**Title:** The effect of a Community-Based Health Insurance on the Out-of-pocket Payments for Utilizing Medically Trained Providers in Bangladesh

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### Abstract

We aimed to estimate the effect of community-based health insurance (CBHI) scheme on the magnitude of out-of-pocket (OOP) payments for the healthcare of the informal workers and their dependents.The CBHI scheme was piloted through a cooperative of informal workers, which covered 7 Unions in Chandpur Sadar Upazila of Bangladesh.A quasi-experimental study was conducted using a case-comparison design. In total 1,292 (646 insured and 646 uninsured) households were surveyed. A propensity score matching was done to minimize the observed baseline differences in the characteristics between insured and uninsured groups. A two-part regression model was applied using both the probability of OOP spending and magnitude of such spending for healthcare in assessing the association with the enrolment status in CBHI scheme while controlling for other covariates. The OOP payment was 6.4% (p<0.001) lower for medically trained provider (MTPs) utilization among the insured in comparison with the uninsured. However, no significant difference was found in the OOP payments for healthcare utilization from all kind of providers including the non-trained ones.The CBHI scheme could reduce OOP payments while providing better quality healthcare through the increased use of MTPs, which consequently could push the country towards Universal Health Coverage.

**Keywords:** Community-based Health Insurance; Out-of-pocket payments, Healthcare financing, Informal workers, Bangladesh

**Introduction**

The government of Bangladesh expressed its interest to work for achieving Universal Health Coverage (UHC) and taking actions accordingly.1 Like many low- and middle-income countries (LMICs), out-of-pocket (OOP) health expenditure constitutes a large share (63.3%) of total healthcare expenditure 2. Reliance on OOP payment results in two divergences, firstly, it leads to the catastrophic economic burden on households3 and secondly, inability to pay for adequate healthcare at the point of service by low-income people which results in unmet need of care.4 This effect often leads low-income people to seek healthcare from untrained healthcare providers, which in many cases results in adverse effects on health or inadequacy of required healthcare considering need.5 The catastrophic health expenditure and inadequacy of healthcare address the “financial risk protection” and “service coverage” dimension of UHC respectively.6 Therefore, the Sustainable Development Goals (SDG) has included UHC (goal 3) as an important agenda objective.7 High reliance on OOP payments is a challenge to achieve UHC since healthcare is considered as a luxury when utilizing from private for-profit providers without financial protection.8 Furthermore, the accumulation of prepaid funds, for instance, tax, social insurance contribution from informal workers is difficult as they often are not in the national income tax base. Achieving UHC is thus a challenge due to the difficulties of includig the informal workers in Bangladesh in the public financing system for healthcare. This challenge has been recognized in the first ever healthcare financing strategy of Bangladesh.1 However, value-added tax are being paid by all consumers irresepctive of their employment status, which ultimately contribute to the public fund. Government revenue through taxes for social health protection schemes (along with funding from development partners), micro-or/and community-based health insurance (CBHI) are prioritized and considered as the potential mechanisms for financing healthcare of low-income people. Like many LMICs, the tax-base in Bangladesh is small and the inclusion of low-income people, particularly the informal workers, in the tax system is still a challenge. The CBHI could be a suitable mechanism to achieve their goals. The CBHI schemes are often criticized for its small size to function effectively for risk pooling. This type of scheme has limited coverage and often excluded expensive treatment such as surgery.6 However, such a scheme is still useful to expand protection against the financial risk of ill health where other prepayment schemes are limited or difficult to implement.6 Some studies reported that CBHI scheme are vulnerable to adverse selection due to it’s voluntary nature.9–11 However, careful designing of the scheme may be useful to diminish such problems.

For mitigating the consequences of OOP payment, risk-pooling mechanisms are recommended for financing healthcare. However, the inclusion of informal workers in risk pooling mechanisms (e.g. social health insurance) is a challenge because of their irregular income and the difficulty of collecting contributions from them through the tax system.12,13 Occupational associations and cooperatives could be a base for engaging such workers for healthcare financing.13–15 This study thus aims to evaluate a pilot CBHI scheme of informal workers to estimate its effect on the magnitude of OOP payments for healthcare while utilizing services from the medically trained providers (MTPs). Since the quality of care is for UHC mission, our investigation focused on OOP payments for utilizing the health services provided by the medically trained providers. The UHC is concerned about safe, effective, people-centred and timely care.16 In LMICs context, it can be argued that the services from MTPs might secure better quality than any other providers without adequate medical training.

### Description of the scheme

## *Labour Association for Social Protection (LASP)*

A group of workers established a cooperative, named Labor Association for Social Protection (LASP) that included 14 Unions (lower administrative in rural) and a municipality in the Chandpur sub-district of Bangladesh. The LASP has implemented a CBHI pilot scheme in 7 Unions from January 2013 to June 2014 with support from Grand Challenge Canada. A research team from icddr,b provided technical support for capacity building in collaboration with the Sajida Foundation - a micro-credit and health institute. The areas of technical support comprised: training of management and field staff, relationship development with healthcare providers and stakeholders, making policies and operational directives relevant to social protection (with an emphasis on health protection); training on information technology (IT) and database management of IT-staff, training of labour leaders/ prospective leaders and developing and applying monitoring tools.

