

# Impact of Micro Health Insurance Plans on Protecting Households Against Catastrophic Health Spending in Tanzania

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**Abstract**—The paper analyses the impact of households' membership in micro health insurance plans on the protection against catastrophic health spending, in the episodes of illness. The analysis considers the groups of poor and non-poor members of micro health insurance schemes and non-members in both urban and rural areas in Tanzania.

Matching estimator method was used to analyse the effect of membership in the micro health insurance on the protection against catastrophic health spending, in the episodes of illness among the members of micro health insurance scheme and non-members for the different income groups. Data used in the analysis involved those on the 10,300 households involved in Tanzania Demographic and Health Survey of 2011.

The estimation results revealed that insurance schemes enabled households to get protection against catastrophic health spending, in the episodes of illness to members of insurance schemes compared to non-members. Thus, it is recommended that households be encouraged to enroll in the micro health insurance schemes. The insurance scheme also needs to be close to the would be customers. This will also contribute to poverty reduction in the country as well.

**Keywords** - micro health insurance, out of pocket payment, matching estimator, catastrophic health spending rural households, Tanzania.

## I. INTRODUCTION

This paper analyses the outcome of rural households' decision to enrol in micro health insurance schemes in Tanzania. Membership in the micro health insurance schemes enables households to access health services and get protection against expenditure shock, in the episodes of illness. It also contributes to the efforts to overcome poverty, since insurance schemes enables households to avoid large out of pocket spending for modern health care services in episodes of illness [50][53].

In developing countries, communities have established mechanisms for protection against risks of being ill. Specifically, communities have established the micro health insurance schemes. Furthermore, the government of Tanzania has also been promoting the public supported community health funds.

Micro Health Insurance Fund (MHIF) or micro health insurance schemes are also referred to as either Community

Based Health Insurance Funds (CBHIF) or Mutual Health Funds (MHF). The funds are considered as one the types of private voluntary health insurance schemes [5] [20] [22] [46].

The general consensus among scholars is that community based or micro health insurance funds are specific group organised insurance schemes, characterised by the pooling of revenue, the sharing of health risk and voluntary membership. Thus, in this paper, micro health insurance is also regarded as synonymous to community based health insurance and mutual health funds. In Tanzania, there is a number of micro health insurance schemes.

Catastrophic health spending is said to occur when, hospitalisation spending for a household member as a proportion of ability to pay exceed a certain threshold [Xu 2003]. The threshold values ranges between 5 and 40 percent. [64]. In this paper, it refers to out of pocket spending on health expenditure that exceeds 25 percent of the household budget.

Large out of pocket spending in the episodes of illness is a challenge most low income or poor households face in the episodes of illness. A large number of households either choose not going to hospitals or to make out of pocket payments, when visiting health care services, in the episodes of illness, because they have no health insurance cover.

In 2005, the WHO World Assembly passed resolution on universal coverage of health insurance, among the populace in different nations, in order to promote equity in accessing health care services among other things. However, notwithstanding the efforts by a number of developing countries to enrol households to health insurance schemes in response to the resolution, only few countries have been successful [51].

The government of Tanzania has also been promoting universal health insurance coverage among its citizens. However, only 15 percent of Tanzanians were members of health insurance schemes in 2010 [38]. This suggests that most households made out of pocket payments for health services in the episodes of illness.

In 1994, the government had introduced health sector reforms in order to improve households' access and equity in utilising health care services. Furthermore, Tanzania Health Sector Strategic Plan III of 2009-15 seeks to achieve equity in accessing health care service among the Tanzanians, and this has led to the establishment of the National Health Insurance

and Community Health Funds. The Strategic Plan aimed at having 30 percent of Tanzanians having health insurance cover by 2015 [57] [61].

In Tanzania, the introduction of health insurance dates back to 1997, when the National Social Security Fund (NSSF) introduced Social Health Insurance Benefit (SHIB) Schemes for formal and informal sector employees. In 1999, Community Health Fund was introduced mainly for those in the informal sector [31][59] [60]. National Health Insurance Fund that caters for civil servants was introduced in 2003 [40].

Households, who are not members of health insurance schemes, are prone to large out of pocket spending in the episodes of illness or injury. Reference [25] observed that most poor or low income households were to ask for assistance from relatives or had to borrow in order to be able to pay for health care services, when sick.

Given the financial constraint households face, and the need to have protection against catastrophic health spending in the episodes of illness, a number of communities in both urban and rural areas have initiated micro health insurance schemes as the means to spread health risk among the members and protect themselves against expenditure shocks in the episodes of illness [13][20][21].

