1 (STATA Institute Inc.) [47]. Results were considered statistically significant at $p < 0.05$.

Results

Participant retention, baseline demographic and clinical characteristics

At the follow-up time point (12 months), interviews were conducted with 284 (97.9%) households of a person with SMD and 281 (97.2%) comparison households. In the depression study, at the 12 month follow-up, 120 (93.0%) households of a person with depression and 118 (91.4%) comparison households were resurveyed. Combining the studies, 803 (96%) participants completed the follow-up survey. For the SMD sub-study the lost to follow-up sample did not significantly differ from the retained sample on most demographic characteristics. However, in the depression sub-study, those lost to follow-up were significantly different from those that completed the follow-up on two characteristics: smaller household size ($p=0.011$) and higher household income ($p=0.020$) (Table 1).

Table 2 presents the full distribution of socio-demographic, economic and clinical characteristics for baseline and follow-up per group. Participants in the SMD sub-study were slightly older (mean age 50 years for SMD households and 51 years for comparison households) than those in the depression sub-study (47 years for depression households and 44 years for comparison households). We found no evidence of significant differences in family size, residence and education level of the heads of households for the SMD vs comparison households. However, the proportion of household heads with no formal education was higher for households of persons with depression compared to households with no affected member: 63.3% vs. 42.4% ($\chi^2 = 10.68$, $p = 0.005$). In both SMD and depression households, over 20% of households were headed by females and more than two thirds were married.

Over the 12-month follow-up period, the mean number of follow-up appointments for people with SMD and depression in the PRIME intervention was 4.1 (SD 2.4) and 2.5 (SD 1.2), respectively. At follow-up, in households of people with SMD and comparison households, there were significant differences in enrolment in community-based health insurance (CBHI), 9.2% vs. 20.0% ($\chi^2 (1)=13.34$; $p<0.001$). Similarly, a significantly lower proportion of households with a person with depression (15.8%) were part of CBHI compared to the unaffected households (30.9%) ($\chi^2 = 10.41$; $p=0.001$).

Change in household income

Table 3 shows household income, consumption expenditure and catastrophic OOP payment at T1 and at T2 for each group. In households of a person with SMD, the average household income was significantly higher at T2 than T1 (T1 Birr 5984.53; SD 23115.77 vs. T2 Birr 7355.16; SD 20401.11; $Z = 8.137$,

$p < 0.001$) but there was no significant change in the comparison households (T1 Birr 6990.72; SD 22796.01 vs. T2 Birr 7452.79; SD 1771.94; $Z = 0.908$, $p = 0.364$).

Similarly, in the depression sub-study, there was a significant increase in the mean income for households with a person with depression (T1 Birr 4815.60; SD 4593.79 vs. T2 Birr 5981.33; SD 5168.23; $Z = 2.847$, $p = 0.004$) but no significant change in the comparison households (T1 Birr 6368.36; SD 6359.20 vs. T2 Birr 7383.35; SD 6572.93; $Z = -0.588$, $p = 0.101$).

The change in income from T1 to T2 was significantly higher in households of people with SMD compared to comparison households [Birr 1370.63 (SD 9493.37)] versus Birr [462.07 (SD 28402.75); $Z = 2.931$, $p = 0.036$]. However, there was no significant difference in the change in income in households in the depression group [Birr 1165.73 (SD 5413.44)], versus [Birr 1130.85 (SD 7449.31)] in the comparison households ($Z = -0.967$, $p = 0.556$).

Change in household consumption expenditure

In the SMD sub-study, the consumption expenditure scores improved in both households with a person with SMD [T1 Birr 10156.47 (SD 8289.02) to T2 Birr 12414.44 (SD 10130.52) ($Z = 4.567$, $p < 0.001$)] and in the comparison group (T1 Birr 10749.43 (SD 8030.55) to T2 Birr 12803.43 (SD 9380.46) ($Z = 4.040$, $p < 0.001$). However, these changes in consumption expenditure did not differ significantly between the households with a person with SMD and the comparison group ($Z = -0.100$, $p = 0.920$).

In the depression sub-study, consumption expenditures showed no significant improvement in either group (depression households: T1 Birr 10526.58 (SD 7710.99 to T2 Birr 10969.00 (SD 6105.01) and comparison households: T1 Birr 13205.65 (SD 10317.37) to T2 Birr 14091.84 (SD 10498.60). There was no evidence of significant differences in the changes in consumption expenditure between households with a person with depression (Birr 442.48; SD 9266.97) and comparison households (Birr 886.19; SD 10271.40); $p = 0.956$.