## *Membership*

Membership of LASP was open for informal blue-collar workers against a membership fee. The informal workers referred to them, who did not have any formal job contract.17 The commonly found informal workers in urban Bangladesh are rikshaw Pullers, shop keepers, restaurant workers, daily labour, factory workers, transport workers and so forth.18,19 A maximum of 6 household members could get access to benefits against one membership, with a possibility of inclusion of more household member with additional fees. The membership fee (premium) was 50 Bangladeshi Taka (BDT) per month. The premium was determined through informal discussion with the workers in the Chandpur sub-district and considering findings of willingness-to-pay studies among a similar group of workers.15,18 Initially, the fee was collected weekly and after one year it was revised to monthly since it was difficult to reach all members on a weekly basis.

*Benefits package and providers*

The benefit package of the CBHI scheme included both health and non-health benefits. In addition to the cooperatives’ own doctor and pharmacy facility, private and public healthcare providers were engaged for providing services to the enrollees of the scheme. The enrollees had an entitlement to the benefits package with a low co-payment. The benefits package offered by LASP was as follows,

**Health benefits**

* MBBS doctor’s consultation - co-payment 30 BDT (0.40 USD)
* Medicine – 20% discount from the maximum retail price
* Diagnostic tests – 50% discount on market price
* Specialist doctor’s consultation (e.g. paediatricians, gynaecologists, cardiologists, endocrinologists) – co-payment 100 BDT (1.3 USD)
* Hospitalization–maximum 4,000 BDT (52 USD) per household per year
* Periodic satellite clinics in rural areas

**Non-health benefits**

* Weekly/monthly savings opportunity
* Computer course at a lower price than the market price

**Materials and methods**

## Study design

A quasi-experimental case-comparison study was conducted. The households that were insured (case) and uninsured (comparison) were asked about their OOP payments for healthcare in the past three months from the time of the survey. The difference in OOP payments between insured and uninsured households was the main variable of interest in this study.

## Study population and sample

Chandpur sub-district consists of 14 unions and a municipality. Out of these 14 Unions, seven closely located Unions of Chandpur were under the CBHI scheme and consequently included in the study. There are 98,109 households in the sub-district of which 63.5% (62,296 households) live in rural areas and the rest (35,813 households) in urban.20 Since the scheme covered around 50% of the population of the sub-district, an estimated 31,148 households in rural and 17,907 households in urban were available to join the scheme. In absence of comparable studies in Bangladesh, we estimated the sample size considering 7.6% and 6.2% healthcare utilization rates in insured and uninsured group respectively as observed by an earlier study on micro-health insurance in the Philippines.21 The sample size was estimated at 777 households from each of the insured and uninsured groups were estimated considering 90% power and a 10% non-response rate.22,23 The total sample size was thus 1,554 households. However, 1,292 households (83.1% response rate) responded to this survey which comprises 6,694 individuals (insured=3,548, uninsured= 3,146). Random sampling was done for the insured group from the list of all enrolled households and the uninsured household was identified through cross-walk from the same village with a similar occupation of the household head. The household survey was conducted from April to June 2014. We lost 16.9% of the targeted sample due to low (83.1% response rate). response rate. Since we considered high power (90%) during the sample size calculation; the non-response rate should not affect the estimates as the power of sample calculation varied between 80% and 90% in the literature.24

## Data collection and variables

A structured questionnaire was administered in face-to-face interviews of the household head of the insured and the uninsured households. Five trained Field Research Assistants were involved in conducting the interviews through household visits. One Field Research Officer along with the investigators of the study supervised the data collectors. Information on the demographic characteristics of individual members and household socioeconomic characteristics were collected. Data about healthcare seeking of any household members and associated out-of-pocket payments in the past 90 days were gathered. Generally, the informal workers sought healthcare from village doctors, drug-sellers, traditional healers, doctors, private clinics, medical colleges and district hospitals, sub-district health complexes and clinics managed by non-profit organization (NGO).25,26 We considered the doctors with Bachelor of Medicine and Bachelor of Surgery (MBBS) degree (General Practitioners), specialized doctors, private clinics, medical college and district hospitals, Upazila Health Complex and NGO clinics as the MTPs since these healthcare proving organizations employ medically well-educated staffs. Whereas, village doctors, drug-sellers, traditional healers constituted the non-trained providers in this study as such providers usually lack medical training as per standard curriculum. The OOP payments for healthcare included medical fees, user charges for public hospital care, purchases of medicines (whether prescribed or not), insurance co-payments, and payments for appliances and diagnostic tests.27

The income is an unreliable estimate of socioeconomic status of informal workers due to seasonal variation and underreport of their income in the LMIC context.19,28 Therefore, we used asset quintile as a measure of socioeconomic status rather than the income levels. Household wealth status was categorized into five quintiles ranging between the poorest to richest based on the available assets in the households like housing material, sanitation facilities, access to utility services, access to drinking water. A principal component analysis (PCA) was conducted using these asset variables to estimate the asset score after adjustment for household size, which was used for the categorization of the wealth status of the households.29

## Propensity score matching

Due to the absence of baseline information for insured and uninsured groups, there was a high possibility of baseline bias after the direct matching of household and individual characteristics. We, therefore, employed a propensity score matching (PSM) approach to minimise the observed differences between insured and uninsured groups while estimating the effect of CBHI scheme on OOP payments.30,31 PSM is a statistical tool that weighs differences in observable variables between the individuals of the case and comparison groups. This is a useful tool for reducing selection bias where complete randomization is challenging.32 The propensity score represents the conditional probability of assignment to a particular intervention given a vector of observed covariates. The matching was done at the level of the individual. However, both individual (e.g. gender, age) and household (e.g. household size, asset quintile) characteristics were used for this matching since such characteristics were associated with healthcare utilization and OOP payments. We also included age-group and illness status of individuals (as a dummy variable, 1=suffered from illness, 0= did not suffer from illness) in the PSM as a proxy for health status to addressing the adverse selection problem.