A number of scholars had questioned the envisaged benefits of micro health insurance schemes to the households, since most of the micro health insurance schemes have fixed premiums or limited range of premiums and that the poor cannot afford [20] [33] [51]. Furthermore, the members of micro health insurance schemes usually incur extra expenses such as transport costs to health facilities and the purchase of prescribed drugs, when sick [36] [51]. Regardless the arguments provided by different scholars, micro health insurance schemes are useful in providing protection against expenditure shocks in the episodes of illness among the low income and poor households, in rural and urban areas.

This paper analyses whether households' membership in micro health insurance funds provide them with the protection against catastrophic health spending, when sick. Previous studies on Tanzania had focused on rural households' membership in health insurance schemes or examining the supply factors and socio economic determinants of the households' membership in the micro health insurance schemes. Little attention has been given on examining the outcomes of membership in the health insurance plan on financial protection, against catastrophic health spending, when sick for the low income or poor households in both rural and urban areas. This is the knowledge gap this study seeks to fill.

#### A. *The research problem*

In Tanzania, households' out of pocket spending in the episodes of illness constitutes 80 percent of the total private expenditure. Also they contribute to 50 percent of total health care expenditure [38]. This is a large proportion of the incomes especially for the households, given that 34 percent of them are poor. Such a situation is undesirable, especially for the low income or poor households. The poor households constitute about 34 percent of households in the country [38]. The consequence of large out of pocket spending is the reduction of

disposable income and capabilities of households to augment human and non-human capital [39] [61].

Evidences from some developing countries suggest that even the low income or poor households are willing and able to purchase micro health insurance plans, provided appropriate mechanisms are in place [4] [11][20][25][47]. Households' membership in micro health insurance plan results in pooling of revenue as well as protection against health risk and catastrophic health spending.

Nonetheless, in Tanzania only few households have enrolled in the micro health insurance plans, leading to the minimal spreading of health risks and limited protection against expenditure shocks for the households, in the episodes of illness. This has affected the efforts to reduce poverty as envisaged by Millennium Development Goals (MDGs) and National Strategy for Growth and Reduction of Poverty (NSGRP) as well as that of National Health Strategic Plan [58]. Empirical studies had revealed that for low income countries poverty rate is linked to high level of expenditure relative to total household expenditure [1].

Thus, an insight into the outcome of households' membership in the micro insurance plans in regard to protection against catastrophic health spending shall provide an additional knowledge on the demand for voluntary private health insurance and on strategies to promote households enrolment in the health insurance schemes, and health care financing in Tanzania.

This paper is organised as follows, after this introduction; Section two is on literature review on the demand for health insurance, followed by Section three on the framework of analysis and methodology. Section four is on sample size, data and variables. Estimation results are presented in section five and the last section is conclusion.

## II. LITERATURE REVIEW ON DEMAND FOR HEALTH INSURANCE AND EMPIRICAL STUDIES

In literature, demand for health insurance refers to the quantity of insurance cover an individual is willing to purchase at different premiums [14][27]. The appropriate amount of health insurance is purchased when the marginal benefit of health insurance is equal to the cost of insurance. The theories of large numbers and that of risk provide the foundations for the understanding of demand for health insurance.

As far as demand for health insurance is concerned, households have two choices. The first one is to purchase health insurance plans and incur small loss in the form of premium and the other one is to decide to self-insure, that is facing a small possibility of large loss in event that illness or injury will occur, or equally, large possibility that medical loss will not occur [14].

In that respect, the demand for private health insurance is the predictor of the enrolment in the insurance plans. It is believed that rural households make assessment of health risks and associated expenses before purchasing health insurance plans. In particular, households or individuals purchase health

insurance to overcome income and expenditure shocks, in the episodes of illness among other things [9][10][29][44].

Since micro health insurance is one type of the voluntary private health insurance, the theory of demand for health insurance provides a basis for analysing households decisions to purchase micro health insurance plans as well [4] [5] [20] [20]. The reason is that the theory considers health insurance as risk avoidance mechanisms, in the episodes of illness.

#### A. *Empirical studies on households demand for micro health insurance*

In a number of studies on households demand for micro health insurance plans in developing countries, the focuses have been either on analysing the demand or supply side factors or both. The authors had used different variables and methods to analyse demand for micro health insurance plans. In addition, a number of authors have examined factors determining low income or rural households enrolment in the micro health insurance schemes in developing countries [2] [3][4] [6] [20] [21] [22] [42][48].

