

**ARS-12-812**  
**Revised version**  
**(incorporating all suggestions of the editor)**

**Determinants of Household Livelihood Security in Poor Urban Settlements in Bangladesh<sup>1</sup>**

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September 2012

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<sup>1</sup> The paper was presented at the 84<sup>th</sup> Annual Conference of the Agricultural Economics Society (UK) held at the Royal Agricultural College, Edinburch, UK during March 29-31, 2010. An earlier and unabridged version of this is available as NAF-IRN International Working Paper #10/01 (2010), University of Pavia, Italy <http://economia.unipv.it/naf/>.

# **Determinants of Household Livelihood Security in Poor Urban Settlements in Bangladesh**

## ***Abstract***

*The paper applies a quantitative approach to measure and identify the determinants of household livelihood security (HLS) status in poor urban settlements of two cities in Bangladesh. Indices were computed for five HLS areas (economic, food, health, education and empowerment) using a large set of socio-economic characteristics of the households. Results reveal that economic security is the dominant component of the overall livelihood security status followed by food security. Irrespective of regional differences in opportunities, people in poor urban settlements appear equally insecure. Development programs focusing on improvements in access to assets, education and livestock/fisheries based livelihoods programs are suggested.*

**Key Words:** Livelihood security analysis, determinants, poverty, Bangladesh

JEL Classifications: O1; O18; R0.

## **1. Introduction**

Analysis of livelihood is complex. Much of the literature in examining livelihood of the households and/or communities adapted Chambers and Conway's (1992) definition. They conceptualized sustainable livelihoods in terms of capacities and activities, that is, "a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for next generation: which contributes net benefits to other livelihoods at the local and global levels in the long and short term" (pp 6–7).

Livelihood approaches are a comprehensive way of thinking about the objectives, scope and priorities for development, which places people and their priorities at its centre. The focus of these livelihood approaches are on empowering the poor by building on their own opportunities, supporting their access to assets, and in developing an enabling policy and institutional environment. NGOs and donor agencies found the approaches useful (Frankenberger et al. 2000).

Bangladesh, being one of the world's poorest and populous countries, always finds it difficult to raise the standard of living as well as to provide secure livelihood for its increasing population. Recent MDG analysis identifies Bangladesh as a nation that has attained some remarkable social and economic successes in terms of per capita income growth, reduction in population growth, decrease in child mortality, improvements in child nutrition, expansion of primary and secondary education, reduction of gender inequality in education, maintaining food production close to self-sufficiency level, and sustained trends of decline in income-poverty. In spite of impressive progress, 31.5% of the population is still living below the poverty line according to the Household Income and Expenditure Survey 2010 (BBS 2011). However, this may not be viewed as unusual for a country of 144 million people trying to make a living on a small area of land (which works out roughly as less than 0.02 ha per person) with very limited natural resources and are also frequently confronted by natural calamities and disasters. An estimated 30% of the population live in urban areas including 15 million in the capital Dhaka alone. Poor people in urban areas routinely turn to slums and squatter settlements for shelter with high population density, poor services and extremely insecure livelihoods. Being trapped in a low-wage low-skilled work with little job security, inadequate food and shelter, deprivations of basic education and health, these people are extremely vulnerable to pressures of ill health, economic dislocation and natural disasters.

The existing literature on livelihood analysis is skewed towards qualitative accounts and usually restricted to a geographical area or a particular resource management system and so conclusions are imprecise, often difficult to generalise them (e.g., Toufique and Turton, 2002; Lindenberg, 2002; de Haan et al., 2000; Toulmin et al., 2000; Ashley, 2000; Carney, 1999). Use of quantitative approach to analyse livelihoods is also inadequate. For example, Jansen, et al. (2006) applied a quantitative approach to analyse livelihood strategies and their determinants for hillside population in rural Honduras. Ellis (2000a and 2000b) provided a detailed analysis and identified determinants of livelihood diversification in rural areas in the developing economies.

Given this backdrop, the aim of this study is to examine livelihood security outcomes of the households residing in poor urban settlements in Bangladesh and to identify their determinants using a quantitative approach. This is done by utilising a large sample of household survey data from two secondary cities of Bangladesh collected jointly by the International Food Policy Research Institute (IFPRI) and CARE Bangladesh (CARE, 2001, 2004).

The paper is organised as follows. Section 2 describes the analytical framework, methodology and the data. Section 3 presents the results. Section 4 discusses, draws policy implications and concludes.