The main purpose of the matching was to identify unique controls with similar characteristics except for the outcome of interest i.e. out-of-pocket payment. The radius matching was done in PMS between two-groups of observations (insured and uninsured) considering the weight equals 1. We tried other matching methods like kernel matching; however, none served our purpose of identifying two groups of observations for using them in the two-part model. We, therefore, used the radius matching which was supported by available literature.33

We applied a logistic regression model for estimating the propensity score. Based on the closeness of the estimated propensity score of each individual from insured to the individual from the uninsured group, a matched sample was drawn. Using “psmatch2” command in STATA 13, we applied a radius matching method to estimate the matched sample using recommended calliper size (standard deviation of the logit score is multiplied by 0.2).33 Figure 1 shows the distribution of propensity scores before and after matching in the insured and the uninsured groups. Before propensity score adjustment, the insured and uninsured groups were dissimilar with regard to the characteristics. However, after matching they are mostly similar (Figure 1). Finally, 2,502 individuals from the insured group and the same number from the uninsured group were included in the analysis.

Figure 1 to be inserted here

## Statistical analysis

The main hypothesis of this study was that the OOP payments for utilizing MTP provider were lower for insured compared to uninsured. Descriptive statistics presented the mean and variations (standard deviation) of OOP payments in insured and matched uninsured groups. We presented this variable even using several dimensions, like asset quintiles, occupation, household size, geographic area. We performed the Shapiro–Wilk test and found that OOP healthcare payment was not normally distributed (P-value<0.01). We, therefore, employed Wilcoxon-Mann-Whitney test, a non-parametric test, to make inference on the significance of the mean differences in the OOP healthcare payments between insured and matched uninsured groups. Further, two-part regression analysis was conducted to estimate the effect of individuals’ enrolment in CBHI scheme on OOP payments for seeking healthcare from the MTP. Additionally, we estimated the association of OOP payments with healthcare utilization from non-trained providers. The OOP payment was a limited dependent variable and was continuous over most of its distribution but had a mass of observations at zero values. The decision of healthcare expenditure and the magnitude of expenditure might not be statistically independent.34,35 Application of an Ordinary Least Square (OLS) estimation method of regression coefficient to only part of the sample who spent for healthcare raised the possibility of sample selection bias.36 In this case, a two-part regression model was applied.34,37 The first part involved the likelihood of incurring any healthcare costs, where 0 and 1 meant ‘no cost’ and ‘any cost’ respectively. This was incorporated in the two-part model with a logit function. The second part considered the magnitude of OOP healthcare payments. An ordinary least square function was used to model it with the consumption decision. Thus the two-part model used information on both the probability and magnitude of OOP payments for healthcare simultaneously in assessing predictors like enrolment in CBHI scheme along with other covariates.28,38 In sum, the dependent variable for the logit model was a dichotomous variable that indicated whether OOP expenses were incurred (the participation decision). The ordinary least square regression model analysed the natural logarithm of OOP payments () as a function of the covariates.37 In addition to our main variable of interest, i.e. ‘membership of the CBHI scheme’, several control variables like, asset quintiles, education, household composition, healthcare utilization, geographic location and health condition were included as control variables in the regression model. Let consider Yi is the semi-continuous OOP payment variable. The observed OOP payments can be presented by two variables. Firstly, the occurrence of OOP payments will be a dummy variableas below,

…(I)

And the magnitude of OOP payment variable (Y2i) will be approximately normally distributed which will be subset of the OOP payment variable (Yi) where Yi >0. In two-part model, we are interested in both the distribution of occurrence variable (Y1i) and magnitude variable (Y2i) given that Yi >0. Therefore, the two-part regression model can be specified using following two equations39,

….(II)

Where, θ0 is a constant, X1 indicates if the household had membership in CBHI scheme with values 0 or 1 (0= did not have a membership, 1= had membership), θ1 is the coefficient that shows magnitude and direction of relationship, X2, X3... denote control variables, θ2, θ3 ... represent the estimated coefficients and ui is the random error term of the model.

Similarly, β0 is a constant, X1 indicates if the household had membership in CBHI scheme with values 0 or 1 (0= did not have a membership, 1= had membership), β1 is the coefficient that shows magnitude and direction of relationship, X2, X3... denote control variables, β2, β3 ... represent the estimated coefficients and εi is the random error term of the model.

Tobit model can address the problem with a large number of zero response of dependent variable. Although the two-part model is a more popular approach to modelling medical expenditures and preferred by O’Donnell et al. 2008 28, we included findings from Tobit model supplementary materials. We presented a 95% confidence interval for the coefficients of regression analysis and standard error for OOP payments estimates.

**Results**

Table 1 reports the percentages of participants in insured and uninsured groups by socio-demographic characteristics, before and after matching by propensity score. Before matching, there were significant associations of age group, occupation, household size, years of schooling and asset quintiles with the insurance status. After matching, we found no significant association of occupation, household size, years of schooling, and asset quintiles with the insurance enrolment status of the participants. However, a significant association was observed between age and insurance enrolment status still after matching.

