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Investigating Multiple Domains of Household Livelihood Security: Insights from Urban Slums in Bangladesh [1]

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Abstract

In this article, the authors construct indices of Household Livelihood Security (HLS) domains, namely, economic, food, health, and education securities and empowerment with data from 1,120 poor households in two urban settlements of Bangladesh. The authors then jointly identify domain-specific socioeconomic determinants employing a multivariate Tobit model. A quintile analysis of domains shows high levels of inequalities among these poor households. The HLS domains are significantly positively correlated, and a host of factors significantly influence individual HLS domain. Interventions targeted at improving education, provision of business training and building of land asset are suggested to improve livelihood security.

***Key words*:** Household Livelihood Security domains, urban slums, socio-economic determinants, multivariate Tobit model, Bangladesh

***JEL Code*: C3,** O1; O18

1. Introduction

Over the past few decades, the concept and measurement of poverty evolved dramatically from purely economic to multi-dimensional and sustainable livelihoods (Lindenberg, 2002; Deaton, 2005; Scoones, 2009; Clegg, 2010). With this development in understanding of the dimensions of poverty, the complexity to analyse livelihoods of the poor has also increased. A livelihood comprises capabilities, assets, access to assets and activities required for means of living (Chambers and Conway 1992). Livelihood approaches aim at empowering the poor by building on their own opportunities, supporting their access to assets, and in developing an enabling policy and institutional environment (Hussein, 2002).

The ultimate aim is to safeguard the poor from food, health, and education insecurities and other multiple dimensions of poverty.

Due to a multitude of pull and push factors, urban population growth is unprecedented. Poverty and unemployment in the countryside, vagaries of the nature push people from countryside to cities, whilst modern, dynamic and economic opportunities in the cities attract them. Even the employment gains owing to 'Green Revolution' in the countryside remains skewed in favour of men as they are mostly hired to meet the increased demand for labour (Rahman, 2000, 2010) despite significant contribution of women's labour to agricultural productivity and efficiency (Rahman, 2010) thereby prompting women to migrate to the cities in search of livelihood. However, rural migrants in the cities often remain entangled in poverty (Deshingkar & Akter, 2009). For the better connected and better educated, moving to cities can result in rapid accumulation of assets but for those who belong to historically oppressed communities or locations, poverty is the worst. Most of these migrants from disadvantaged background end up in slum areas of cities. They remain trapped in a low-wage low-skilled work with little job security, inadequate food and shelter, deprivations of basic education and health and are extremely vulnerable to pressures of ill health, economic dislocation and natural disasters. Even though more than a billion of urban population live with inadequate basic resources, very little is known about the factors influencing livelihood security of these urban poor (IFPRI, 2002).

Bangladesh has made considerable progress in improving wellbeing of its population over the past few decades. Nevertheless, poverty is still high; 31.5% of the population are living below the poverty line (BBS, 2011). Also, an estimated 30% of total population live in the cities. The capital Dhaka is one of the most dense cities of the world with a population well over 15 million (Rahman & Akter, 2012). Furthermore, a multitude of causes including unemployment in the rural countryside, vagaries of the weather and river erosion result in an

unscrupulous migration to cities, making it further crowded. Urban slums and squatter settlements are characterised by high density of poor people along with inadequate services like health, sanitation, water supply and electricity.

CARE, an international NGO, uses livelihoods approach as its primary programming framework in development projects for the poor. Prior to up scaling its urban programme during the early 2000s and to identify best practices in urban programming, CARE-Bangladesh, in collaboration with International Food Policy Research Institute (IFPRI), conducted detailed baseline survey using Household Livelihood Security (HLS) framework (CARE, 2001, 2004; Figure 1). The survey included 1120 households from slum areas of two secondary cities, Jessore and Tongi. Jessore is located 376 kms away from capital Dhaka in the southwest corner of Bangladesh with primary economic activities revolving around trade with India. Tongi is a "suburb" of the capital Dhaka with industries as its main economic activity.

(Insert Figure 1 here)

We utilize this rich dataset to specifically investigate our three key research objectives to better understand the level of livelihood security of the urban poor households in a developing economy like Bangladesh. These objectives are to: (a) measure the levels and the extent of inequalities amongst households with respect to five key HLS domains, namely, *economic, food, health*, and *education* securities and *empowerment*; (b) identify socio-economic factors influencing individual HLS domains; and (c) identify association or jointness amongst HLS domains.

In order to address these objectives, we adopt a quantitative approach which is rather limited in the literature on livelihoods analysis. The early literature is based largely on qualitative approaches (e.g., Lindenberg, 2002; de Haan et al., 2000; Toulmin et al., 2000; Ashley, 2000; Carney, 1999). They are rich in information but limited on wider

generalization of findings. The use of quantitative approach to analyse livelihoods is growing but still limited (e.g., Rahman & Akter, 2012; Jansen, et al. 2006; Ellis, 2000a, 2000b). For example, Jansen, et al. (2006) investigated livelihood strategies and their determinants for hillside population in rural Honduras. Ellis (2000a, 2000b) identified determinants of livelihood diversification in rural areas in the developing economies using quantitative approaches. Similarly, Rahman and Akter (2012) identified socio-economic determinants of overall household livelihood security of the urban poor in Bangladesh using econometric method.

