Description of the Official Methodology Used for Poverty Estimation in Bangladesh for 2016/17

Household Income and Expenditure Survey 2016/17

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Table of Contents

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1 Bangladesh's Household Income and Expenditure Survey

The Household Income and Expenditure Survey (HIES) is a comprehensive nationally representative survey used to measure monetary poverty in Bangladesh. The HIES 2016/17 is the fourth round in the series of HIES conducted by the Bangladesh Bureau of Statistics (BBS) in 2000, 2005, and 2010. Before 2000, BBS monitored poverty using a smaller survey that only collected data on expenditure named Household Expenditure Survey (HES). The World Bank played an important role in supporting BBS in the development of the HIES 2016/17 questionnaire, sampling design, data collection protocols, and estimation of the poverty estimates.

1.1 Sampling Design

A stratified, two-stage sample design was adopted for the HIES 2016/17 with 2304 Primary Sampling Units (PSU) selected from the list of the 2011 Housing and Population Census enumeration areas. Within each PSU, 20 households were selected for interviews. The final sample size was 46,080 households (Ahmed et.al, 2017).

In Bangladesh, divisions are the first-level administrative geographical partitions of the country. As of 2016, the country has eight divisions: Barisal, Chittagong, Dhaka, Khulna, Mymensingh, Rajshahi, Rangpur, and Sylhet. Each division is subsequently divided into 64 districts, or *zilas*. Each district is further subdivided into smaller geographic areas, with clear rural and urban designations. In addition, urban areas in the main divisions of Chittagong, Dhaka, Khulna, and Rajshahi are classified into City Corporations (CCs), and other urban areas.

PSUs in the HIES 2016/17 were allocated at the district level. Therefore, the sample was stratified at the district level. Since there were a total of 64 districts in Bangladesh, the sample design included a total of 132 sub-strata: 64 urban, 64 rural, and four main CCs. The sample was also implicitly stratified by month.

Table 1 presents a summary of sample design and PSUs allocation.[1]

Table 1. HIES 2016/17 summary of sampling design

DESCRIPTION	NUMBER
Number of districts	64
Number of PSUs in each district	36
Number of households in each PSU	20
Total number of PSUs in sample	2,304
Total sample size	46,080
Total number of teams	128
Total number of enumerators	256

Departures from the previous HIES. The samples of the latest three rounds of the HIES were designed to provide reliable annual poverty estimates for the country's divisions urban and rural areas separately and the Statistical Metropolitan Areas (SMAs).[2] However, the HIES 2016/17 was designed to produce reliable poverty estimates at three different levels: (i) annual poverty estimates at the division level for urban and rural areas; (ii) annual poverty estimates for the country's 64 districts; and (iii) quarterly poverty estimates at the national level. This change implied quadrupling the sample size of HIES 2016/17 compared to previous rounds — from 12,240 in 2010 to 46,080 households.

The substantial increase in the sample size also required using a different sampling frame to accommodate the larger number of PSUs. The PSUs for all the previous rounds of the HIES were selected from the Integrated Multiple-Purpose Sample (IMPS) — a master sample updated after each Housing and Population Census. In the HIES 2016/17, the PSUs come from the list of Enumeration Areas (EAs) used for the Bangladesh's 2011 Population and Housing Census. The IMPS could not be used because the most recent version based on the 2011 Census included only 2,012 EAs, an insufficient number to serve as a sampling frame for this new round of the survey. Importantly, the Bangladesh IMPS excluded some geographic areas, such as urban slums. Therefore, the HIES 2016/17 has a higher likelihood of capturing slum areas.[3]

1 There was a replacement strategy for households that were not found or refused to answer. However, the households that were replaced were not identified during the fieldwork.

2 In 2010 the country had 7 divisions: Dhaka, Chittagong, Barisal, Khulna, Sylhet, Rangpur, and Rajshahi.

3 For details of the sampling design see Ahmed et. al (2017).

1.2 Period of Data Collection

The HIES 2016/17 was in the field for an uninterrupted period of 12 months. The survey was launched on April 1, 2016, and field operations were completed on March 31, 2017. Data was collected over a year to capture seasonal variations in expenditure, expenditure patterns, and income. The one-year period was divided into 18 terms of 20 days. A term is the time needed for a team of two enumerators to cover the 20 households selected within a PSU.

1.3 Questionnaires

The 2016/17 HIES consisted of nine major modules, covering various aspects of household activities and characteristics (household roster, education, health, economic activities, non-agricultural enterprises, housing, agriculture, other assets and income, and consumption). The 2016/17 HIES redesigned and expanded the Social Safety Net questions. The final questionnaire reflects several technical discussions on questionnaire design and content.

1.4 Data Entry and Management

The data collection, entering, and transferring process for the HIES 2016/17 was conducted using Paper and Pencil (PAPI) combined with CAFE (Computer-Assisted Field-Based Data Entry). The data was collected by interviewers using PAPI and later entered or digitized using laptops while interviewers were still in the field. The data entry application was developed in CSPro and was paired with a cloud-based data transferring system, which allowed teams to transfer data to the BBS headquarters and monitor data in almost real time using mobile internet connection. After the data was transferred to the BBS headquarters, the data was compiled and exported to a readable version by standard statistical software using an automatized routine. PAPI combined with CAFE can improve data quality, when enumerators need to visit households more than once, by allowing correction of inconsistencies and errors while still in the field.

The data entry and transferring system were combined with a data monitoring system. This data monitoring system fed from the compiled data to create a set of key indicators that were tracked on a continuous basis. Some of the key indicators that were tracked by team, term, division, and district, included: number of households, household size, number of households with incomplete food and non-food consumption, number of households with incomplete durable items, number of daily food items consumed by households, number of weekly food items consumed by households, and number of non-food items and durables consumed by households. This information supported supervision of fieldwork and ensured that consumption data was complete and high quality for poverty estimation.