The matched sample showed that most of the participants were 15-60 years old (63.6% of insured and 61.4% of uninsured) and proportion of female (49.7% of insured and 49.6% of uninsured) represented similarly in both insured and uninsured groups. Most of the participants were married (49.9% of insured and 48.7% of uninsured).

(Table 1 to be inserted here)

The highest proportion of respondent was a housewife (21.7% of insured and 23.3% of uninsured) in both groups. The proportion of agricultural worker, daily labourer, sales worker (shop-keeper), service holder and transport workers were similar in both groups. The average household size was 5 persons or more in both groups (49.4% in insured and 51.2% in uninsured). The average household monthly income was significantly higher in the insured group (19,148 BDT) compared to uninsured group (17,969 BDT) before matching (Supplementary Table 1). Since we used asset quintile in PSM for matching, we did not include household monthly income for matching.

Table 2 presents the descriptive statistics on OOP payments in both groups for seeking healthcare from MTPs and from any providers. Average OOP payments for seeking healthcare from all providers were lower in the insured group (2,512 BDT) compared to uninsured group (2,660 BDT) though not statistically significant. However, when compared the means healthcare payments for utilizing healthcare from MTPs, we observed significantly lower amount in the insured group in comparison with uninsured (4,189 BDT versus 5,154 BDT). We further observed that irrespective of provider types, the OOP payments between insured and uninsured groups were significantly different between insured and uninsured when disaggregated into different socioeconomic characteristics namely, age-group, marital status, and occupation (Table 2).

(Table 2 to be inserted here)

Table 3 shows the estimated effects of CBHI enrolment on OOP payments for healthcare utilization from MTPs and from all types of providers while controlling for relevant covariates, like demographic and socioeconomic characteristics. It was found that insured individuals were 1.43 times more likely (95% CI=1.22-1.68) to spend for services from MTPs and their OOP payments were significantly less by 6.40% compared to uninsured.

(Table 3 to be inserted here)

Along with enrolment in CBHI, marital status, occupation, education and asset quintile influenced the OOP payments for utilizing services from MTPs. Marital status (being unmarried) had a significantly negative effect on OOP payments. However, individuals’ asset quintile, residential location, illness type and inpatient care utilization had a significantly positive effect on OOP payments. CBHI enrolment status, however, didn’t appear to have a significant association with OOP payments while we considered utilization of healthcare from all types of providers (including MTPs and non-trained ones) together in the analysis.

In addition to the two-part model, we estimated the average insurance effect (ATE) using the “teffects psmatch” command. This analysis showed similar findings as a two-part model, meaning that the OOP expenditure was significantly lower among the CBHI enrolled individuals while utilizing healthcare from the MTPs (Supplementary Table 2). Further, the inclusion of the inverse probability weights from PSM in the analysis did not change the association between insurance enrolment and OOP payments for services from MTPs (see Supplementary Table 3). The Tobit model also showed significantly less OOP payment among insured for utilizing MTPs compared to the uninsured group while controlling for a number of demographic and socioeconomic factors (Supplementary Table 4). It implies that the usage of different relevant analysis techniques verified our findings from the two-part model.

**Discussion**

The pilot CBHI scheme offered health benefits package consisting of mainly primary care with affordable co-payment and an opportunity for reimbursement for inpatient care with a ceiling. We found that OOP payments for healthcare utilization from MTPs were significantly lower among workers in the insured group in comparison with the uninsured group, which can be explained by lower co-payment of enrollees due to their entitlement to the benefits package. The health services from non-trained providers, on the contrary, were not covered by the insurance benefits package and OOP payments for such services did not reduce as expected. Since enrolees of the insurance scheme utilized health services from other service providers than the contracted ones (by the scheme), the OOP payments for health services from all types of providers did not decrease significantly. However, it needs to be noted here that for achieving UHC the quality of healthcare is crucial. The World Health Organization noticed that healthcare should be safe, effective, people-centred and timely.16 Securing such quality of care, contracting medically trained providers for healthcare delivery of insured is imperative, which has been focused in this study. The CBHI scheme had assigned a doctor and diagnostic centre. Information about the place for care seeking in advance could have a favourable influence on travel costs of care seekers. Further, care-seeking in satellite clinics did not cost the patients for travels as the insured patients lived close to such clinics.

In addition to our main variable of interest, we found some significant association of control variables with the dependent variable. Unmarried individual spent 5.7% less OOP compared to a married individual for MTPs utilization. Number of studies reported a similar association between marital status and OOP expenditure.40–42 The healthcare need may be higher among married compared to unmarried that resulted in higher OOP payments by the married workers.43,44 Higher OOP payments among better-off informal workers (e.g. 2nd and the richest quintiles) compared to the poor worker (e.g. the poorest quintile) can be explained by the ability to pay and utilization of expensive private facilities not covered by the scheme among the better-off worker.45–47 Similar association between asset quintiles and OOP healthcare payments were observed in a number of earlier studies in low-income settings.37,40,48 The worker suffered from a chronic illness spent 8.2% higher OOP compared to a worker who suffered from communicable disease in the last 90 days period. This may be due to high treatment expenses for the chronic condition(s).49