## **2. Methodology**

### **2.1 The Household Livelihood Security (HLS) Framework**

The livelihood security approach was employed to achieve the objectives. The livelihood approach evolved from the food crisis in the mid 1980s and Sen's (1981) theory on entitlement referring to the set of income and resource bundles (e.g. assets, commodities) over which households can establish control and protect livelihoods. The evolution of the

concepts and issues related to this theory eventually led to the development of the broader concept of Household Livelihood Security (HLS).

Hussein (2002) documented the diversity in the interpretation of livelihood approaches by various development agencies. Of them, CARE considers this approach as its integral part of program intervention and defines HLS as adequate and sustainable access to income and resources to meet all the basic needs and rights (Carney, 1999). This concept of HLS embodies three fundamental attributes of livelihoods: (1) the possession of human capabilities (e.g., education, skills, health, psychological orientation); (2) access to tangible and intangible assets; and (3) the existence of economic activities. The interaction between these attributes defines which livelihood strategies a household will pursue to reach its desired outcomes, known as CARE's HLS model (Figure 1). Simply speaking, livelihood security here refers to the ability of the household to meet its basic needs (or realize its basic rights). These needs include adequate food, health, shelter, minimal levels of income, basic education, and community participation (Frankenberger, et al. 2000).

## ***2.2 Construction of the livelihood security indices***

CARE developed a set of multiple indicators to assess each of the eight livelihood security outcomes of the HLS framework based on a reflective workshop involving several other NGOs in Bangladesh (for details, see CARE, 2004). In this study, a suite of indicators from these recommended set were selected (CARE, 2004) which can be derived from the survey data to construct the livelihood security indices. It is worth mentioning that CARE has developed a composite HLS index using rapid community appraisal techniques and selected sample household interviews by using a team of 10-12 persons spending about eight hours in a community (Lindenberg, 2002). A limitation of CARE's HLS indices is that it is designed to provide a quick grasp of the constraints faced by the households and/or communities to

assist in building program design and is not intended to serve as a researcher's tool kit that would allow for in-depth examination and scope for cross-comparisons and generalizations.

In this study, a composite set of HLS indices at the household level was developed by utilising a set of indicators representing each of the livelihood security areas using an approach similar to Hahn, et al. (2009). A total of 33 security indicators<sup>2</sup> were identified (see Table 2) from the data set and broadly grouped them under five security areas: economic security, food security, health security, educational security and empowerment (Lindenberg, 2002). The framework is described below.

Indicators are identified according to its relevance and it is assumed that each indicator carries equal weight and contributes to the overall HLS index. Therefore, the selected indicators are standardized following the procedure adopted in measuring Life Expectancy in Human Development Reports (also adopted by Hahn, et al. 2009). For example, a standardized indicator  $j$  of a household is given by:

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

where the minimum and maximum values of the indicators are from the same community where the household belongs. Once each indicator representing a particular livelihood security domain is standardized, then the relevant household livelihood security index for the particular domain is constructed by averaging the standardized indicators:

$$HLS_i = \frac{\sum_{j=1}^n zind_j}{n} \quad (2)$$

where  $j$  is the number of indicators used to construct the index. Once each HLS index is

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<sup>2</sup> It should be re-emphasized that the data that we are using has been collected by applying CARE's own HLS framework. The first author of this paper was responsible for designing and implementing the surveys in collaboration with other IFPRI and CARE-Bangladesh colleagues.

constructed, then the composite overall Livelihood Security (LS) index for the household is constructed by using the formula in equation (3):

$$LS = \frac{\sum_{i=1}^n w_i HLS_i}{\sum_{i=1}^n w_i} \quad (3)$$

where  $w$  are the weights determined by the number of indicators used to construct each HLS index. Weights vary between households because of the variation in the number of indicators at the household level.

This framework differs from CARE's because the main purpose of the latter was to provide a quick grasp of the constraints faced by the households and/or communities using rapid appraisal techniques whose caveats are well known. In contrast, our approach to measure HLS index uses a range of quantitative indicators of different security areas with a greater degree of precision.

### **2.3 Determinants of livelihood security**

In identifying the determinants of overall livelihood security, an econometric procedure is adopted. The underlying theoretical assumption mirrors the utility maximization premise of the rational households. In other words, households are assumed to maximize livelihood security status (including each of its domains) by following various strategies subject to the constraints of their asset/resource base, livelihood capabilities, claims and access. The strategies undertaken are not observable. What can be observed are the livelihood security outcomes in five key areas under consideration for each individual household which is determined by their asset/resource base, capabilities, claims and access.