Overall, although there is a change in income and consumption expenditure at 12 months follow up, households of persons with SMD or depression earned less and consumed less than the comparison households (Table 3).

Change in catastrophic OOP health care expenditure

Catastrophic OOP health care expenditure at the 10% threshold level of total consumption, decreased from 20.3% to 9.0% ($p = 0.002$) between T1 and T2 in households with a person with SMD compared to a change from 15.6% (T1) to 8.2% (T2) ($p = 0.035$) in the comparison group. The reduction in catastrophic OOP expenditure did not differ significantly between households of a person with SMD and the comparison group ($p = 0.808$).

At the 40% threshold level of non-food consumption, the percentage of households of people with SMD facing catastrophic OOP healthcare expenditure reduced from 31.9% at T1 to 14.9% at T2. This change of -17.0% (95% CI -25.1, -8.8) was statistically significant ($p < 0.001$). In the comparison households, the percentage of households experiencing catastrophic OOP healthcare expenditure at T1 and T2 was 18.2% and 10.5%, respectively. This reduction of -7.6% (95% CI -16.2, 0.9) was not statistically significant ($p = 0.074$). At the 40% threshold, we observed a non-significant difference ($p = 0.144$) in the proportions of households incurring catastrophic OOP healthcare expenditure between households with a person with SMD and the comparison group.

In the depression sub-study, the proportion of households experiencing catastrophic OOP health care expenditure at the 10% threshold decreased significantly and by a greater extent in the depression households (-14.3%; 95% CI -23.0, -5.4; $p = 0.002$) than the comparison group (-8.0%; 95% CI -16.5, 0.3). However, the between-group difference was not statistically significant ($z = -1.812$, $p = 0.070$). At the 40% threshold level, catastrophic OOP healthcare expenditure in the depression households declined by -13.4% (95% CI -23.9, -2.8; $p = 0.015$) compared with -11.1% (95% CI -22.2, 0.1; $p = 0.056$) in the comparison group. However, there was no significant difference in the proportion of households experiencing catastrophic OOP health care expenditure in the two groups ($p = 0.779$) (Table 3).

Multivariable analysis of changes in income and consumption expenditure

Propensity score match with regression adjustment estimates for changes in income and consumption expenditure for the households with a person with SMD or depression versus comparison households are presented in Table 4 and Table 5.

Households of people with SMD had a significantly greater change in income (adjusted mean difference: Birr 919.53; 95% CI 34.4, 4573.5) after adjusting for changes in comparison groups and other covariates ($p = 0.032$). However, the change in consumption expenditure for households of people with SMD was non-significantly different to the comparison group (Birr 176.25 (95% CI -1338.1, 1690.7); $p = 0.890$).

In the depression sub-study, there was no significant improvement in either household income or consumption expenditures in households of people with depression compared to the comparison households (Change in income: Birr 227.78 (95% CI -1361.2, 1816.7); change in consumption expenditure Birr -81.20 (95% CI -2572.5, 2410.1)).

Factors associated with change in income and consumption expenditure in households of a person with SMD or depression (exploratory analysis)

Supplementary Table 1 and 2 provide estimates of the effect of baseline functioning, economic and socio-demographic measures on changes in income and consumption expenditures for the households. We find a negative impact of baseline WHODAS score on the probability of having a change in income. A 1-point increase in baseline WHODAS complex score was associated with a decrease in income by Birr -7.25 in the households of people with SMD and Birr -2.36 in the depression households. However, the coefficients lacked statistical significance and the magnitudes were small.

Treatment attendance was positively but not significantly associated with change in income. A 1 appointment increase in treatment follow-up was associated with Birr 401.48 (95% CI -443.47, 1246.44) increase in household income for the SMD households and Birr 105.59 (95% CI -320.64, 531.83) for the depression households.

Household debt was associated negatively with changes in consumption expenditure in both SMD and depression groups; although neither of these relationships were significant. Households headed by women, in a rural residence and not attending formal education predicted negative income or consumption changes, whereas having a male household head, urban residence and higher education were related to positive change in income and consumption expenditures. In the SMD sub-study, a 1 Birr higher baseline income and baseline consumption reduced income change by Birr 0.19 and consumption by Birr 0.27, respectively. Similarly, in the depression sub-study, a 1 Birr higher in baseline income and baseline consumption reduced income change by Birr 0.43 ($p < 0.001$) and consumption change by Birr 0.86 ($p < 0.001$).

The correlation between change in income ($r = 0.35$) and change in consumption ($r = 0.24$) for SMD and depression were weak.