The contribution of our study to the existing livelihood literature are as follows: (a) provide explicit information on the magnitude and the extent of inter-household inequality with respect to key HLS domains so that development programs can be targeted and prioritized to address HLS domains with highest level of inequality; (b) identify the determinants that are robust across all HLS domains so that programs can be targeted to improve these specific socio-economic factors; and (c) determine the nature of association amongst HLS domains so that synergies can be obtained from programs targeted at improving HLS domains those are inter-related.

2. Methodology

2.1 Construction of the Household Livelihood Security indices

The origin of livelihood security approach is linked to Sen's (1981) theory on entitlement, which refers to the set of income and resource bundles (e.g. assets, commodities) over which households can establish control and secure livelihoods. Most organizations adopted Chambers and Conway's (1992) definition of livelihood mentioned in Section 1, which also forms the basis of the baseline survey conducted by SHAHAR (Supporting Household Activities for Health, Assets and Revenue) project of CARE-Bangladesh to create the dataset used in this study.

Therefore, in this study we adopt the concept of HLS as adequate access to income and assets to meet basic needs such as food, nutrition, education, health facilities, shelter, water and sanitation and participation in community and social activities. We ignore the debates on the threshold security level or cut off point to classify the households as secure or insecure. Our focus is to identify robust determinants of HLS domains and inter-relationship amongst them. We consider five key HLS domains, namely, *economic security, food security, health security, education security* and *empowerment* (Rahman & Akter, 2012; Lindenberg, 2002). Rahman and Akter (2012) estimated the impact of these five domains on overall HLS but our analysis is more disaggregated. Unlike them, we estimated domain-specific socio-economic determinants, whilst cared for their joint influence using a multivariate Tobit model. The choice of multiple indicators to construct these HLS domains were based on guidelines provided by CARE-Bangladesh as formulated from a reflective workshop involving several other NGOs in Bangladesh (CARE, 2004).

The general framework of constructing our proposed indices is discussed below. Each HLS index uses a balanced weighted average approach with a large number of indicators, where each indicator contributes equally to the overall index. The indicators are grouped into different domains. Since each indicator is measured on a different scale, indicators are standardized following the approach adopted in measuring 'Life Expectancy' in Human Development Reports (also adopted by Hahn et al. 2009). For example, a standardized indicator j is given by:

$$zind_j = \frac{indicator_j - \min j}{\max j - \min j} \qquad (1)$$

where minimum and maximum values of the indicators are from the same community within which the household belongs.

$$HLS_i = \frac{\sum_{j=1}^{J} zindj}{J} \qquad (2)$$

where J is the number of indicators used to construct the index. These HLS indices are bounded between 0 and 1 by construction.

2.2 Modelling factors influencing HLS domains: multivariate Tobit model

Quantitative analysis of household's HLS domains is based on the economic assumption of utility maximization. The underlying utility function, which ranks the preference of individual households with respect to individual HLS domain, is not observable. A set of socio-economic characteristics of the household and its members are measurable and influence household's achievement of a given level of HLS index value. HLS is assumed to provide the household with a certain level of perceived utility and/or security.

We postulate that the households follow sequential decisions: first 'whether participate in a particular HLS domain?' and second, conditional on participation, 'what is the level of achievement in the chosen domain?' In such a case, a censored regression model is required. A Tobit model is the most suitable because it uses all observations, both those at the limit, usually zero (e.g., non-participants), and those above the limit (e.g., participants), to estimate a regression line as opposed to other techniques that use observations which are only above the limit value (McDonald & Moffit, 1980). The procedure also captures latent level of intensity of potential households who decide not to participate in a particular HLS domain.

Let the outcome function for participation in a particular HLS domain, for example economic security, (measured in terms of computed HLS index explained above) be given by:

$$Y_i^* = \gamma' X_i + \mu_i \qquad (3)$$

where X_i is the vector of regressors, γ is the vector of parameters to be estimated, and μ_i is the error term. For households trying to maximize economic security domain, Y_i^* equals the

actual level of economic security index value (Y_i). For those who are not participating in economic security domain Y_i^* is an index reflecting potential economic security such that:

$$\begin{aligned} Y_i \quad &= Y_i^* \quad \text{if } \gamma' X_i + \mu_i > 0 \\ &= 0 \quad \text{if } \gamma' X_i + \mu_i \leq 0 \end{aligned} \tag{4}$$