In order to examine the determinants of overall livelihood security LS in Eq (3), we have specified the following reduced form equation:

$$\ln LS_i = \alpha_i + \gamma_i \sum_{i=1}^5 \ln HLS_i + \sum_{k=1}^n \beta_{ik} \ln X_{ik} + \varepsilon_i \quad (4)$$

where  $X$ 's are the exogenous variables representing household's socio-economic circumstances as well as community level attributes. A Two Stage Least Squares (2SLS) approach is employed because of possible endogeneity of individual HLS indices entering equation 4 since these are constructed from the indicators representing socio-economic characteristics of the households.

#### **2.4 Data and variables**

Data are drawn from the SHAHAR (Supporting Household Activities for Health, Assets and Revenue) project implemented by CARE-Bangladesh during 1999-2004 aimed at improving livelihood security of vulnerable urban households<sup>3</sup>. The SHAHAR Baseline Survey was conducted in slums and low-income settlements in August 2000 within the municipal areas of Jessore and Tongi districts (CARE, 2001). These two secondary cities were selected purposively to take into account of the diversities in city characteristics.

Jessore, located in southwest Bangladesh, has the main transport route linking Bangladesh to India. The slum communities in Jessore are to a large extent part and parcel of the city, located alongside middle-class and well-off neighbourhoods. Also, a few sites are located at the fringes of the municipality, which has a complex mix of urban and rural lifestyles, including extensive crop agriculture. Administratively, Jessore is divided into 9 wards<sup>4</sup>. Of these 9 wards some 63 slum communities known as *bastis*<sup>5</sup> were identified. In contrast, Tongi is an industrial area located 25km north of capital Dhaka. Tongi is characterized by the presence of large slum areas that have distinct identities and are to a large extent spatially isolated from neighboring communities. Many of its inhabitants

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<sup>3</sup> It should be noted that we are not evaluating the impact of SHAHAR program here. Some aspects of the evaluation of SHAHAR can be found elsewhere (e.g., Rahman, 2009).

<sup>4</sup> A ward is the smallest administrative unit in the urban/suburb setting in Bangladesh.

<sup>5</sup> 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.



including women work in the neighboring mills and factories. Some 21 slum communities from 6 wards were selected for the survey.

Households were selected randomly from a complete listing done as part of a census in all the 63 communities in Jessore and 21 communities in Tongi during April-May 2000. The sample size which was statistically representative and was determined as (CARE, 2001):

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

where, 1.645 is the standard error associated with 90% confidence level of a standard normal distribution,  $p$  is the proportion of a key variable of interest – ‘estimated prevalence of stunting’ in this case, because an important objective of SHAHAR project was to apply action research program aimed at improving food and nutrition security, and 0.05 is the error level (5%).

A total of 1120 households were surveyed (563 in Jessore and 557 in Tongi) during September 2000. A structured questionnaire consisting of 17 modules was used for data collection. Topics comprise household composition, migration and education, status of employment and earnings, transfers, social assistance and other income, 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. The enumerators visited each household 2-3 times in September 10-26, 2000 to complete all sections of the questionnaire. Table 1 shows the sample distribution; number of households, number of persons in household by gender and average family size. Family size was slightly higher in Jessore but statistically not different.

[Insert Table 1 here]

We assume that our five security areas (economic security, food security, health security, educational security and empowerment) are highly important and are directly related to the welfare of the poor households. Table 2 includes a set of indicator/component variables that we have constructed from the SHAHAR baseline survey data to calculate the indices. These indicators are assumed to differentiate household status substantially. For example, income levels differentiate economic status and so it is a component of economic security. Similarly, dietary diversity distinguishes food security status. Health security can be distinguished by examining the incidence of sickness and access to treatment and control. Education security can be differentiated by the level of literacy and enrollment status. Empowerment is distinguished by institutional participation and access to services to such organizations. Some indicators should represent the quality of these components. Quality component is not given adequate attention in this analysis due to non-availability of such information.

[Insert Table 2 here]

### **3. Results**

#### ***3.1 Income and livelihood diversity***

Data of regular activities and income derived from three broad activity groups of the past 30 days were collected in the survey. The activity groups are wage labourer, salaried worker and self-employed. Several activities were identified under each of these broad groups. Data were also collected for seasonal income from enterprises, social assistance and other irregular sources for the last six months. Income from all these sources was aggregated and per person monthly income is reported in the upper part of Table 2. Monthly average income is slightly higher in Tongi but statistically average income is the same in two areas because of high variation within areas. We subdivided all the activities, enterprise income and other sources of income into 12 groups and calculated the inverse Hirschman-Herfindahl Index (IHHI) (see

appendix). The value of this index ranges from 1 to the number of activities (12 in this case). Livelihoods appeared equally diversified in the settlements of both the districts. Individuals from different households engage in many activities but household level diversification in the settlements is low; 1.42 out of 12 activities (1.44 for Jessore and 1.40 for Tongi and is not statistically different).