The odds of incurring catastrophic OOP payments were significantly lower in households enrolled in CBHI for both SMD (OR 0.12; 95% CI 0.02, 0.50, $p = 0.004$) and depression households (OR 0.09; 95% CI 0.01, 0.71, $p = 0.023$).

Discussion

To the best of our knowledge, very few studies have addressed the impact of an integrated mental health programme on household economic status in LMICs [12, 48]. In our study a district mental health care programme was associated with a significant increase in household income but had no effect on consumption expenditure in households of people with SMD over 12 months of follow-up. However, there was no impact on household income or consumption expenditure of households with a person with depression after adjusting for secular trends. Catastrophic OOP healthcare costs reduced significantly in all households and were significantly lower in households of people with SMD and depression that were covered by community-based health insurance. Households with a person with SMD or depression remained poorer relative to the comparison groups at follow-up.

Consistent with our findings, improved household income following interventions for people with SMD has been shown in non-randomized studies [12, 48]. In an uncontrolled before-after study among 203 participants with diagnoses of schizophrenia, bipolar disorder and depression in Kenya, a district level mental health intervention was associated with improved household income [12]. Family-based community rehabilitation including drug treatment and psychoeducation significantly decreased family economic burden, increased family employment, and increased the working ability of patients with mental health conditions in China [49]. In a randomized control trial, group inter-personal psychotherapy for depression was associated with significant improvements in daily economic tasks among women (however not among men) in Uganda [50].

In our findings, post intervention data indicated statistically non-significant improvements in household consumption expenditures in the SMD intervention group but not in the depression intervention group. Unexpectedly, the estimated result showed that change in consumption was negative in the households of person with depression intervention albeit that this result was positive in the descriptive analysis and the change was non-significant. It is difficult to explain why this has happened, but the finding may reflect the low treatment follow-up of people with depression and higher attrition among the better-off in this group. Moreover, the baseline income and consumption expenditure levels appeared to be lower for the intervention households. However, it is the difference between the time periods for the two groups which is important for the comparison rather than the comparison between the two groups. Overall, changes in consumption in both SMD and depression intervention groups were low when compared to changes in income. This might be due to the high inflation rate (i.e. as much as 15%) consistently happening in Ethiopia over the follow-up time period. In Kafle et al.'s (2016) study on household consumption using panel data from Ethiopia, there was a statistically significant drop in mean household consumption from 5,378 Birr/person in 2012 to 4,973 Birr/person in 2014 suggesting that consumption poverty has largely remained the same across the two periods [51].

Regarding factors associated with changes in income and consumption expenditures, the estimates of the probability of household demographic characteristics, including sex, residence and education of the household head, were not significantly associated in households with a person with SMD or depression. However, baseline income was negatively correlated with change in income; similarly, baseline consumption was negatively correlated with change in consumption. This result could be explained by regression-to-the-mean or could also reflect the potential capacity of poorer households to benefit more.

Treatment attendance was associated with a non-significant increase in income or consumption. Reverse causality may complicate interpretation of this finding in a setting where a minority of people received minimally adequate care [14]; attendees may therefore be dominated by more severely unwell people who are less likely to have good economic outcomes over a 12 month period.

Previous studies reported antipsychotic medications have a proven effect on symptom reduction [15,34,52] and productivity [53] which might have a positive return on income. These are likely to be influenced by the availability and adherence to antipsychotic medication. However, the accumulated disadvantage experienced by a household with a person with mental illness is not expected to be reversed by medication alone. There is clear evidence of exclusion as shown in the coverage of CBHI. In an earlier study from the same population, improvements in food security were determined to be mediated by a reduction in discrimination [15]. Thus, interventions to address exclusion and poverty will be needed, in addition to access to adequate evidence-based mental health care.

Our analysis suggests that catastrophic OOP healthcare expenditures over the follow-up period declined remarkably in both households of people with mental illness and the comparison groups. These changes can be in part attributed to the availability of district mental health interventions for the cases and the higher enrollment to the CBHI by the comparison groups (i.e. two times higher than the cases). We are not aware of controlled intervention studies or a non-randomized trial that has documented an intervention effect on catastrophic OOP health care expenditure among households of people with SMD or depression in order to compare the results.

Earlier studies reported that having health insurance reduced the odds of incurring catastrophic OOP health care expenditure, increased service utilization and had an impact on household economic welfare [54-57]. Nonetheless, the proportion of households with catastrophic OOP healthcare expenditure was still high among the intervention groups at follow-up. This may cause many who do receive treatment to drop out before completing treatment due to inability to pay for health care, as indicated by qualitative exploration in this study sample [58]. Moreover, the high catastrophic OOP health care expenditure at 12 months reflects the need for greater, not less, financial protection for these households. At present, health care financing reforms in Ethiopia have not fully addressed the needs of this key vulnerable population.