≤The advantage of the Tobit model as in Eq (4) is that it captures the decision to participate as well as the resulting outcome, whereas a probit model will provide information on the decision to participate only. Since we assume that majority of households will try to achieve multiple HLS domains at the same time, we postulate a multivariate Tobit model in order to capture this joint outcome:

$$\begin{aligned}
&Y_{1i}^* = \gamma' X_{1i} + \mu_{1i} \\
&Y_{1i} = Maximum(Y_{1i}^*, 0) \quad (the\, usual\, Tobit\, specification\, as\, in\, 4). \\
&Y_{2i}^* = \gamma' X_{2i} + \mu_{2i} \\
&Y_{2i} = Maximum(Y_{2i}^*, 0) \quad (the\, usual\, Tobit\, specification\, as\, in\, 4). \\
&Y_{3i}^* = \gamma' X_{3i} + \mu_{3i} \\
&Y_{3i} = Maximum(Y_{3i}^*, 0) \quad (the\, usual\, Tobit\, specification\, as\, in\, 4). \\
&Y_{4i}^* = \gamma' X_{4i} + \mu_{2i} \\
&Y_{4i} = Maximum(Y_{4i}^*, 0) \quad (the\, usual\, Tobit\, specification\, as\, in\, 4). \\
&Y_{5i}^* = \gamma' X_{5i} + \mu_{3i} \\
&Y_{5i} = Maximum(Y_{5i}^*, 0) \quad (the\, usual\, Tobit\, specification\, as\, in\, 4). \\
&\mu_{ii}, \mu_{2i}, \mu_{3i}, \mu_{4i}, \mu_{5i} \approx \\
&N[0,0,0,\sigma_1^2, \sigma_2^2, \sigma_3^2, \sigma_4^2, \sigma_5^2, \rho_{12}, \rho_{13}, \rho_{14}, \rho_{15}, \rho_{23}, \rho_{24}, \rho_{25}, \rho_{34}, \rho_{35}, \rho_{45}]
\end{aligned} \tag{5}$$

where Y_{1i}^* denotes $HLS_{economic}$ value of the *i*th household who participated in economic security domain; Y_{2i}^* denotes HLS_{food} value of the *i*th household who participated in food security domain, Y_{3i}^* denotes HLS_{health} value of the *i*th household who participated in health security domain, Y_{4i}^* denotes $HLS_{education}$ value of the *i*th household who participated in education security domain, Y_{5i}^* denotes $HLS_{empowerment}$ value of the *i*th household who participated in empowerment domain,; ρ_{12} is the correlation between the error terms μ_{1i} and

μ_{2i}, ρ_{13} is the correlation between the error terms μ_{1i} and μ_{3i}, and so forth. The distributions are independent if and only if $\rho_{12} = \rho_{13} = \rho_{14} = \rho_{15} = \rho_{23} = \rho_{24} = \rho_{25} = \rho_{34} = \rho_{35} = \rho_{45} = 0$.

This enables us to accommodate household's decision to participate in a single or a combination of HLS domains at the same time. The other advantage of this multivariate approach, as opposed to the univariate approach (i.e., single equation Tobit/probit/logit models), is that it is more efficient because it not only nests individual univariate models but also enables us to demonstrate jointness of the HLS domains by providing an estimate of the correlation between the error terms of the individual univariate models. The model is estimated with a program code developed by Barslund (2007) for STATA V10 software programme.

2.3 Study locations, data and variables

Data are drawn from the Baseline Survey of the SHAHAR project of CARE-Bangladesh which was conducted in slums and low-income settlements in the municipalities of Jessore and Tongi districts during August 2000 (CARE, 2001). CARE selected these two secondary cities purposively to accommodate diversities in city characteristics in its program. Figure 2 shows the survey locations in a map of Bangladesh. The spatial characteristics of Tongi are very different from Jessore. The former is characterized by the presence of large slum areas that have distinct identities and to a greater extent are spatially isolated from the general vicinity. In contrast, the slum communities in Jessore are largely part and parcel of the city, located alongside middle-class and well-off neighborhoods.

(Insert Figure 2 here)

Jessore is located in the southwest of Bangladesh on the main transport route linking Bangladesh to India. Administratively, Jessore is divided into 9 wards[2]. From these 9 wards,

[2] A ward is the smallest administrative unit in the urban/suburb setting in Bangladesh.

some 63 slum communities known as *bastis* were identified[3]. Tongi is an industrial area, which is located 25 km north of Dhaka, a fast growing mega-city in the world. Many of the inhabitants in Tongi including women work in the neighboring mills and factories. A total of 21 slum communities from 6 wards were selected for the survey.

Study sites in Jessore consist of a mix of rich, middle class and absolutely poor households living together whereas in Tongi the residents are purely slum dwellers. Also, a few sites in Jessore are located at the fringes of *Pourashava* (the municipality) which has a complex mix of urban and rural lifestyles, including extensive crop agriculture. A total 1120 households were surveyed (563 in Jessore and 557 in Tongi). Households were selected randomly from a complete listing done as part of a census in the areas in April-May 2000. The sample size was statistically representative (CARE, 2001). The size was determined using the following equation:

$$n = \frac{(1.645)^2 \times [p(1-p)]}{(0.05)^2}$$

where, 1.645 is the standard error associated with 90% confidence level of a standard normal distribution; p = proportion of a key variable of interest, estimated prevalence of stunting in this case, because the survey was a baseline meant for action research to improve food and nutrition security. 0.05 = error level (5%)[4].