Effects of health insurance on OOP healthcare payments were ambiguous in literature, implying that while some studies showed a negative relationship 50–53 others found non-significant relations.48,54–58 Aji et al. (2013) investigated the effect of three health insurance programs (*Askeskin, Askes, and Jamsostek*) on OOP expenditure in Indonesia.52 The authors found a decrease in OOP payments among enrollees in two programs with 34% (*Askeskin*) and 55% (*Askes)* reduction. The *Jamsostek* program, however, did not show any significant relationship with OOP payments. The authors of the Indonesian study concluded that two large existing insurance programs had the ability to reduce OOP spending, which was a direct function of their benefits packages and co-payment.52 The findings from our current study were on the same line. A Chinese study examined the impact of health insurance on OOP payments for stroke and found that uninsured workers were 7 times more likely to face catastrophic economic burden due to acute stroke in comparison with insured enrollees, which implied that OOP healthcare payments were remarkably reduced among the insured patients.53 A systematic review reported that CBHI and Social Health Insurance (SHI) increased service utilization and simultaneously secured financial risk protection of members by reducing their OOP expenditure.59 The same review stated that CBHI scheme generates new resources for healthcare.59 However, another review on the impact of SHI observed no remarkable evidence of an impact of insurance on utilization, protection from financial risk, and health status, while a few insurance schemes found significant protection from high OOP expenditures.

Catastrophic health expenditure in many countries occurs due to high OOP health spending which contributes to the challenges of financial protection.3,48,60,61 The findings from this pilot addressed the influence of CBHI scheme on the financial protection dimension of UHC for low-income informal workers and their dependents. While UHC aims at increasing the number of population covered through risk pooling mechanisms (like, tax and insurance) and find informal workers as a challenge, the pilot scheme gave an indication that using labour cooperatives more people can be brought under a risk pooling mechanism and such people can be benefited by getting access to better healthcare from MTPs at a lower OOP payment. The magnitude of reduction in OOP healthcare payments through utilization of a health insurance scheme depends on the co-payment for different services in the benefit package offered by the scheme.52 For instance, the benefits package of LASP was mainly characterized by primary care along with the co-payments as well as reimbursement of 4,000 BDT for inpatient care per household per year.

CBHI schemes could be a potential mechanism for generating new resources for securing quality healthcare with financial protection in the journey towards UHC since the largest share of employment in the country are located in the informal sector of the economy. It might be reasonable to develop such schemes in existing cooperatives. In these cooperatives, this scheme can be built on the basis of solidarity among the current members. The existing infrastructure (e.g. management capacity, office space, field staff) of the cooperatives will facilitate implementation of the CBHI schemes as an add-on project. This will reduce costs to ongoing activities of the scheme. Cooperatives in Bangladesh are organized under the Department of Cooperatives in the Ministry of Local Government and Rural Development of Bangladesh. The recent information showed that there are 1,107 central cooperatives with 133,188 members and 163,408 primary cooperatives with 8.5 Million members (Ministry of LGRD & Cooperatives, GoB).62 These cooperatives are not necessarily developed by informal workers. However, there are existing cooperatives of informal workers and there is a large scope for such workers to incorporate CBHI along with their prevailing economic activities (e.g. micro-credit, trading, and landowning).

The healthcare financing strategy of Bangladesh strongly addressed the importance as well as the resilience of including informal workers in pre-payment schemes.1 Our experience suggests that cooperatives appear as a platform for economic benefits e.g., micro-credit, savings of informal low-income workers. It was observed that CBHI schemes suffer non-renewal or drop-out of enrollees, which puts such schemes into the challenge of financial sustainability.63,64 The cooperatives, which are developed based on solidarity among members in addition to careful designing of the scheme, may reduce the challenge of retention of the members.65,66 In the CBHI schemes, operated by cooperatives, if workers do not get health benefits (if they do not get sick), they may be benefited from other components of the cooperative (e.g. micro-credit and savings) which can increase the possibility for more enrolment and retention of the members. In this pilot scheme, we did not have the opportunity to test these assumptions because of lack of comparable packages under the same scheme since all enrollees were entitled to both health insurance and savings. Further research is required by offering different combinations of benefits (health insurance alone or/and savings or/and micro-credit or/and subsidy on food purchase) for designing the schemes based on more evidence. It is thus important to emphasize here that for progressing towards UHC usage of cooperatives can be considered as a high potential platform for developing CBHI schemes.

One possible limitation of this study was that we could not capture the seasonal variation in OOP payment of healthcare since the survey took place from April to June 2014. However, the use of a comparison group in the study from the same community and the use of PSM during analysis could minimize such bias. Another limitation was the potential for recall bias, as OOP payments related information was collected using a self-reported questionnaire. We used 3 months recall period though earlier studies used 1 to 12 months recall periods.67–69 Further, the interviewers’ biasness can influence the response of the respondent. To mitigate this bias, we conducted training of the data collectors and supervisors on the survey tools; pilot interviews were therefore conducted to identify and resolve potential challenges prior to final data collection. We did not include income in the PSM model for two reasons. Firstly, we included asset quintile in the PSM model as indicator of socio-economic status. Adding income in this model will generate multicollinearity problem in the model since income and asset quintiles are highly correlated. Secondly, asset index is better indicator for socioeconomic status of the informal workers than income. This is because of fluctuation in income of different types informal workers by season19.