Although there are no significant differences in total income per person and diversity of income, significant difference exists in income derived from individual sources. In other words, the occupational categories were significantly different between these two regions (Table 3). For example, wage labour and salaried income are the two dominant sources of earnings in Tongi. This is consistent with its industrial nature and proximity to capital Dhaka. Wage labour and self employment (except craft and related trade workers) are equally important in Jessore. Specifically, the income share from trading in Jessore is significantly higher than Tongi. This evidence tends to reflect Jessore's proximity to Indian border. Many people in this area are engaged in intercountry trade. Enterprise income, which includes agriculture (e.g., vegetables, fruits) and livestock, is also significantly higher in Jessore where land and natural resources are relatively more accessible.

[Insert Table 3 here]

### **3.2. Food security**

Household level food baskets collected on a 24-hour recall basis were divided into eight groups. These groups are 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 eight types of food. Remaining 98% of the households missed at least one type of food group. About 66% of the households missed four types of food group other than cereals in a 24-hour period (Table 4). Missed foods are mainly protein-rich high value products such as foods from animal origin (milk, milk products, eggs and meat) and fruits. Data were also

available on a number of times each type of food was consumed in a 24-hour period (i.e., food frequency).

Food frequency is highly correlated to the number of food groups consumed ( $r = 0.78$ ,  $p < 0.01$ ). This means that people, who eat more frequently, also eat more types of food. In other words, food frequency and dietary diversity are highly correlated variables. Any of these two variables may be used to represent food diversity; here we have used both food diversity and food frequency indicators to construct the food security index. The frequency of taking food ranges from 2 to 7 times a day. Some households eat food only twice a day, others eat more frequently up to a maximum of 7 times. Cereals (rice and wheat) are common in everybody's diet. More than half of the households in both locations consumed roots and tubers, particularly potatoes. Fish consumption was also common. Vegetable intake was quite low in Tongi, particularly for the female-headed households. In general, intake of protein-rich foods (e.g., meat, milk and milk products, eggs and fruits) was lower in female-headed households than male-headed households in both areas. In Table 4 we have categorised the households based on frequency of food groups eaten daily. The most frequent number of taking food is four types of food groups in addition to cereals.

[Insert Table 4 here]

Average level of food security indicators are presented in mid-panel of Table 2. There are significant differences between Jessore and Tongi in terms of foodgrain stocks and dietary diversity. Households in Jessore have more access to secure food due to the availability of higher foodgrain stocks. The difference appears small but statistically highly significant. There is a common tendency of female members to skip meals and eat less after feeding all other members. Obviously, this has food security implications. So we have included 'number of main meals undertaken by women in the household' in the indicator list of food security. There is no difference between Tongi and Jessore with respect to this

indicator. Data on food quantity was not recorded to examine whether female members eat less quantity than required in each meal. People in the settlements are much better in terms of food security relative to economic security but still the average is in the middle of the scale of 0 to 1.

### ***3.3. Economic security***

We have selected 10 economic security indicators (see upper part in Table 2). Higher values of these indicators imply that households are economically better off and hence more secured. Table 5 reports mean values of the indicators for Jessore and Tongi. The economic security index was calculated using the standardised values of these indicator variables. Standardisation was done using their ward level maximum and minimum values. Economically, the two regions are the same as the economic security index is low and not statistically different (Table 5). Location of the settlements does not matter in improving economic security. The implication is that policy intervention is necessary in all types of poor urban settlements but the same intervention is not appropriate in all locations. For example, households in the Jessore settlements are endowed with more land based resources as well as machineries and equipments and, therefore, interventions with land based enterprises may be more appropriate for Jessore, but may not be suitable for Tongi settlements. For Tongi, opportunities to improve access to wage and salaried employment are the key strategies.

[Insert Table 5 here]

### ***3.4. Health security***

Seven component measures of health security were used and the results showed that the people of Jessore and Tongi were equally health insecure but there are significant differences in terms of some individual components. Sickness is significantly higher in Tongi (lower mid-panel of Table 2). An estimated 81% of the households in Jessore and 83.3% in Tongi had at least one member who was sick during the 30-day recall period. Consistently, body

mass index for adult women is significantly lower in Tongi. Further analysis of data shows that in Tongi 49% of the girls and 41% of the boys under the age of 5 are stunted, while in Jessore the figures are 33% and 40% for girls and boys, respectively. Another 20% of the children in Tongi and 15% in Jessore were underweight for their height. This indicates existence of alarming malnutrition among children.