According to this formula and the above values, n is approximately 271, this number was doubled because stunting was measured for children under 5 and 50% of the households do not have children. Another 10% was added to this number to consider non-response due to

[3] A *basti* is often defined as an unplanned settlement of households typically without secure tenure, adequate sanitation and other urban services needed to maintain minimum environmental health standards.

[4] Rapid assessment was used to estimate the prevalence of stunting (p), which was 38% of boys and 41% of girls. A higher rate of 50% was used to select the sample size to account for any error in the assessment as well as to maximise sample size.

mobility of households because slum dwellers are highly mobile. Thus the upper bound of the randomly chosen sample size was (271*2)*1.10=596, approximately 600 and actual sample size was 563 in Jessore and 557 in Tongi as reported in Table 1.

A structured questionnaire consisting of 17 modules was used for data collection. Topics include information on household demographics, education, migration, income from employment, transfers, social assistance and other sources, household assets, urban agriculture, savings, loans, housing, environment, water and sanitation, daily food consumption, diarrhoea and other illnesses, health, nutrition knowledge and practice, pre-school feeding, utilization of health care facilities for pregnancy/birth, anthropometry, community participation, general household livelihood security.

Multiple visits (2–3) were made by the enumerators during September 10-26, 2000 to complete all sections of the questionnaire in each household. The distribution of the sample and some key features are presented in Table 1.

(Insert Table 1 here)

In the survey, the project team collected data on regular activities and income of last 30 days from four broad activity groups with several activities within each group. The groups are wage laborer, salaried worker (with and without salary or pay) and self-employed. Data on seasonal income from enterprises, social assistance and other irregular sources for the last six months was also collected. All these income sources were then aggregated to arrive at the monthly income per capita reported in Table 1. Although monthly average income is slightly higher in Tongi than Jessore, the difference is not statistically significant. A slightly higher income in Tongi was due to higher contribution of salaried income upto 50% as compared to about 28% in Jessore. This is expected because of Tongi's industrial nature and proximity to Dhaka city. On the other hand, income share from trading in Jessore was significantly higher

at 36% as compared to Tongi (26%) which reflects status of Jessore as a trading city with neighboring India.

Although the data collected for this study are 15 years old, little has changed with regard to the plight of the urban slum dwellers in Bangladesh. Furthermore, we are investigating underlying structural relationships amongst livelihood security domains using econometric techniques where timing of data collection has no influence. Therefore, we argue that our results are capable of providing valuable information of relevance to policy makers and development practitioners alike.

3. Results

3.1 Indicators of HLS domains

In this section we present details of the five HLS domains: *economic security, food security, health security, education security* and *empowerment* constructed using a total of 33 indicators. The summary statistics of these indicators for Jessore and Tongi are presented in Table 2 which shows clear differences between the regions with respect to a number of indicators. For example, households in Jessore are endowed with land based resources, machinery and equipment which is not the case with Tongi. The implication is that interventions aimed at enhancing land based income will work well in Jessore but not in Tongi. On the other hand, female participation in employment is higher in Tongi. Therefore, interventions targeting women, which are common in livelihoods and poverty related projects, will work well in Tongi.

(Insert Table 2 here)

In order to construct indicators for food security, data on household level food baskets collected on 24 hour recall basis were divided into 8 groups: cereals, roots and tubers, pulses, foods of animal origin, vegetables, fruits, fats and oils, and snacks. Only 2% of the households had diets consisting of all 8 types of food. About 66% of the households missed

four types of food other than cereals in 24 hours. Missed foods are mainly protein-rich high value products (e.g., milk, milk products, eggs and meat and fruits). Data were also collected on number of times each type of food consumed in a 24 hour period (food frequency). Food frequency was significantly highly positively correlated to the number of types of food groups consumed ($r = 0.78$, $p<0.01$), implying that those who eat more frequently also eat more types of food. In other words, food frequency and dietary diversity are positively correlated, implying that any of these two indicators can be used satisfactorily to represent food diversity, although we have included both.

There is very little difference with respect to health related indicators between regions except a few which are significantly different. For example, the 'number of days unable to work due to sicknesses' is significantly higher in Tongi which may be due to higher level of industrial pollution. Measures aimed at reducing industrial pollution will positively influence reduction in sick days for employees in Tongi. The incidence of sickness is, however, high in both regions as 81% of households in Jessore and 83.3% in Tongi had at least one member who was sick during the 30-day recall period. The body mass index is significantly lower in Tongi. In Tongi 49% of girls and 41% of boys under age 5 were stunted while in Jessore 33% of girls and 40% of boys were stunted. Also, 20% of the children in Tongi and 15% in Jessore were underweight. These figures indicate existence of alarming level of child malnutrition.