### Conclusion

This study showed that enrollees of the CBHI scheme, piloted in a cooperative, had a significantly lower level of out-of-pocket healthcare payments for utilizing health services from medically trained providers. More research needs to be done for understanding and estimating the incentives (e.g., co-payment size, reimbursement ceilings, waiting period before accessing benefits, and non-health benefits) for designing the benefit package and, insurance policy of the scheme. Considering the availability of a large number of cooperatives in Bangladesh, such CBHI schemes may contribute to bringing more informal sector workers and their dependents under health coverage with financial protection for achieving UHC.

**Authors’ contributors**

JAMK and SA conceptualized the research idea, study design, literature search, data extraction and analysis, data interpretation, and writing the manuscript. MS, ARS, SC, MHR, ZI, CR and LWN contributed in writing, reviewing and revising the manuscript. All authors read and approved the final manuscript.

### Acknowledgement

We acknowledge with gratitude the financial contribution of Grand Challenge Canada for performing this study. We thank the Executive Committee members, management and employees of LASP for giving the opportunity to implement the study. Our gratitude goes to the then the Director General Mr. Kabir Khaled and Director Amio Kumar Chottopaddhya of the Department of Cooperative in Bangladesh and to the core funders of icddr,b. Gratitude goes to Mr. Khandaker Mohammad Zahid and other field workers for their cordial cooperation for conducting this study.

**Funding**

This work was supported by the Grand Challenge Canada (GR# 01009, 2012).

**Competing interest**

None declared**.**

**Ethics statement**

Informed written consent was taken from all interviewees, and confidentiality and anonymity were ensured. This study was approved by the Ethical Review Committee of the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b).

### References

1. MoHFW. Expanding Social Protection for Health: Towards Universal Coverage, Health Care Financing Strategy 2012-2032. Dhaka; 2012.

2. MoHFW. Bangladesh National Health Accounts 1997 - 2012. Dhaka; 2015. doi:10.13140/RG.2.1.3951.6247

3. Van Doorslaer E, O’Donnell O, Rannan-Eliya RP, et al. Catastrophic payments for health care in Asia. Heal Econ. 2007;16(11):1159-1184.

4. Hwang SW, Ueng JJM, Chiu S, et al. Universal health insurance and health care access for homeless persons. Am J Public Health. 2010;100(8):1454-1461. doi:10.2105/AJPH.2009.182022

5. Donnell OO. Access to health care in developing countries : breaking down demand side barriers. Cad Saude Publica. 2007;23(12):2820-2834. doi:S0102-311X2007001200003 [pii]

6. WHO. The World Health Report: Health Systems Financing: The Path to Universal Coverage. Geneva: World Health Organisation; 2010.

7. UN. Transforming Our World: The 2030 Agenda for Sustainable Development. New York; 2015. doi:10.1017/CBO9781107415324.004

8. Khan JAM, Mahumud RA. Is healthcare a ‘ Necessity ’ or ‘ Luxury ’ ? an empirical evidence from public and private sector analyses of South-East Asian countries ? 2015.

9. Parmar D, Souares A, de Allegri M, Savadogo G, Sauerborn R. Adverse selection in a community-based health insurance scheme in rural Africa: implications for introducing targeted subsidies. BMC Health Serv Res. 2012;12:181. doi:10.1186/1472-6963-12-181

10. Wang H, Zhang L, Yip W, Hsiao W. Adverse selection in a voluntary Rural Mutual Health Care health insurance scheme in China. Soc Sci Med. 2006;63(5):1236-1245. doi:10.1016/j.socscimed.2006.03.008

11. Ahmed S, Sarker AAR, Sultana M, et al. Adverse Selection in Community Based Health Insurance among Informal Workers in Bangladesh: An EQ-5D Assessment. Int J Environ Res Public Health. 2018;15(2). doi:10.3390/ijerph15020242

12. Vargas V, Begum T, Ahmed S, Smith O. Fiscal Space for Health in Bangladesh. Washington D.C.; 2016. doi:10.13140/RG.2.1.1153.3040

13. Akazili J. Equity in Health Care Financing in Ghana. Cape Town: University of Cape Town; 2010.

14. Devadasan N, Nandraj M. Planning and implementing health insurance programme in India. Inst Public Heal Bangalore. 2006.

15. Khan JA, Ahmed S. Impact of educational intervention on willingness-to-pay for health insurance: A study of informal sector workers in urban Bangladesh. Health Econ Rev. 2013;3(1):12. doi:10.1186/2191-1991-3-12

16. WHO. Quality in universal health coverage. http://www.who.int/servicedeliverysafety/areas/qhc/en/. Accessed April 16, 2018.

17. Hussmanns R. Developments in the design and implementation of informal sector and similar surveys - A review of national practices and experiences. In: Geneva: Sixteenth International Conference of Labour Statisticians; 1998.

18. Ahmed S, Hoque ME, Sarker AR, et al. Willingness-to-Pay for Community-Based Health Insurance among Informal Workers in Urban Bangladesh. Lane J, ed. PLoS One. 2016;11(2):e0148211. doi:10.1371/journal.pone.0148211

19. ADB. The Informal Sector and Informal Employment in Bangladesh. Philipines; 2010.

20. BBS. Population and Housing Census 2011. Dhaka; 2011.

21. Dror DM, Soriano ES, Lorenzo ME, Sarol JN, Azcuna RS, Koren R. Field based evidence of enhanced healthcare utilization among persons insured by micro health insurance units in Philippines. Health Policy (New York). 2005;73(3):263-271. doi:10.1016/j.healthpol.2004.11.018

22. Ury HK, Fleiss JL. On approximate sample sizes for comparing two independent proportions with the use of Yates’ correction. Biometrics. 1980;36(2):347-351. http://www.ncbi.nlm.nih.gov/pubmed/7407322. Accessed January 2, 2014.