The findings from the above mentioned studies had revealed that households and community characteristics that is age, of the head of household, gender and income were among the factors determining households' purchase of insurance plans. Other characteristics were education level of the household members, household size and religious denomination belonging. The same factors are expected to influence household demand for micro health insurance plans in rural areas in Tanzania.

Furthermore, the reciprocal relationship in helping each other, among the family members including the extended families, was also found to influence households demand for micro health insurance plans [6] [20], [21]. Similar finding was observed by [18] in Indonesia. The relationship determines social values of individuals or households which influence the calculation of costs and benefits and the decisions of households to be members in the micro health insurance scheme. The larger the social capital or network, the lower the enrolment in the micro health insurance schemes is expected.

The benefit packages, the insurance plans provide, the degree of freedom to choose providers and the extent of compensation given, also determine households' decisions to purchase micro health insurance plans or not to [7][12] [50] [65]. The insurance packages are also expected to have effect on households' enrolment in the micro health insurance fund

Risk attitude among the households is another factor that is deemed to influence households' enrolment in the micro health insurance schemes. Reference [23] and [44], argue that, in developing countries, individuals and households have low attitude towards health risk and this led few of them to enrol in the micro health insurance schemes.

Reference [25] had a different view on the issue and argues that in various parts of developing countries, where appropriate mechanisms are available low income or households have joined micro health insurance schemes. This suggests that even the low income households can purchase micro health insurance plans provided that appropriate arrangements are available to them. They purchase health insurance plan in order to get protected from financial risks in the episodes of illness.

Reference [51] and [53] examined the outcome of households' enrolment in micro health insurance schemes in developing countries. Among the outcomes considered were the households' protection against catastrophic health spending in the episodes of illness.

Reference [51] also examined the use of health services among the poor and non-poor households, who were members and non-members of the insurance schemes in order to ascertain whether they had different utilisation pattern of health services, when sick and the effect of membership in the micro health insurance schemes on the protection against catastrophic health spending. The issue of households' protection against catastrophic health spending in the episodes of illness are worth exploring in the context of Tanzania as well, since a small proportion of the populace has purchased health insurance plans.

In sum, the review of literature on empirical studies on demand for micro health insurance plans in developing countries reveal that studies have focused on either examining socio economic or supply factors or both as determinants of household membership in the schemes [5] [6] [8] [21] [25]. Few studies had analysed the outcomes of rural households' membership in the micro health insurance plans on the outcome of membership in protecting the households against catastrophic health spending, in the episodes of illness.

#### B. *Demand for micro health insurance plans—some methodological issues*

Experimental, cross sectional studies, case studies and econometric methods have been used to examine the determinants of demand for micro health insurance plans in developing countries [4] [8] [20] [25] [28] [42] [48] [51]. The methods have a number of advantages and shortcomings as well. The shortcomings of the cross sectional methods include selection bias in the process of collecting data [4] [8][42]. The problem can be addressed by using instrumental variables and matching estimator method [18] [19][41][45][51] [51].

In cross sectional studies econometric methods have been used to analyse the determinants of households enrolment in the micro health insurance schemes [3] [7][20] [41] [50] [54]. In particular, the probit or binary logit models have been used to estimate the demand for micro health insurance plan. Among the problems encountered in the estimations is the inability of the models to address the problem of endogeneity of the variables as well as selection bias [17] [18]. In addition, in regression analysis, both dependent and independent variables are discrete. Thus, the estimation process tends to be complicated and leads to implausible results.

In order to overcome the problems highlighted above, matching estimator method has been used to analyse the outcomes of membership in the micro health insurance plans. The method enables the estimation of the effect of membership in the micro health insurance on protection against catastrophic health spending, in the episodes of illness among other things [19][43] and [51].

The methods have also been used to examine the differences in the utilization of health care services among the members of micro health insurance and non-members. Thus, this study uses the same method, since it is expected to provide plausible results.

C. Empirical studies on demand for micro insurance plans in Tanzania

In studies on Tanzania, a number of scholars have analysed the government supported community based health insurance schemes and those which are privately managed [23] [25][26] [33] [34]. Scholars have also examined different issues in regard to the impact of the micro health insurance schemes on the accessibility to health care services and on households' consumption [35].

Reference [25] examined whether group or individual premiums were better alternatives for making micro health insurance plans affordable to households in the informal sector. The author found that premiums payment modes had an impact on households' decisions to purchase insurance plans and the continuity of the households' membership in the schemes. A similar finding was observed by [34].

In addition, reference [35] also observed that rural households' decisions to join government supported community health funds was determined by whether they were going to save, when sick. This also suggests that financial protection against catastrophic health spending influences households' memberships in the micro health insurance schemes.