Tongi fare worse with respect to educational indicators. All of the seven indicators have lower average value in Tongi in spite of its proximity to capital city Dhaka. These may be due to a combination of a number of factors. Although both cities comprise population of rural migrants but Tongi attracts more of those. Because the literacy rate is inherently lower in rural areas, it is reflected in the education indicators in Tongi. Also, this may be the impact of industrial/manufacturing job opportunities. The short run impact of this is higher per capita

earnings but the long run impacts may not be pleasant. Tongi is more congested and so basic services are extremely poor. Female-headed households account for 21% of households in Tongi and 11% in Jessore. Of those, 85% in Tongi and70% in Jessore are not able to meet basic needs.

Access to and control of resources, participation and influencing the decisions at family, social and political levels are often considered important components of empowerment (Kabeer, 2000). In this study, we take community participation as one of the three indicators of empowerment. It is measured by number of months of active involvement with any organisation that deliver community services. The second indicator is the access to services. This is measured based on whether households received any service (yes=1 and no=0) such as training, credit, health awareness, water and sanitation, sports, culture and other urban amenities from any provider. The third indicator is the household participation in the planning process. This variable was measured from the answers (yes=1 and no=0) to question that 'Have any of the household members ever participated in any planning process with the *Pourashava* regarding development of your community?' Only 6% of the households reported participation in the *Pourashava* planning process. In spite of longer involvement with different organizations, households in Tongi had lower access to services, perhaps because the area is overcrowded.

3.2 Inter-household inequality of the HLS domains

The HLS indices for each domain were calculated using the standardized values of the indicator variables. The standardization was done using their ward level maximum and minimum values, based on the method explained in Section 2.1. We report the mean index values of these five key HLS domains distributed by their quintiles in order to demonstrate existence of serious inequality within these poor households with respect to these indices (Table 3). Although all indices are standardized, monotonically increasing and are bounded

between 0 and 1, one should not compare the index values between domains to judge relative level of security outcomes of individual domain. However, comparison is valid across quintile distribution of households within the same HLS domain.

Overall, both regions are equally poor with respect to economic, food, health, and education securities and empowerment. However, the differences in terms of food security, education security and empowerment between regions are statistically significant, implying that Tongi is worse off than Jessore even though both may still be insecure. The more disturbing feature in the distributions is the existence of high level of inequality between the bottom and top 20% of households with respect to each HLS domains in Jessore and Tongi. For example, the mean values of economic security, food security and health security indices are respectively 218%, 100% and 305% higher for the top 20% of the households than the bottom 20%. In the extreme case, mean index values of the education security and empowerment is almost nil for the bottom 40% in both Jessore and Tongi. The implication is that although both slums of Jessore and Tongi are equally poor with respect to HLS domains, the bottom 20% of the households are extremely insecure, particularly for education security and empowerment domains.

Many organizations consider education and empowerment are weaker than other domains. Then they intervene with projects such as skills training/literacy for mothers and children. This may cause higher inequalities with respect to these two domains as we noted in our study. Due to economic hardship or health related issues, the poorer group in the community may not be visible and may not reap opportunities arising from such interventions. Also, evidence suggests that better off groups usually attempts to make poorer groups invisible to direct the benefits from intervention towards their own group interest (Kamath & Vijayabaskar, 2014).

(Insert Table 3 here)

3.3 Determinants of HLS domains: a multivariate Tobit model

The results of the full information maximum likelihood estimation of the multivariate Tobit model are presented in Table 4. The explanatory variables used in these equations are strictly exogenous as these are not included in constructing any of the HLS domains (i.e., those presented in Table 2). Prior to discussing the findings we explain the test results. The first test was a pooling test done to determine whether the data from two regions can be pooled. The test suggested by Battese and Coelli (1988) compares the value of log-likelihood for the pooled model (H_0) with the sum of log-likelihood for the sub-samples estimated separately (H_1). The LR test results showed that the data can be pooled. Next test was to identify suitability of explanatory variables included in the model. The model test results reported in the lower panel of Table 4. Globally, 58% of the estimated coefficients (32 out of 55 coefficients) were significantly different from zero at 10% level at least. This supports the inclusion of the variables in the model. The Wald χ^2 test results, presented at the bottom panel of Table 4 statistically validate that these variables contribute significantly as a group to the explanation of the determinants of HLS domains.

(Insert Table 4 here)

The final test was to identify jointness of the HLS domains. The key hypothesis that the 'correlation of the disturbance terms across five HLS domains are jointly zero is strongly rejected at the 1% level of significance, implying strong association amongst HLS domains. This further establishes that the use of a multivariate Tobit model is justified. The lower panel of Table 4 shows that six of the 10 pairs of correlation amongst disturbance terms are significantly different from zero at 1% level, which further establishes jointness of the outcomes of HLS domains. All of the significant correlation coefficients are positive. For example, the correlation coefficient between the disturbance terms of $HLS_{economic}$ and HLS_{food} domains, $\hat{\rho}_{(economic,\ food)}$, is positive implying that the unobservable factors, which increase the

probability of economic security also increase the probability of food security. Similarly, the unobservable factors, which increase the probability of food security also increase the probability of increasing health security, $\hat{\rho}_{(food,\ health)}$.