23. Casagrande JT, Pike MC. An improved approximate formula for calculating sample sizes for comparing two binomial distributions. Biometrics. 1978;34(3):483-486.

24. Jones SR. An introduction to power and sample size estimation. Emerg Med J. 2003;20(5):453-458. doi:10.1136/emj.20.5.453

25. Ahmed SM, Adams AM, Chowdhury M, Bhuiya A. Changing health-seeking behaviour in Matlab, Bangladesh: do development interventions matter? Health Policy Plan. 2003;18(3):306-315.

26. Ahmed SM, Tomson G, Petzold M, Kabir ZN. Socioeconomic status overrides age and gender in determining health-seeking behaviour in rural Bangladesh. Bull World Health Organ. 2005;83(2):109-117. doi:10.1590/S0042-96862005000200011

27. van Doorslaer E, O’Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. Lancet. 2006;368(9544):1357-1364.

28. O’Donnell O, van Doorslaer E, Wagstaff A, Lindelow M. Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation. Washington DC: The World Bank; 2008.

29. Vyas S, Kumaranayake L. Constructing socio-economic status indices: how to use principal components analysis. Heal Policy Plan. 2006;21(6):459-468.

30. Wagstaff A, Lindelow M, Jun G, Ling X, Juncheng Q. Extending health insurance to the rural population: An impact evaluation of China’s new cooperative medical scheme. J Health Econ. 2009;28(1):1-19.

31. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika. 1983;70(1):41-55. doi:10.1093/biomet/70.1.41

32. Morgan CJ. Reducing bias using propensity score matching. J Nucl Cardiol. 2018;25(2):404-406. doi:10.1007/s12350-017-1012-y

33. Austin PC. Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. Pharm Stat. 2011;10(2):150-161. doi:10.1002/pst.433

34. Okunade AA, Suraratdecha C, Benson DA. Determinants of Thailand household healthcare expenditure: the relevance of permanent resources and other correlates. Health Econ. 2010;19(3):365-376. doi:10.1002/hec.1471

35. Jones A. A double‐hurdle model of cigarette consumption. J Appl Econom. 1989;4(1):23-39. http://onlinelibrary.wiley.com/doi/10.1002/jae.3950040103/full. Accessed January 10, 2014.

36. Jones AM. Health Econometrics. In Handbook of Health Economics. Vol 6. (Culyer A, Newhouse J, eds.). Amsterdam: Elsevier North-Holland; 2000.

37. Rahman MM, Gilmour S, Saito E, Sultana P, Shibuya K. Health-related financial catastrophe, inequality and chronic illness in Bangladesh. PLoS One. 2013;8(2):e56873. doi:10.1371/journal.pone.0056873

38. Cragg J. Some statistical models for limited dependent variables with application to the demand for durable goods. Econom J Econom Soc. 1971;39(5):829-844. http://www.jstor.org/stable/10.2307/1909582. Accessed January 10, 2014.

39. Farewell VT, Long DL, Tom BDM, Yiu S, Su L. Two-Part and Related Regression Models for Longitudinal Data. Vol 4.; 2017. doi:10.1146/annurev-statistics-060116-054131

40. Mahumud RA, Sarker AR, Sultana M, Islam Z, Khan J, Morton A. Distribution and determinants of out-of-pocket healthcare expenditures in Bangladesh. J Prev Med Public Heal. 2017;50(2):91-99. doi:10.3961/jpmph.16.089

41. Ekman B. The impact of health insurance on outpatient utilization and expenditure: evidence from one middle-income country using national household survey data. Health Res Policy Syst. 2007;5:6. doi:10.1186/1478-4505-5-6

42. Chaudhuri A, Roy K. Changes in out-of-pocket payments for healthcare in Vietnam and its impact on equity in payments, 1992-2002. Health Policy. 2008;88(1):38-48. doi:10.1016/j.healthpol.2008.02.014

43. Bourne PA. Self-rated health and health conditions of married and unmarried men in Jamaica. N Am J Med Sci. 2009;1(7):345-352. doi:10.4297/najms.2009.7345

44. Joung IM a, Van Der Meer JBW, Mackenbach JP. Marital Status and Health Care Utilization. Int J Epidemiol. 1995;24(3):569-575. doi:10.1093/ije/24.3.569

45. Ahmed S, Sarker AR, Sultana M, et al. The impact of community-based health insurance on the utilization of medically trained healthcare providers among informal workers in Bangladesh. Oh J, ed. PLoS One. 2018;13(7):e0200265. doi:10.1371/journal.pone.0200265

46. Khan JAM, Ahmed S, MacLennan M, Sarker AR, Sultana M, Rahman H. Benefit incidence analysis of healthcare in Bangladesh - equity matters for universal health coverage. Health Policy Plan. 2017;32(3):359-365. doi:10.1093/heapol/czw131

47. Rahman A, Nisha MK, Begum T, Ahmed S, Alam N, Anwar I. Trends, determinants and inequities of 4+ ANC utilisation in Bangladesh. J Heal Popul Nutr. 2017;36(1):2. doi:10.1186/s41043-016-0078-5