### ***3.5. Education security***

Seven indicators were used to measure education security (lower panel of Table 2). It is significantly lower in Tongi than in Jessore. All the indicators (except one) have significantly lower average value in Tongi in spite of its proximity to capital Dhaka. These may be due to the combined effects of a number of factors. Both cities comprise majority of population who were rural migrants but Tongi hosts relatively more of those. As the literacy rate is lower in rural areas, this is reflected in the education indicators in Tongi because these rural migrants come with low level of education. Also, settlements in Tongi are more congested and therefore, basic services are of extremely poor quality and/or non-existent. Nearly two thirds of the households in Tongi and more than half of the households in Jessore are struggling to cope with absolute poverty. Female-headed households, which account for 21% of the households in Tongi and 11% in Jessore, about 85% and 70% of them are not able to meet basic needs.

### ***3.6. Empowerment***

Empowerment has the lowest values among the five domains of livelihood security (bottom panel of Table 2) People are slightly more empowered in Jessore but the difference is not statistically significant. Empowerment index was calculated based on three indicators such as community participation, access to services and participation in the planning process. Community participation is measured by the number of months of active involvement with any organisation that deliver community services. Access to services 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. Household participation in the planning process 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 municipality (*pourashava*) regarding future of your community?’ Only 6% of the households reported participation in the municipality planning process. In spite of longer involvement with different organizations, Tongi households had lower access to services, perhaps because the area is overcrowded.

### ***3.7. Overall livelihood security***

Overall livelihood security index comprises five major livelihood security domains: economic security, food security, health security, educational security and empowerment. On an average, overall security is higher in Jessore (Table 5). The difference is small but statistically significant at 1% level. This variation arises from the significant difference in food, education and empowerment security. The other two areas such as economic and health security have the same average statistically in both regions. In both regions median values of education and empowerment are much lower than the average indicating that the distribution is skewed towards the lower values of the indices. This means that the majority of the households are far less secured than the average level depicted in the Table 5. An analysis of skewness of the distribution of these indices confirmed this intuition (not reported here).

### ***3.8. Determinants of livelihood security***

Finally we conduct an econometric analysis to identify the determinants of overall livelihood security status of these households using Eq 4. In addition to livelihood security indices, we have specified 10 additional variables to represent household circumstances ( $X$  variables in Eq. 4). For example, for the household which have higher level of family size and dependency ratio, their demand for basic needs will also be higher. The expectation is that

these variables will affect livelihood security negatively, other things being equal. The individual security indices would affect overall livelihood security positively. Other variables included are the characteristics of the household heads. The expectation is that their age and education will associate positively with the livelihood security level but the signs of the other variables such as marital status, gender etc. cannot be determined a priori and depends on the circumstances.

### **3.9. Model tests**

First data pooling tests were conducted. For example, there is a need to decide whether to analyse the combining Jessore and Tongi data together or model them separately. Chow test was applied to check this and results showed that the data should be modelled separately for each region or use a independent set of dummy variables to take into account of the regional differences. Separate models are preferable due to a fewer numbers of parameters to be estimated in each model and there are sufficient degrees of freedom available for each region.

Since modelling structure involves endogenous and exogenous regressors, next a set of tests for normality, constant variance and endogeneity were carried out using the Two Stage Least Squares (2SLS) framework. Breusch-Pagan/Cook-Weisberg test for heteroskedasticity on the OLS models identified that the variance is not constant (see bottom of Table 6). Cameron and Trivedi's decomposition of IM-test also showed heteroscedasticity and non-normality problems. Therefore, considering the results from all these tests, 2SLS procedure was applied for Jessore and Tongi separately (Table 6). However, results of the pooled model which actually mirror individual region results was also reported.

[Insert Table 6 here]

### **3.10. Results for Jessore**

All security indices (economic, food, health, education and empowerment) are significant determinants of overall household livelihood security (LS), thereby confirming justification



and robustness of the HLS framework in analyzing livelihoods. The signs of the coefficients are +ve as expected. The contribution of economic security to overall livelihood security is the highest, thereby establishing the need for designing interventions that address economic security as the priority area. In proportional terms, for a 10% increase in economic security, the LS will rise by 4% which is substantial (Table 6). This is followed by food security, which is not surprising. Among other variables, dependency burden has significant negative effect on LS. Given that the average level of economic, education and empowerment securities are extremely low for all households, it is necessary to implement programmes targeted to improve economic condition, education and empowerment as a whole. However, programmes targeting economic security would translate into higher livelihood security outcomes.