The lack of financial protection for people with SMD and depression is likely to reinforce a vicious cycle of higher out-of-pocket payments and greater impoverishment [7]. Our findings of high drop out from treatment is striking and reinforces what respondents have reported that they reduce the frequency of medical visits as a strategy for coping with financial difficulty. In a previous study from Ethiopia, it was reported that poverty was one of the most potent reasons that affected treatment engagement [58].

The study demonstrated the spillover effect of mental illness on household livelihood. It prevents income generation activities for the household, induces high out-of-pocket payments to pay for health care and impacts negatively on consumption of the household [59]. Therefore, these households need to be supported, for example, through micro-financing or cash transfer schemes and provided with financial risk protection against catastrophic OOP payments. Moreover, as set out in the earlier study from Ethiopia [60], more equitable and sustainable mental health financing may contribute to accessing mental health care. In our CBHI enrollment data, households in SMD or depression intervention groups were significantly lower than for the comparison households to be a member of CBHI. There could be discrimination or social exclusion that act as a barrier to households with SMD getting CBHI even though they are the households that need it most. Due to their lower socioeconomic status, households of persons with SMD or depression may be less able to afford to pay the contribution, even though it is considered to be nominal. A fee-waiver or exemption mechanism must target these vulnerable groups of the society.

Strengths and limitations

The study offers some insight into the effectiveness of the district mental health care plan on household economic outcome in households of people with SMD and depression that received the interventions. However, the basic problem for any program evaluation is to identify and quantify a counterfactual outcome. Our study included a comparison group of households without a person with a mental health condition which enabled us to assess whether the observed changes are over and above those resulting from secular trends. The other strength was the prospective nature of data collection. Moreover, in the study area we are not aware of any development assistance projects or programmes targeting households of people with SMD or depression which might confound our result. It could be argued that, in an agriculture-dominated subsistence economy, significant changes in economic outcome for households of persons with SMD or depression are likely to take longer than a year to occur. Nonetheless, our findings indicate that some economic benefits can happen earlier. Like other studies that investigated household economic status, we had to rely on self reported income and consumption expenditures. Thus, recall and reporting bias cannot be excluded. In the depression sub-study the sample size was small which meant that we may have lacked adequate statistical power to detect a difference. We did not include transportation cost in our estimation of catastrophic OOP payment which might have underestimated our results. We were not able to compare households of people with SMD or depression who were in the district where the mental health programme was implemented to districts with no programme, because of ethical concerns. Any observational study is susceptible to residual confounding. Therefore, the existence of endogeneity cannot be ruled out although we have controlled for various observable demographic and economic variables. Co-morbid physical and mental health conditions in households in our samples were not assessed. This may overestimate the observed OOP health care expenditure.

Conclusions

Our findings support global initiatives to scale up mental healthcare, alongside interventions to support social inclusion and targeted financial protection for vulnerable households as part of universal health coverage initiatives.

Abbreviations

BPRS-E: Brief psychiatric rating scale, Expanded version; Emerald : Emerging mental health systems in low- and middle-income countries; GDP: Gross domestic product; LMICs: Low- and middle-income countries; OCRPIT: Operational criteria checklist for psychotic illness and affective illness; OECD: Organization of economic co-operation and development; OLS: ordinary least squares; PHQ-9: Patient health questionnaire – 9 item; PRIME: Programme for improving mental health care; SAGE: Study on global Ageing and adult health; SMD: Severe mental disorder; VIF: variance inflation factor; WHO: World Health Organization; WHODAS: WHO disability assessment schedule; MHCP: mental Health Care Plan; UHC: Universal health coverage; MhGAP-IG: Mental health Gap Action Programme Interventions Guide.

Declarations

Availability of data and materials

The dataset used and/or analysed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable

Ethics approval and consent to participation

Voluntary informed, written consent was obtained from all study participants prior to their inclusion in the study. Ethical approval was obtained from the Institutional Review Board of the College of Health Sciences, Addis Ababa University (Reference numbers 074/13/Psy and 023/15/SPH), King's College London, and the Ethics Review Committee of the World Health Organization (RPC 619).

Contributors

YM, DHM, CL, SD, DC and CH designed the study. YH, SD analyzed the data. YH drafted the manuscript and received critical feedback from CH, KT, AF, AA, GM, CL, SD, DC and DHM. All co-authors (DHM, KT, AF, AA, GM, CL, SD, DC and CH) read and approved the final version of the manuscript.