48. Ahmed S, Szabo S, Nilsen K. Catastrophic healthcare expenditure and impoverishment in tropical deltas: evidence from the Mekong Delta region. Int J Equity Health. 2018;17(1):53. doi:10.1186/s12939-018-0757-5

49. Rahman MM, Gilmour S, Saito E, Sultana P, Shibuya K. Health-related financial catastrophe, inequality and chronic illness in Bangladesh. van Baal PHM, ed. PLoS One. 2013;8(2):e56873. doi:10.1371/journal.pone.0056873

50. Dror D, Chakraborty A, Majumdar A, Panda P, Koren R. Impact of community-based health insurance in rural India on self-medication &amp; financial protection of the insured. Indian J Med Res. 2016;143(6):809. doi:10.4103/0971-5916.192075

51. Xie B, Huo M, Wang Z, et al. Impact of the New Cooperative Medical Scheme on the trend of catastrophic health expenditure in Chinese rural households: results from nationally representative surveys from 2003 to 2013. BMJ Open. 2018;8(2):e019442. doi:10.1136/bmjopen-2017-019442

52. Aji B, De Allegri M, Souares A, Sauerborn R. The impact of health insurance programs on out-of-pocket expenditures in Indonesia: an increase or a decrease? Int J Environ Res Public Health. 2013;10(7):2995-3013. doi:10.3390/ijerph10072995

53. Heeley E, Anderson CS, Huang Y, et al. Role of health insurance in averting economic hardship in families after acute stroke in China. Stroke. 2009;40(6):2149-2156. doi:10.1161/STROKEAHA.108.540054

54. Wang Y, Jiang Y, Li Y, Wang X, Ma C, Ma S. Health insurance utilization and its impact: observations from the middle-aged and elderly in china. PLoS One. 2013;8(12):e80978. doi:10.1371/journal.pone.0080978

55. Philip NE, Kannan S, Sarma SP. Utilization of Comprehensive Health Insurance Scheme, Kerala: A Comparative Study of Insured and Uninsured Below-Poverty-Line Households. Asia-Pacific J public Heal. 2015;28(1 Suppl):77S-85S. doi:10.1177/1010539515602306

56. Mebratie A, Sparrow R, Debebe Z, Ejigie DA, Alemu G, Bedi AS. The Impact of Ethiopia’s Pilot Community Based Health Insurance Scheme on Healthcare Utilization and Cost of Care. Vol 593. Amsterdam; 2014. http://repub.eur.nl/pub/77021/.

57. Ekman B. Community-based health insurance in low-income countries: a systematic review of the evidence. Health Policy Plan. 2004;19(5):249-270.

58. Raza WA, Van De Poel E, Bedi A, Rutten F. Impact of community-based health insurance on access and financial protection: Evidence from three randomized control trials in rural India. Health Econ. 2016;25(6):675-687. doi:10.1002/hec.3307

59. Spaan E, Mathijssen J, Tromp N, McBain F, ten Have A, Baltussen R. The impact of health insurance in Africa and Asia: a systematic review. Bull World Health Organ. 2012;90(9):685-692. doi:10.2471/BLT.12.102301

60. Khan JAM, Ahmed S, Evans TG. Catastrophic healthcare expenditure and poverty related to out-of-pocket payments for healthcare in Bangladesh-an estimation of financial risk protection of universal health coverage. Health Policy Plan. 2017;32(8):1102-1110. doi:10.1093/heapol/czx048

61. Wagstaff A, van Doorslaer E. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993-1998. Health Econ. 2003;12(11):921-934. doi:10.1002/hec.776

62. LGRD. Department of Cooperatives in the Ministry of Local Government and Rural Development of Bangladesh. http://www.coop.gov.bd/. Published 2012. Accessed December 6, 2012.

63. Mebratie AD, Sparrow R, Yilma Z, Alemu G, Bedi AS. Dropping out of Ethiopia’s community-based health insurance scheme. Health Policy Plan. 2015;30(10):1296-1306. doi:10.1093/heapol/czu142

64. Panda P, Chakraborty A, Raza W, Bedi AS. Renewing membership in three communitybased health insurance schemes in rural India. Health Policy Plan. 2016;31(10):1433-1444. doi:10.1093/heapol/czw090

65. Dror DM, Koren R, Ost A, Binnendijk E, Vellakkal S, Danis M. Health insurance benefit packages prioritized by low-income clients in India: three criteria to estimate effectiveness of choice. Soc Sci Med. 2007;64(4):884-896. doi:10.1016/j.socscimed.2006.10.032

66. Sarker AR, Sultana M, Mahumud RA. Cooperative societies: a sustainable platform for promoting universal health coverage in Bangladesh. BMJ Glob Heal. 2016;1(3):e000052. doi:10.1136/bmjgh-2016-000052

67. Lu C, Chin B, Li G, Murray CJL. Limitations of methods for measuring out-of-pocket and catastrophic private health expenditures. Bull World Health Organ. 2009;87(3):238-244.

68. Bose M, Dutta A. Inequity in hospitalization care: a study on utilization of healthcare services in West Bengal, India. Int J Heal policy Manag. 2015;4(1):29-38. doi:10.15171/ijhpm.2015.05

69. Ranson MK. The Impact of SEWA’s Medical Insurance Fund on Hospital Utilization and Expenditure.; 2016.