### ***3.11. Results for Tongi***

In Tongi, results are consistent and similar to Jessore. However, the marginal effects are relatively lower as compared to Jessore except for food security index. This implies that economic, health, education and empowerment enhancing programmes will exert slightly higher livelihood impact in Jessore than Tongi. For education, a 10% increase will result in a rise of 0.94% in overall LS in Tongi as compared to 1.13% in Jessore. Therefore, education enhancing policy will even exert better outcomes in Jessore. The effect of dependency ratio is highly consistent; virtually the same in both regions. The goodness of fit of Jessore model is slightly better than the Tongi model, but both fits are satisfactory.

## ***4. Conclusions and Policy Implications***

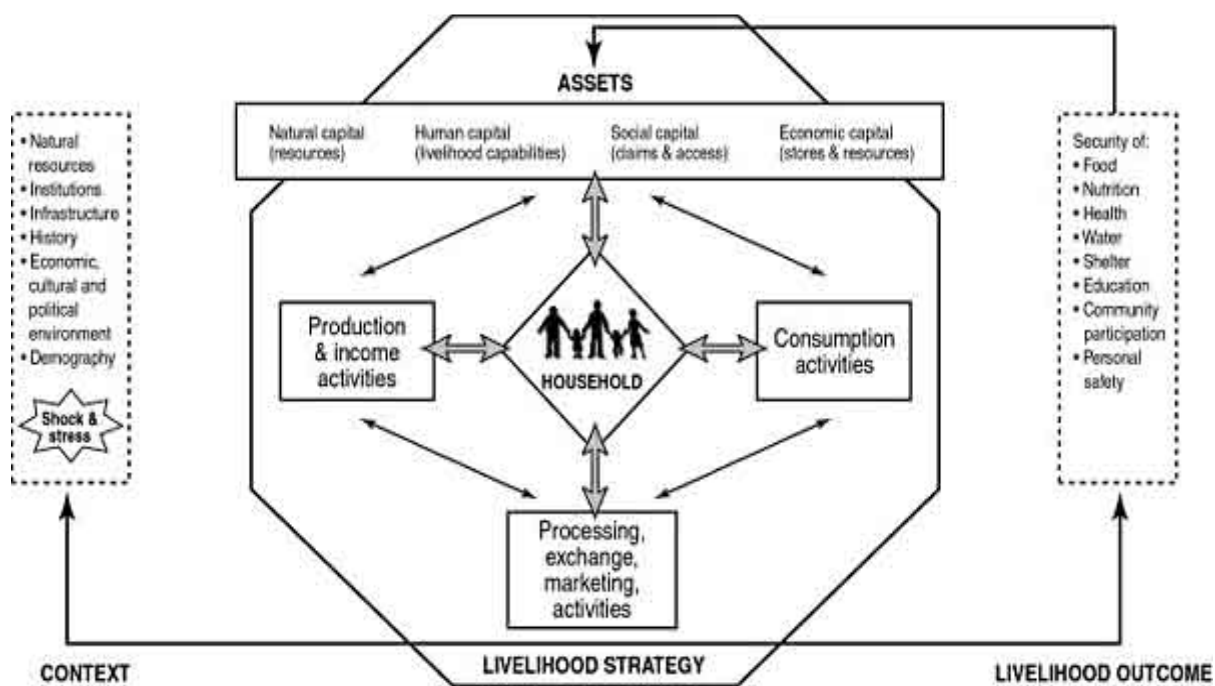
This study utilised a quantitative approach to measure livelihood security status of the households residing in poor urban settlements (slums and squatters) in two secondary cities of Bangladesh and identified the determinants of livelihood security outcomes. Five security domains, namely, economic, food, health, education and empowerment were chosen and the

indices were computed based on a number of components under each domain. From the results, it can be concluded that irrespective of regional differences in opportunities, people in urban squatters and slums appear similarly insecure. This does not mean that the same intervention strategy is equally applicable everywhere. There are geographical differences in the component indicators. Access to assets/capital endowment should be taken into consideration to design programmes. For example, areas where land/housing/ponds are more accessible, livestock/fisheries based livelihoods may be encouraged. Education enhancing policies are suitable for everywhere. Not only is overall livelihood security status relatively poorer in Tongi but also the impact of individual security domain on overall status is lower as compared to Jessore. This may be due to the fact that the survey sites in Tongi are contextually different, more crowded and are subject to severe livelihood constraints as these are purely slum areas. Any poverty reduction strategy should take into account these differences. Failure to do so would cause areas like Tongi to be less benefited from any intervention.

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Source: Adapted from CARE, 2004.