Among the explanatory variables, family size has variable effects on HLS domains. Larger family size significantly increases the probability of being food secure, education secure and empowered but reduces the probability of being health secure. The reasons may be the ability to produce/procure more food due to availability of family labor, more members being in education, and more members being able to access services. But, ensuring good health for all seems to be not feasible in a larger family. However, dependency ratio (i.e., larger number of dependence) significantly reduces most of the HLS domains. The overall implication of these two indicators is that large family size with more working adults per household actually is the preferred scenario.

Land asset significantly increases the probability of being economically, food, and health secure, although the effect is too small. Land is a major source of wealth in Bangladeshi economy, and land scarcity is acute in an urban setting. Therefore, significant influence of this indicator on three key HLS domains is expected. Age of the household head, used as a proxy of overall experience, significantly increases the probability of being health and educationally secure and empowered.

Highest level of education of any member of the household significantly increases the probability of being economically, food, and educationally secure. Not only high level of education in the family, but also education of head of the household positively influences security. The two simple measures of literacy of the household head (i.e., ability to read or write or sign name only; or ability to read and write properly) shows that this low levels of education significantly increases the probability of household being food, health, and educationally secure as well as empowered than households which have illiterate heads. The

overall implication of the effects of these three education related indicators establishes that education for all is the key to secure livelihoods, which is also a very straight forward policy amenable variable. Also, receiving business training significantly increases the probability of being economically and health secure, another policy amenable variable. Average level economic security is higher in Tongi where food and education securities were significantly lower, as reflected by the district dummy variable.

4. Conclusions and Policy Implications

The main objectives of this study are to measure the level and extent of inter household inequalities with respect to five key HLS domains (namely, economic, food, health, and education securities and empowerment), identify their robust determinants and inter-relationship amongst HLS domains of the poor urban households from two secondary cities of Bangladesh (Jessore and Tongi).

Results reveal that the levels of HLS domains are equally low in both cities. However, significant difference exists between the cities with respect to food security, education security and empowerment. High level of inequality exists between the bottom and top 20 % of households within each HLS domain. The situation is particularly worse for the bottom 40 % of households who had zero values for education security and empowerment. The HLS domains are significantly positively correlated, implying that improvement in one domain is associated with improvement of the other domains. Among the determinants, larger family size with more working adult significantly improves HLS domains. Land ownership significantly positively influence economic, food and health security domains. The influence of education and literacy is very strong on the HLS domains. Business training significantly influences both economic and health security.

The policy implications are clear. Interventions should target to address all security domains, not only pick and choose the weakest domain as commonly done by development

organizations. Interventions aimed at enhancing education and literacy for all members of the households, provision of business training, and building of land based assets will significantly improve all HLS domains jointly because these are the robust determinants. Many organizations intervene with projects such as skills training /literacy for mothers and children. Such types of interventions should be combined with employment generation programmes to strengthen economic security. The literacy programme cannot be accessed by the bottom groups due to economic hardships. This should be borne in view while programming for the poor. The better off groups may make poorer groups invisible to direct the benefits from intervention towards their own group interest. In that situation inequality would rise even in the poorer part of the country.

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Table 1. Key demographic features of the sampled households in Jessore and Tongi, Bangladesh

Locations	Number of households	Number of male members	Number of female members	Total number of members	Family size	Income per capita (BDT)	12 activity diversity (HHI)
Jessore	563	1337	1347	2684	4.77	820.86	1.44
Tongi	557	1292	1289	2581	4.63	891.88	1.40
Total	1120	2629	2636	5265	4.70	856.12	1.42

Note: BDT is Bangladesh currency Taka, US$ 1.00 = BDT 52.14 in 2000.

Table 2. Summary statistics of the livelihood security indicators in Jessore and Tongi, Bangladesh.