Furthermore, in studies on Tanzania, different research methodologies have been used to examine government supported community health funds or micro health insurance schemes[25] [26] [33]. They include case and cross sectional studies. Others are experimental and econometrics methods.

Moreover, the studies on Tanzania have used primary data to examine various issues concerning micro health insurance schemes. Among other things, the studies have examined the socio-economic determinant of rural households' membership in the micro health insurance schemes. Little is known about the relationship between households' membership in the private health insurance plans and protection against catastrophic health spending.

In contrast to previous studies on micro health insurance schemes in Tanzania, this study uses data from Tanzania Demographic and Health Survey conducted in 2010 and published in 2011 [38]. In addition, the matching estimator method is adopted to examine whether membership in the micro health insurance scheme has impact on the protection of households against health related expenditure shocks.

III. FRAMEWORK OF ANALYSIS AND METHODOLOGY

The theory of demand for health insurance provides the basis for examining rural households' membership in the health insurance schemes in Tanzania. It is assumed that individuals or households seeking health care services behave in economic and rational manner. Thus, membership in the health insurance schemes, facilitate individuals or households to access health services and get protection against catastrophic health spending, in the episodes of illness [32].

In order to ascertain the outcomes of membership in micro health insurance schemes, two groups are identified, that is, members and non-members. The groups are also categorised in

treated" and "control" dichotomy conditional on observable covariates, that is, common characteristics [19] [45] [52]. The households' characteristics are also used to match the treated and control group households.

The dichotomy allows the estimation of the statistics for the purpose of evaluating the impact of membership of micro health insurance schemes on protection against catastrophic expenditure shocks, when sick. It also allows the comparison of the utilisation of health services among the members and non-members. Specifically, the Average Treatment Effect (ATE) allows comparison of outcomes between the treated sub groups (members) and the control sub group (non-members). The comparison is done by taking the randomly selected individuals from both sub groups so that the impact of micro health insurance schemes is evaluated.

The use of matching estimator method to evaluate the impact of the micro health insurance plans requires the information on whether individuals or households are treated or not. The differentiation between the treated and control groups is done by using dummy ("D") variable on the realised outcome (Y<sub>i</sub>), due to the treatment. The variable (X<sub>i</sub>) is used to represent the set of exogenous covariates used as control variables. Thus, the formal matching estimator is expressed as equation (1) below:

$$Y_i = Y_i(D_i) = Y_i^C; \text{if } D_i=0; Y_i^T \text{if } D_i= 1 \tag{1}$$

X<sub>i</sub> = K x 1; coefficients of covariates for the members and non-members of the insurance schemes.

A. Matching estimator

In determining matching for each treated (Y<sub>1</sub>), and untreated groups Y<sub>0</sub> respectively were determined, in an attempt to find out the effects of membership in the insurance schemes on the utilization of health services and protection against catastrophic health spending [16]. In this regard two equations are identified. They are:

$$\hat{Y}(1) = \begin{cases} Y_i & \text{if } w_i = 1 \\ Y_{li} & \text{if } w_i = 0 \end{cases} \dots\dots\dots(2)$$

$$\hat{Y}(0) = \begin{cases} Y_i & \text{if } w_i = 0 \\ Y_{li} & \text{if } w_i = 1 \end{cases} \dots\dots\dots(3)$$

Then, the simple matching statistics are estimated. This will enable the determination of the unbiased matching estimator [17]. The new estimator to be estimated is expressed as equation (4):

$$rbcm = \frac{1}{N} \sum_{i=1}^n \hat{Y}_i(1) - \hat{Y}_i(0) \dots\dots\dots(4)$$

This was done for both "Overall Average Treatment Effect" (ATE). The results of estimating equation (4) are presented in Section V.

IV. SAMPLE SIZE AND DATA

In order to be able to do estimation of equations as provided in the previous sections and realise the objective of

the study, it was necessary to determine the optimal sample size of data for households, who are members and non-members of the micro health insurance schemes. Equally, it was important to determine and define the variables used in this study. The details are provided in this Section.

#### A. Determination of sample size

The data used in this study were obtained from Tanzania Demographic and Health Survey conducted by National Bureau of Statistics in Tanzania, from December, 2009 to May 2010. The survey covered 475 clusters and 10,300 households [37]. The study included men and women aged between and 15-49 years old only. While all women in the selected sample were interviewed, only one third of the men were included in the survey exercise. In addition, women had more questions to answer than men in the questionnaires administered.