Conflict of Interest

None declared.

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Tables

Table 1

Characteristics of household participants who did and did not complete follow-up assessment

Variables	Severe mental disorders sub- study			Depression sub-study		
	Follow-up (n=565)	No follow-up (n=14)	P	Follow-up (n=238)	No follow-up (n=20)	P
Demographic variables						
Age, mean (SD)	49.7 (14.1)	49.9 (16.6)	0.960	45.0 (13.5)	45.4 (16.9)	0.902
Household size ,mean (SD)	5.2 (2.1)	5(2.9)	0.673	5.1 (2.0)	3.9 (2.1)	0.011
Residence [‡] (rural), n(%)	462 (81.8)	10 (71.4)	0.315	192 (80.7)	15(75.0)	0.541
Gender (female), n(%)	137 (24.4)	5(35.7)	0.333	48 (20.4)	7(35.0)	0.128
Education [†] (Formal education), n(%)	356 (63.4)	7(50.0)	0.307	137(58.6)	11(55.0)	0.758
Economic variables						
Household income, median (IQR) [†]	3166.6 (1730.7, 5555.5)	3125.0 (2080.0, 4000.0)	0.991	3583.3 (2352.9, 6896.5)	5720.2 (3640.3, 10874.3)	0.020
Household consumption, median (IQR) [†]	8412.6 (5350.1, 12938.3)	8935.2 (4520.0, 11672.7)	0.987	9436.6 (5795.8, 14270.2)	9461.1 (7202.6, 17797.8)	0.653
Clinical variables						
WHODAS complex score, median (IQR) [§]	25 (5.5, 55.5)	27.7 (2.7, 52.7)	0.864	31.94 (16.6, 48.6)	33.3 (19.4, 45.8)	0.649
BPRS-E score, mean (SD) [§]	47.3(16.7)	42.0 (15.0)	0.436	-	-	-
PHQ-9, mean (SD) [§]	12.7(5.4)	17.5(4.8)	0.034	11.0(4.5)	9.8(4.1)	0.491
[†] =Birr; US\$1= Birr 20.69 (2015); [§] Index person; P value for Wilcoxon rank sum test (for comparison of medians , t-test for means and Pearson's χ^2 for categorical variables. Residence [‡] categorized by rural or urban location; Education [†] categorized as(no formal education, primary education and more than primary), WHODAS (World Health Organization Disability Assessment Scale); IQR (Inter-Quartile Range); SD (Standard Deviation); BPRS-E (Brief Psychiatric Rating Scale, Expanded version), PHQ-9 (Patient Health Questionnaire item-9)						

Table 2

Households characteristics at enrollment(T1) and follow-up(T2)

Variables	SMD sub- study				Depression sub- study			
	T1		T2		T1		T2	
	SMD intervention	Comparisons for SMD	SMD intervention	Comparison for SMD	Depression intervention	Comparisons for depression	Depression intervention	Comparisons for depression
	N=290	N=289	N=284	N=281	N=128	N=129	N=120	N=118
Age, in years, mean (SD)	49.5 (14.3)	49.9 (14.0)	49.8(14.4)	51.1 (14.4)	46.3 (12.6)	44.2(13.8)	46.5 (15.4)	43.8 (14.6)
Household size, mean (SD)	5.2 (2.3)	5.3(2.1)	5.0 (2.1)	5.2 (2.1)	5.1(2.1)	5.0 (2)	5.2(2.1)	5.4 (2.1)
Education, no. (%)								
No formal education	185(63.8)	179(61.94)	184(64.8)	186(66.2)	82(64.1)	67(52.4)	76* (63.3)	50 (42.4)
Primary education	76(26.2)	83(28.72)	65(22.9)	67(23.8)	32(25.0)	36(28.1)	29 (24.2)	42(35.6)
More than primary	29(10.0)	27(9.34)	35(12.3)	28(10.0)	14(10.9)	25(19.5)	15 (12.5)	26(22.0)
Gender, no. (%)								
Male	210(72.7)	223(78.0)	200(70.4)	212(75.4)	102(80.3)	98(76.6)	96(80.0)	91(77.1)
Female	79(27.3)	63(22.0)	84(29.6)	69(24.6)	25(19.7)	30(23.4)	24(20.0)	27(22.9)
Residence, no. (%)								
Rural	236(81.4)	236(81.7)	231(81.6)	230(81.9)	104 (80.6)	103(79.8)	98(81.7)	94(79.7)
Urban	54(18.6)	53(18.3)	52(18.4)	51(18.1)	25(19.4)	26(20.2)	22(18.3)	24 (20.3)
With health insurance, no. (%)								
Yes	3(1.0)	8(2.8)	26**(9.2)	56(20.0)	3(2.4)	9(7)	19*** (15.8)	40(30.9)
No	286(99.0)	279(97.2)	258(90.8)	224(80.0)	124(97.6)	119(93)	101(84.2)	78(66.1)
Marital status, no. (%)								
Never married	20 (6.9)	5 (1.7)	13(4.6)	3(1.1)	4(3.2)	6(4.7)	1(0.8)	5 (4.2)
Married	205(70.9)	223 (77.7)	203(71.7)	215(76.5)	103(81.7)	98(76.6)	99(83.2)	94 (79.7)
Separated/divorced/widowed	64 (22.2)	59 (20.6)	67(23.7)	63(22.4)	19(15.1)	24(18.7)	19(16.0)	19 (16.1)
Clinical characteristics								
WHODAS complex score, median (IQR) §	52.8*** (30.6, 69.4)	5.6(0, 19.4)			33.3(16.6, 47.2)	-		-
BPRS-E score, median (IQR) §	47 (35,5)	-			-	-		-
PHQ-9, median (IQR) §	12(9,1)				10 (8,1)	-		