Security Domains	Indicators	Jessore region		Tongi region		All region	
		Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Economic	Income per capita per month (BDT)	820.9	664.9	891.9	1314.4	856.1	1039.5
	Value of land/house/animal shed/pond per capita (BDT)	25252.2	67261.8	8516.9	25961.3	16929.4	51741.1
	Value of livestock asset per capita (BDT)	252.6	1018.1	38.4	275.7	146.1	754.9
	Value of machineries & equipment per capita (BDT)	1505.0	12435.5	307.9	2021.9	909.7	8947.4
	Value of other asset per capita (BDT)	2435.6	3357.1	1865.7	2511.1	2152.1	2979.0
	Income earned by women per capita (BDT)	65.3	163.9	156.4	269.2	110.2	226.7
	Savings per capita (BDT)	1419.7	10288.6	431.9	1088.4	928.5	7348.3
	Loan per capita (BDT)	792.0	2699.5	1093.4	2149.2	941.9	2445.0
	Active population ratio (15-59 yrs population/family size)	0.6	0.2	0.6	0.2	0.6	0.2
	Proportion of 15-59 population in employment	0.6	0.3	0.6	0.3	0.6	0.3
Food	Dietary diversity (number of food groups consumed per day)	11.7	3.5	12.0	4.2	11.9	3.9
	Food frequency (number of meals and snacks per day)	5.1	1.2	4.8	1.3	5.0	1.3
	Household foodgrain stock (BDT per capita)	57.6	383.7	28.9	177.7	43.3	299.7
	Number of food available months in the year	9.6	2.7	9.5	2.3	9.6	2.5
	Number of main meals consumed by women in the household	2.9	0.3	2.9	0.3	2.9	0.3
Health	Family members suffered from diarrhoea (days/month)	0.5	2.0	0.8	2.1	0.7	2.1
	Family members suffered from other sicknesses (days/month)	7.3	8.0	7.4	7.6	7.4	7.8
	Number of days unable to work due to sickness	3.6	4.4	5.6	6.1	4.6	5.4
	Frequency of antenatal consultation	4.1	2.0	4.2	2.2	4.2	2.1
	Doses of tetanus vaccination	2.2	0.9	2.2	1.0	2.2	0.9
	Body Mass Index of women	21.2	3.5	20.2	3.1	20.7	3.4
	Body Mass Index of children under 5 years of age	15.3	6.7	15.0	5.3	15.1	6.0
Education	Literacy (Population aged 7+ yrs who can read and write)	2.4	1.9	1.9	1.8	2.2	1.9
	Adult male literacy aged 15+ yrs	1.0	1.1	0.7	0.9	0.9	1.0
	Adult female literacy aged 15+ yrs	0.7	0.8	0.5	0.7	0.6	0.8
	Adult members with 10 years or more education	0.4	0.9	0.2	0.5	0.3	0.7
	Children enrolment aged between 6-10 years of age	0.4	0.6	0.4	0.6	0.4	0.6
	Boys enrolment aged between 11-15 years of age	0.2	0.4	0.1	0.4	0.2	0.4
	Girls enrolment aged between 11-15 years of age	0.2	0.4	0.1	0.4	0.2	0.4
	Adult enrolment aged between 16-23 years	0.2	0.5	0.1	0.3	0.1	0.5
Empowerment	Community participation or involvement with institution (months)	2.1	5.2	6.5	15.8	4.3	11.9

Security Domains	Indicators	Jessore region		Tongi region		All region	
		Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
	Access to services or organisations offering services	0.1	0.3	0.1	0.3	0.1	0.3
	Households' participation in the planning process	0.1	0.2	0.1	0.3	0.1	0.2
	Sample size (N)	563		557		1120	

Note: Exchange rate USD 1.00 = BDT 52.14 in 2000.
Source: Adapted from Rahman and Akter (2012).

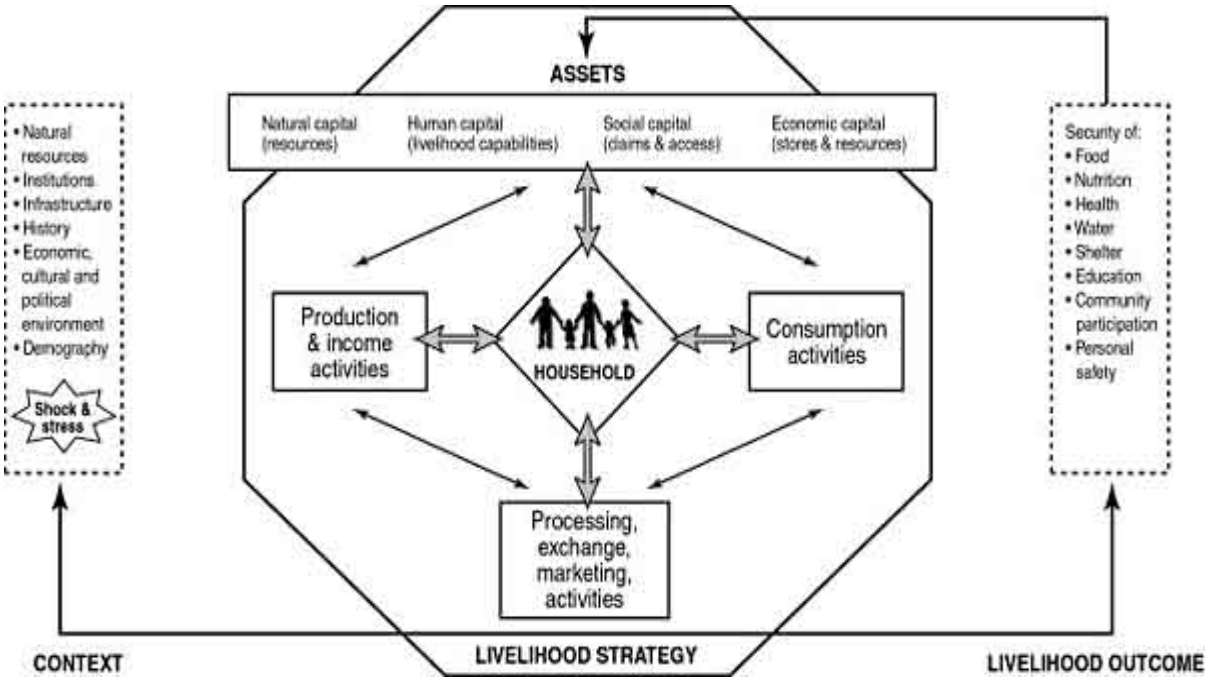
Table 3. Quintile distribution of mean values of HLS indices.