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

**Table 1. Sample size, Jessore and Tongi, Bangladesh**

<b>Locations</b>	<b>Households</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>Family size</b>
	<b>N</b>	<b>members</b>	<b>members</b>	<b>members</b>	
Jessore	563	1337	1347	2684	4.77
Tongi	557	1292	1289	2581	4.63
Total	1120	2629	2636	5265	4.70

**Table 2. Livelihood security indicators, Jessore and Tongi, 2000, Bangladesh**

<b>Security</b>	<b>Indicators</b>	<b>Jessore</b>	<b>Tongi</b>	<b>All</b>
<b>Economic security</b>	Per person income (TK per person per month)	820.86	891.88	856.12
	Per person current value of land/house/animal shed/pond (TK)	25252.17	8516.89	16929.36
	Per person current value of livestock asset (TK)	252.64	38.36	146.08
	Per person current value of machineries & equipment (TK)	1504.96	307.94	909.66
	Per person current value of other asset (TK)	2435.58	1865.65	2152.14
	Active population ratio (15-59 yrs population/family size)	0.60	0.60	0.60
	Proportion of 15-59 population in employment	0.55	0.62	0.58
	Household income earned by women (TK/person)	65.32	156.41	110.20
	Per person current savings (TK)	1419.71	431.93	928.47
	Per person current loan (TK)	791.96	1093.39	941.87
<b>Food security</b>	Dietary diversity: number of food groups consumed per day	5.1	4.8	4.9
	Food frequency (number of meals and snacks per day)	11.7	12.0	11.9
	Household foodgrain stock (TK per person)	57.6	28.9	43.3

Number of food convenient months in the year	9.6	9.5	9.6
Number of main meals taken by women in household	2.9	2.9	2.9
<b>Health security</b>			
Number of days per person suffer from diarrhoea last 30 days	0.5	0.8	0.7
Number of days per person suffer from other sickness last 30 days	7.3	7.4	7.4
Number of days an active person unable to work due to sickness	3.6	5.6	4.6
Per women frequency of antenatal consultation	4.1	4.2	4.2
Per women doses of tetanus vaccination	2.2	2.2	2.2
Body Mass Index per women	21.2	20.2	20.7
Body Mass Index per children <=5 yrs	15.3	15.0	15.1
<b>Education security</b>			
7+ population read and write (Literacy)	2.43	1.91	2.17
Adult male literacy 15+ literate	1.00	0.74	0.87
Adult female literacy 15+ female literate	0.70	0.49	0.9
Adult members 10 years or more education	0.36	0.15	0.26
6-10 years children enrolled	0.44	0.36	0.40
11-15 years boys enrolled	0.17	0.14	0.16
11-15 years girls enrolled	0.19	0.14	0.16



16-23 years person in household enrolled	<i>0.16</i>	<i>0.08</i>	<i>0.12</i>
<b>Empowerment</b>			
Community participation/active involvement with organisation (months)	<i>2.12</i>	<i>6.51</i>	<i>4.31</i>
Access to services/organisations that offer services	<i>0.13</i>	<i>0.10</i>	<i>0.12</i>
Household participation in planning process	<i>0.06</i>	<i>0.06</i>	<i>0.06</i>

Note: Figures in italics represent significant difference between Jessore and Tongi at 5% level at least.

**Table 3. Share of income from 12 groups of sources**

Occupation category	Jessore		Tongi		Total	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Wage labourer	14.8	31.2	25.7	39.5	20.2	36.0
Salaried worker	13.9	31.0	23.6	36.2	18.7	34.0
Maid servant & other salaried worker	3.9	14.1	2.5	13.7	3.2	13.9
Professional	1.0	7.6	0.7	6.8	0.8	7.2
Craft & related trade workers	8.2	24.7	6.0	20.9	7.1	22.9
Plant & machine operators/drivers	11.5	28.9	10.2	27.3	10.8	28.1
Petty traders	13.8	30.2	9.8	25.6	11.8	28.1
Medium/large traders	13.5	31.2	10.3	28.0	11.9	29.7
Other occupation	3.8	16.4	2.1	11.0	2.9	14.0
Transfer, social assistance, rent, interest etc.	10.7	24.4	7.7	19.8	9.2	22.2
Net income from enterprises	3.2	12.1	0.6	5.3	2.0	9.4
Other irregular sources	1.7	9.6	0.9	8.4	1.3	9.0
Total	100.0	0.0	100.0	0.0	100.0	0.0

Note: Figures in italics represent significant difference between Jessore and Tongi at 5% level at least.