§Index person; WHODAS (World Health Organization Disability Assessment Scale); IQR (Inter-Quartile Range); SD (Standard Deviation); BPRS-E (Brief Psychiatric Rating Scale, Expanded version), PHQ-9 (Patient Health Questionnaire item-9) t-test, Mann-Whitney U test and chi-square statistics are used for continuous and dummy variables, respectively; P<0.05*;P<0.01**;P<0.001***.

Table 3

Household income, consumption expenditure and catastrophic OOP healthcare expenditure at T1 and T2

Outcome Variables	Severe mental disorder(SMD) sub-study			Depression sub-study		
	SMD intervention group	Comparison group	P value† (change of changes; SMD intervention Vs. comparison)	Depression intervention	Comparison group	P value † (change of changes; depression intervention Vs. comparison)
Income, Mean(SD) †						
T1	5984.5 (23115.7)	6990.7 (22796.0)		4815.6 (4593.7)	6368.3 (6359.2)	
T2	7355.1 (20401.1)	7452.7 (1771.9)		5981.3 (5168.2)	7383.3 (6572.9)	
Change (T2 vs. T1)	1370.6 (9493.3)	462.0 (28402.7)		1165.7 (5413.4)	1130.8 (7449.3)	
P-value(T2 vs. T1)‡	<0.001	0.364	0.036	0.004	0.101	0.556
Consumption, Mean(SD) †						
T1	10156.4 (8289.0)	10749.4 (8030.5)		10526.5 (7710.9)	13205.6 (10317.3)	
T2	12414.4 (10130.5)	12803.4 (9380.4)		10969.0 (6105.1)	14091.8 (10498.6)	
Change (T2 vs. T1)	2251.3 (7894.5)	2054.0 (10140.7)		442.48 (9266.9)	886.1 (10271.4)	
P-value(T2 vs. T1) ‡	<0.001	<0.001	0.920	0.141	0.167	0.956
COOPHE (≥10% of TC)						
T1, % (CI)	20.3(15.2, 25.4)	15.6(9.0, 22.2)		19.6(12.1, 27.1)	12.1(5.1, 19.2)	
T2,% (CI)	9.0(4.5, 13.5)	7.4(3.2, 11.6)		5.3(0.7, 9.9)	4.1(0.4, 8.6)	
Change(T2-T1),% CI	-11.2(-18.6, -3.9)	-8.2(-16.0, -0.3)		-14.2(-23.0, -5.4)	-8.0(-16.5, 0.3)	
P-value(T2 vs. T1)	0.002	0.034	0.578	0.002	0.069	0.070
COOPHE (≥ 40% of NFC)						
T1, % (CI)	31.9(26.0, 37.8)	18.2(11.1, 25.3)		25.2(17.0, 33.4)	20.7(11.9, 25.5)	
T2,% (CI)	14.9(9.3, 20.5)	10.5(5.6, 15.5)		11.8(5.2, 18.3)	9.5(2.8, 16.3)	
Change(T2-T1), % CI	-17.0(-25.1, -8.8)	-7.6(-16.2, 0.9)		-13.4(-23.9, -2.8)	-11.1(-22.2, 0.1)	
P-value (T2 vs. T1)	<0.001	0.074	0.144	0.015	0.056	0.779
<p>†=Birr; US\$1= Birr 20.69 (2015);COOPHE= catastrophic out-of-pocket health care expenditure, CI(confidence interval), IQR (Inter-Quartile Range);</p> <p>‡Between-group(intervention vs. comparison) differences-in-differences (changes over time) were compared by means of the Wilcoxon rank-sum test(Mann-Whitney U test). ‡ Within-group differences (T1 vs. T2) were compared by means of the Wilcoxon signed-rank test; TC= total consumption; NFC= non-food consumption</p>						