The objective of the survey was to collect data on household in the country, including their status on membership in micro insurance schemes. During the survey, the data on households' utilisation of health care services, when sick, were also collected. Other data collected were those on households' demographics and community characteristics among other things [37]. In order to get data for this study, the households were divided into two groups, that is, one group for members of micro health insurance schemes and non-members as well. In addition, the households were categorised into different income groups, that is, those who are poor and non-poor.

Thus, for this study data for a total of 10,300 households were used to examine the effect of households' enrolment in the micro health insurance schemes. The study covered both rural and urban areas. However, one of the limitations for using household budget survey data is the presence of indefinite factors that may limit the findings of the study [18][20] [51]. This study is of no exception.

#### B. Data and the definitions of variables

As pointed above, this study used data from Tanzania Demographic and Health Survey conducted by National Bureau of Statistics [38]. The report also provided data for various variables that had been used in this study.

The dependant variables of interests were membership in the micro health insurance schemes and non-membership. It is deemed that membership in the micro health insurance scheme is influenced by the demand for health services, when sick. Thus, the dummy variable was used to capture the respective households who sought health service in the episode of illness and those who did not. Additional dummy variable was provided to capture the utilisation of the health services for poor and non-poor and members and non-members as well. Similar approach was used by [51].

Another factor that is associated with the membership in the micro health insurance schemes is the protection of households against catastrophic health spending, when sick. In this study, the dummy variables were used to capture households that experienced catastrophic health spending and for whom health spending was not burdensome. The variable is expected to be positively related to the membership in the schemes.

In addition to the above mentioned variables, other variables on households and community characteristics were introduced and were used in the matching estimator estimations. The variables included age and gender of the head of household, occupation dummies, household size, the highest education level attained by the head of household, and consumption (wealth index) for different income groups. Additional variables included those for illness and disability conditions.

## V. ESTIMATION RESULTS

This Section provides results for matching estimator on ATE. The estimation of the matching estimator for the average treatment on the treated was done, in order to examine the effect of the membership and non-membership in micro health insurance schemes on protection against catastrophic health spending, in the episodes of illness. Table I presents the results on average treatment effect for all groups of households.

The Table shows that all the coefficients for protection against catastrophic health spending for three sub-groups were negative and significant. This suggests that membership in micro health insurance plans did provide protection to households against catastrophic health expenditure, in the episodes of illness compared to non members.

TABLE I. AVERAGE TREATMENT EFFECT (ATE) OF MICRO HEALTH INSURANCE: SIMPLE MATCHING ESTIMATOR

Outcome Variables	Coefficient	p-value
Out of pocket catastrophic health expenditure by all households	-0.07212 (0.034126)	0.035
Out of pocket catastrophic health expenditure by poor households	-0.0686 (0.03347)	0.040
Out of pocket catastrophic health expenditure by non-poor households	-0.08015 (0.0410768)	0.022

NB: Values in brackets are standard errors

The coefficients for catastrophic health spending were all negative and significant. This suggests that members in health insurance schemes pay less, when seeking health services in the episodes of illness. Thus, spending for health care services in the episodes of illness differ among the members and non members. The results also suggest that micro health insurance schemes provide protection against financial risk when ill. The finding conforms to the observation by of [55][58]. However, the finding contradicts those of [Warmer, 2009].

## VI. CONCLUSION AND RECOMMENDATIONS

This study analysed the outcomes of rural households' purchase of the micro health insurance plans in regard to protection against catastrophic health spending in Tanzania. The paper used data from Tanzania Demographic and Health Survey of 2011. Matching estimator methods were adopted to analyze whether micro health insurance plans provide

households with protection against catastrophic health spending in the episodes of illness.

In this, study matching estimator' estimates for ATE were used to ascertain whether membership in the micro health insurance provided households with protection against catastrophic health spending in the episodes of illness. The results revealed that all estimated coefficients were negative and significant. This suggests that for all groups of households, membership in the micro health insurance schemes provided them with protection against financial risks, in the episodes of illness. The reason is that in a number of members spent less in the episodes of illness, when visiting health care services.

Following from the above findings, it is recommended that; households should be encouraged to enrol in the micro health insurance schemes. This will help to reduce poverty in the country. Secondly, the insurance scheme needs to be close to the would be customers.

In general, socio-economic researches in developing countries have limitations. This study is of no exception. Specifically, studies on the impact evaluation of voluntary micro health insurance schemes are beset by the selection bias. This might have affected the results of this study. One area for further research could be analysing determinants the financial viability of the micro health insurance schemes and equity considerations.

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