**Table 4. Frequency and percentage distribution of sample households by the number of food groups consumed daily (dietary diversity), Jessore and Tongi, Bangladesh (food diversity)\*.**

<b>Diet types</b>	<b>Frequency</b>	<b>Percent</b>
Only cereals	2	0.2
Cereals plus another type	26	2.3
Cereals plus any two types	106	9.5
Cereals plus any three types	273	24.4
Cereals plus any four types	332	29.6
Cereals plus any five types	249	22.2
Cereals plus any six types	97	8.7
All types	23	2.1
Missing	12	1.1
<b>Total</b>	<b>1120</b>	<b>100.0</b>

\* Food groups are cereals, roots & tubers, pulses, animal origin foods, vegetables, fruits, fats & oils, and snacks

**Table 5. Livelihood security in poor urban settlements in Jessore and Tongi.**

Livelihood security indices	Jessore		Tongi		All
	Mean	Median	Mean	Median	
Economic security index	0.170	0.160	0.172	0.160	0.171
Food security index	<i>0.555</i>	<i>0.560</i>	<i>0.526</i>	<i>0.540</i>	0.540
Health security index	0.506	0.503	0.499	0.484	0.502
Education security index	<i>0.146</i>	<i>0.060</i>	<i>0.098</i>	<i>0.020</i>	0.122
Empowerment index	<i>0.108</i>	<i>0.050</i>	<i>0.090</i>	<i>0.040</i>	0.099
Overall livelihood security index	<i>0.248</i>	<i>0.242</i>	<i>0.238</i>	<i>0.235</i>	0.243

Note: Figures in italics represent significant difference between Jessore and Tongi at 5% level at least.

**Table 6. Determinants of livelihood security in Jessore and Tongi.**

Overall Livelihood Security	Jessore			Tongi			All		
	Coeff.	Robust Std.	Err.	Coeff.	Robust Std.	Err.	Coeff.	Robust Std.	Err.
Constant	0.0301***	0.0064	0.0245***	0.0074	0.0279***	0.0048			
<b>HLS indices</b>									
Economic security	0.3798***	0.0215	0.3227***	0.0304	0.3458***	0.0181			
Food security	0.1857***	0.0068	0.2198***	0.0118	0.2024***	0.0065			
Health security	0.1380***	0.0094	0.1527***	0.0106	0.1447***	0.0067			
Education security	0.1271***	0.0083	0.0944***	0.0091	0.1120***	0.0063			
Empowerment	0.1340***	0.0090	0.1266***	0.0111	0.1369***	0.0068			
<b>Socio-economic indicators</b>									
Family size	-0.0002	0.0006	-0.0003	0.0011	-0.0003	0.0007			
Land owned per capita	0.0089	0.0112	0.0632*	0.0333	0.0171*	0.0101			
Dependency ratio	-0.0026**	0.0010	-0.0037***	0.0014	-0.0033***	0.0008			
Age of head	-0.0001**	0.0001	-0.0001*	0.0001	-0.0001***	0.0000			

Highest education level of head	-0.0005**	0.0002	0.0000	0.0004	-0.0003	0.0002
Female headed household	-0.0027	0.0026	0.0002	0.0027	-0.0007	0.0019
Head can only read/write/sign name	0.0005	0.0026	-0.0012	0.0027	-0.0003	0.0020
Head married with spouse	-0.0013	0.0020	-0.0007	0.0018	-0.0012	0.0013
Head can read and write	-0.0070**	0.0023	-0.0121**	0.0025	-0.0094**	0.0016
Head received business training	-0.0044	0.0029	0.0131*	0.0072	0.0032	0.0035
<b>Model diagnostics</b>						
R-squared	0.96		0.93		0.94	
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity: $\chi^2(1)$ d.f.)	41.94**		19.55**		68.53**	
N	563		557		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)

## Appendix

### *Calculation of Inverse Hirschman- Herfindahl Index to measure livelihood diversity*

The Herfindahl-Hirschman Index (HHI) was originally being developed for measuring the degree of market concentration that takes into account both the relative size and distribution of each source, increasing as the number of firms in the market falls (Hirschman 1964). We use the inverse of this index to measure the degree of livelihood diversity that takes into account the relative size and distribution of each source of livelihoods, increasing as the number of sources increase and the disparity in the share of those sources in livelihood output. For example, a share of livelihood source  $j$  in income ( $I$ ) of a household is given by:

$$I_j = \frac{I_j}{I}$$

The inverse of the Hirschman-Herfindahl Index (IHHI) for this household is then calculated as:

$$IHHI_i = \frac{1}{\sum_{j=1}^J I_j}$$

Household income sources are first categorised on the basis of flow of income into three categories. First regular occupation consists of either employment or self employment; second category consists of net income from farming (crop, livestock, fisheries and agro-forestry), which are seasonal in nature and third category consists of transfer, social assistance, pension, rent, interest, income from pawning assets etc.