Table 4

Regression estimates for change of changes in income and consumption expenditure for SMD intervention group and covariates

I. Household income		
Variables	Change in income [†]	
	Unadjusted model	Adjusted model
	β (CI)	β (CI)
SMD intervention group	908.56* (89.93 , 4407.05)	919.53* (34.49, 4573.56)
Female household head	-1607.08(-2501.167, 5715.33)	-917.75 (-4973.57, 6809.07)
No formal education	-1773.42(-1869.01, 5415.85)	-1554.47 (-2226.60 , 5335.56)
Rural residence	-368.37(-4910.85, 4174.11)	-588.24 (-4189.46, 3012.96)
Baseline income	-0.575(-0.634, -0.516)***	-0.577* (-1.05, -0.100)
Baseline WHODAS	29.67(-33.87, 93.22)	-8.43 (-45.5, 28.72)
II. Household consumption expenditure		
Variables	Change in consumption expenditure [†]	
	Unadjusted model	Adjusted model
	β (CI)	β (CI)
SMD intervention group	186.30 (-1317.95, 1690.56)	176.25 (-1338.19, 1690.70)
Female household head	-255.83(-1500.25, 2011.93)	-341.01 (-1544.13, 2226.15)
No formal education	-9.02(-1569.54, 1551.50)	-100.99 (-1772.70, 1570.72)
Rural residence	-643.41(-1310.06, 2596.89)	-568.91 (-1891.03 , 3028.86)
Baseline consumption	-0.406***(-0.491, -0.320)	-0.434**(-0.698, -0.170)
Household debt	-0.059(-0.212, 0.332)	-0.051 (-0.364, 0.466)
[†] =Birr; US\$1= Birr 20.69 (2015); P<0.05*; P<0.01**; P<0.001***.; WHODAS (World Health Organization Disability Assessment Scale); Reference group (Comparison household without SMD ; male household head, primary or above in education ; urban residence).		

Table 5

Regression estimates for change of changes in income and consumption expenditure for the depression intervention group and covariates

I. Household income		
Variables	Change of changes in income [†]	
	Unadjusted model	Adjusted model
	β (CI)	β (CI)
Depression intervention group	34.90(-1626.00, 1695.80)	227.78 (-1361.21, 1816.79)
Female household head	-431.14(-2433.58, 1571.29)	-637.87 (-2231.91, 956.16)
No formal education	83.77(-1560.44, 1727.98)	-412.09 (-1261.61, 2085.80)
Rural residence	-1797.25(-3887.63, 293.12)	-1661.09 (-4467.44,1145.26)
Baseline income	-0.610***(-0.737, -0.483)	-0.621***(-0.0896, -0.347)
Baseline WHODAS complex score	31.75(-19.37, 82.884)	-3.70(-42.55, 49.96)
II. Household consumption expenditure		
Variables	Change of changes in consumption expenditure [†]	
	Unadjusted model	Adjusted model
	β (CI)	β (CI)
Depression intervention group	-443.70(-2941.06, 2053.65)	-81.20 (-2572.57, 2410.15)
Female household head	-1779.75(-4789.61, 1230.10)	-1682.79 (-4139.22, 773.62)
No formal education	-1233.51(-3705.49, 1238.47)	-695.55 (-3415.36, 2024.25)
Rural residence	-1243.83(-4402.77, 1915.11)	-904.41 (-4187.84,2379.00)
Baseline consumption	-0.616***(-0.727, -0.505)	-0.072 (-0.196, 0.342)
household debt	0.080(-0.229, 0.391)	-0.072 (-0.196, 0.342)

[†] =Birr; US\$1= Birr 20.69 (2015); P<0.001***; WHODAS (World Health Organization Disability Assessment Scale); Reference group (Comparison household without depression, male household head, primary or above in education , urban residence).