Livelihood security indices	1st quintile Bottom 20%	2nd quintile 21–40%	3rd quintile 41– 60%	4th quintile 61–80%	5th quintile Top 20%	All households
Jessore						
Economic security index	0.088	0.129	0.155	0.193	0.286	0.170
Food security index	0.364	0.502	0.562	0.620	0.730	0.555
Health security index	0.200	0.406	0.511	0.616	0.801	0.506
Education security index	0.000	0.012	0.060	0.176	0.483	0.146
Empowerment index	0.000	0.000	0.036	0.143	0.361	0.108
Tongi						
Economic security index	0.091	0.133	0.161	0.193	0.281	0.172
Food security index	0.345	0.480	0.537	0.591	0.677	0.526
Health security index	0.203	0.390	0.487	0.596	0.825	0.499
Education security index	0.000	0.000	0.019	0.099	0.375	0.098
Empowerment index	0.000	0.000	0.031	0.098	0.323	0.090
Overall						
Economic security index	0.089	0.131	0.158	0.193	0.283	0.171
Food security index	0.353	0.490	0.549	0.605	0.705	0.540
Health security index	0.201	0.397	0.498	0.607	0.813	0.503
Education security index	0.000	0.000	0.041	0.135	0.434	0.122
Empowerment index	0.000	0.000	0.031	0.119	0.344	0.099

Table 4. Joint determination of factors influencing HLS domains: a multivariate Tobit analysis.

Variables	Economic security	Food security	Health security	Education security	Empowerment
Constant	0.1942***	0.4910***	0.5211***	-0.4596***	-0.1655***
Family size (persons in household)	-0.0018	0.0088***	-0.0098***	0.0754***	0.0113***
Per person own land (acres)	0.0001***	0.0001***	0.0001**	0.0001	0.0001
Dependency ratio	-0.0386***	-0.0141***	-0.0266**	-0.0403***	-0.0112
Age of head (yrs)	-0.0001	-0.0004	0.0013**	0.0021***	0.0014**
Highest education of any member (yrs)	0.0031***	0.0046***	0.0021	0.0102***	0.0011
Female headed households	0.0055	-0.0334**	0.0005	0.0567*	0.0410
Head married and living with spouse	-0.0100	-0.0026	-0.0458	-0.0243	0.0261
Head can only read/write/sign name	0.0155	0.0342***	0.0355*	0.0433**	0.0772***
Head can read and write	0.0038	0.0425***	0.0529**	0.1717***	0.0548*
Head received business training	0.0217*	0.0246	0.0870**	0.0191	-0.0248
District dummy (Tongi=1)	0.0112***	-0.0147**	-0.0043	-0.0443***	-0.0081
Model diagnostics					
Log likelihood	2058.22				
Wald $\chi^2_{(\text{df})}$	1447.79***				
Correlation between the error terms					
$\rho_{(\text{economic, food})}$	0.2567***				
$\rho_{(\text{economic, health})}$	0.1458***				
$\rho_{(\text{economic, education})}$	0.1703***				
$\rho_{(\text{economic, empowerment})}$	0.1605***				
$\rho_{(\text{food, health})}$	0.1559***				
$\rho_{(\text{food, education})}$	0.0443				
$\rho_{(\text{food, empowerment})}$	0.0942***				
$\rho_{(\text{health, education})}$	0.0474				
$\rho_{(\text{health, empowerment})}$	-0.0285				
$\rho_{(\text{edcation, empowerment})}$	0.0383				
Wald $\chi^2_{(10\ \text{df})}$ (H_0: Correlation between pairs of disturbance terms are jointly 0)	174.58***				
Number of observations	1120				

Note: *** = significant at 1 percent level (p<0.01); ** = significant at 5 percent level (p<0.05); * = significant at 10 percent level (p<0.10)



Source: Adapted from CARE (2004).

Figure 1. CARE's Household Livelihood Security (HLS) model.

Figure 2. Study locations of Jessore and Tongi in Bangladesh.