Figures

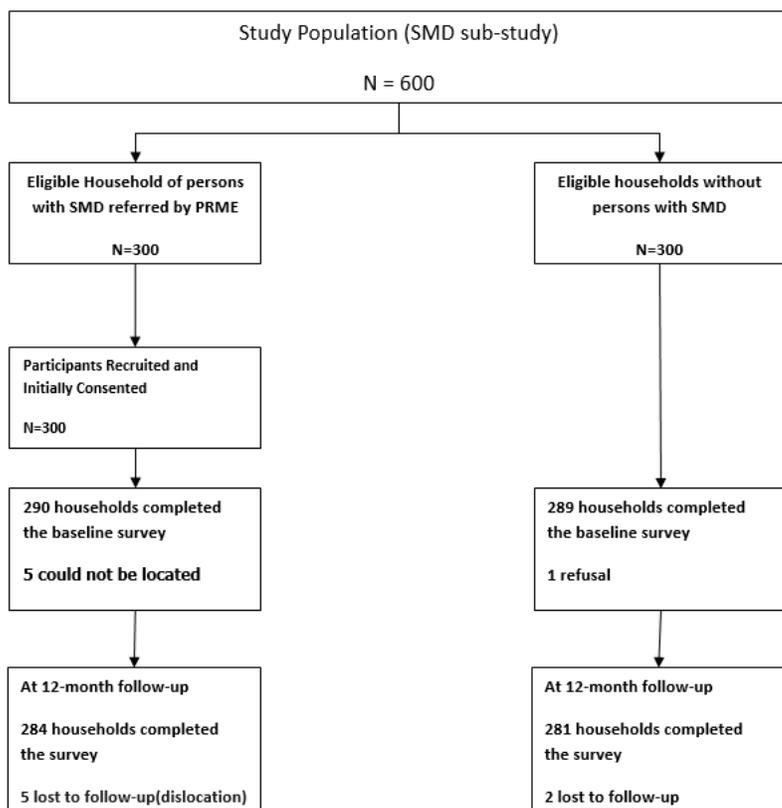


Figure 1

Participants recruitment flow chart for the SMD sub-study

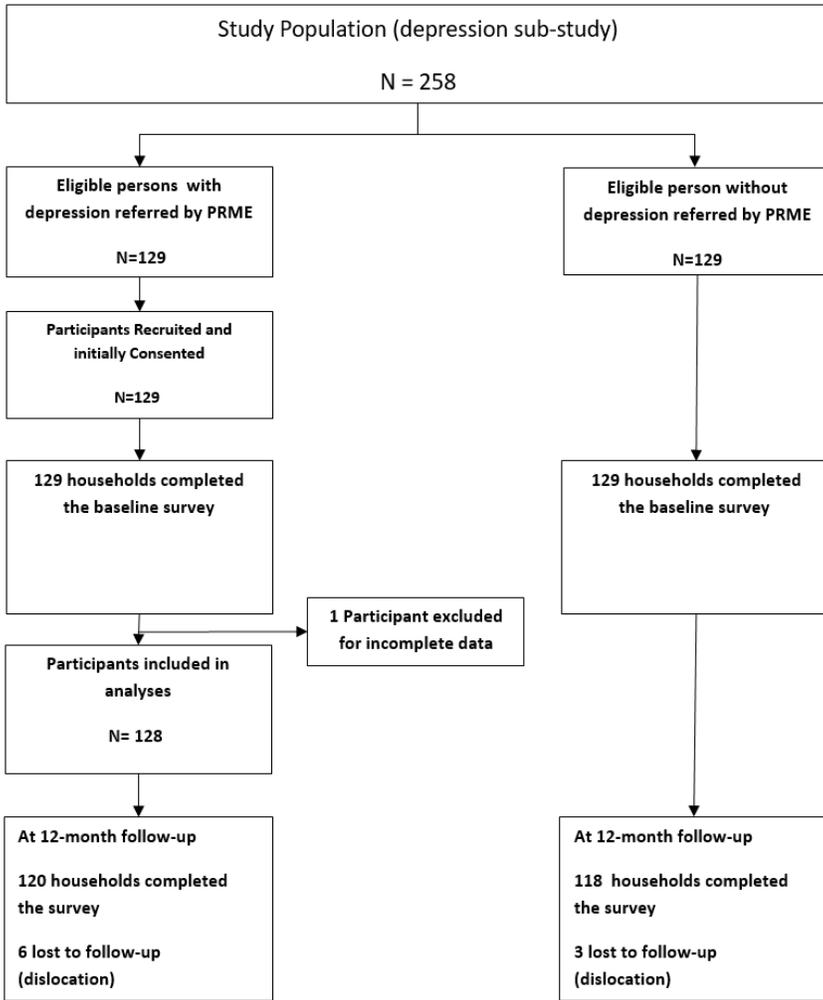


Figure 2

Participants recruitment flow chart for depression sub-study

Supplementary Files

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- [ListofSupplementaryfiguresandTables.docx](#)