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2 Methodology to Estimate Poverty

2.1 Welfare Aggregate

Poverty estimates in Bangladesh were based on household per capita consumption. The consumption section of the HIES questionnaire was divided into five parts:

A. Daily food consumption: Information on daily food consumption for 194 items was collected for 14 consecutive days. Interviewers registered consumption in quantities and corresponding values with sources of receipts.

B. Weekly food consumption for around 25 items.

C. Monthly non-food consumption for about 50 items.

D. Annual non-food expenditure for more than 200 items.

E. Inventory of durable goods.

The consumption aggregate for the HIES 2016/17 was constructed by adding all food and non-food consumption expenditures reported by households, except for taxes and fees, lumpy-cycle expenditures such as expenses for weddings, and interest and insurance expenses. Non-food expenditures included: fuel and lightning, cosmetics and hygiene items, transport and travel, ready-made garments, clothing materials, footwear, household-use textiles, health treatment expenses, housing related expenses, education, recreation and leisure. The non-food expenditure component also included housing rent, imputed rent (i.e., the amount that homeowners report they would like to get if they could rent their house), or predicted rent, depending on the homeownership status of each of the households.[4] For renters, the reported rent was included as part of the non-food consumption aggregate. For homeowners, the reported imputed rent was included as part of the non-food consumption aggregate. For households that did not report rent or imputed rent, a predicted rent was estimated using a regression model on the subsample of renters and added to the non-food consumption aggregate. This regression model was estimated using the (log of) reported rent on the left-hand side and was regressed against a set of housing characteristics,

4 The rent and imputed rent variables were cross-tabulated against house ownership, and a few observations were cleaned to ensure full consistency between these two variables.

including number of rooms, wall materials, access to electricity and tap water, kitchen, dining room, telephone connection, dwelling's land size, and a vector of the 16 original strata dummy variables.

The construction of the consumption aggregate followed the 2010 methodology as closely as possible. However, there was one important departure to the methodology related to the computation of education expenditures. Education expenditures were collected in Sections 2 and 9 of the survey. Traditionally, for the computation of the consumption aggregate, education expenditures are added using the information from section 9. In the 2016/17 round, it was found that 5.6% of households had reported zero or missing education expenditures in Section 9, but had positive expenditures reported in Section 2. In 2010, this was true for only 1.2% of households. Therefore, the 2016/17 consumption aggregate used information from Section 2 to replace the zero and missing values in Section 9. Section 4 shows that this departure in the computation of the aggregate does not significantly change poverty estimates.

Finally, the consumption aggregate was divided by the household size to obtain a per capita measure. The HIES survey defines a household as a group of people who eat from the same pot and sleep in the same dwelling. Household members are defined as people who have eaten and slept in the dwelling for at least six months during the past 12 months (not necessarily continuous), or members who have been in the dwelling for less than six months over the past year, including any of the following: (i) the head of the household; (ii) a major provider of economic support; (iii) infants under six months old; or (iv) a new bride who joined the household less than six months ago. In addition, all servants are always counted as household members.

The average household size for the HIES 2016–17 was 4.06 members. This implies a significant reduction in the average household size compared to the latest HIES 2010 (average household size was 4.5), which it is not explained by differences in the definition of households. Recent national representative surveys collected by BBS show consistent large reductions in household size for the past years in Bangladesh. For example, the Quarterly Labor Force Survey 2015/16 show an average household size of 4.2. Annex 3 summarizes an analysis that compares the HIES household size estimate with other surveys and projections and concludes that the estimations from HIES 2016/17 are in line with trends in fertility and population change.

Table 2 presents the average household total consumption and per capita consumption 2016/17 nominal and deflated across space.

Table 2. Total Household Consumption and Per Capita Consumption, HIES 2016/17

CONSUMPTION	NOMINAL		SPATIALLY DEFLATED	
	HOUSEHOLD	PER CAPITA	HOUSEHOLD	PER CAPITA
Total	15,420	3,800	15,255	3,760
Food	13,868	3,376	14,654	3,567
Non-food	19,383	4,933	16,789	4,273

Note: Averages in monthly Taka

2.2 Estimation of the Poverty Lines

The official methodology used in Bangladesh to estimate the poverty numbers was based on the Cost of Basic Needs (CBN). The CBN method calculates the cost of obtaining a consumption bundle considered to be adequate to satisfy basic consumption needs. If a person cannot afford the cost of this bundle, then this person is considered poor. Therefore, poverty lines under the CBN method represent the minimum per capita expenditure that a person needs to meet his basic needs.

The first step for computing a poverty line involved estimating the cost of a basic consumption food basket. In Bangladesh, the food basket included eleven items (coarse rice, wheat, pulses, milk, oil, meat, fish, potatoes, other vegetables, sugar, and fruits), as recommended by Ravallion and Sen (1996) following Alamgir (1974). This food bundle provided the minimal nutritional requirements corresponding to 2,122 kcal per day per person. The price for each item in the bundle was estimated using unit-values (price per unit) from the HIES. The price for each item was the median of the unit-values reported by a reference group of households calculated separately for each stratum of the survey. The food poverty line was then computed for each stratum by multiplying the estimated prices with the quantities in the food bundle.[5]

Starting in 2000, the HIES defined 16 different geographical strata that have been used since then to estimate the cost of the basic consumption bundle. The estimation of this bundle at different geographical levels allow to account for the cost of living differences across areas and therefore provides a more accurate picture of living standards after accounting for price differences across geographic areas. These 16 original strata include urban and rural areas in the six divisions that existed in 2005 (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, and Sylhet) and the four main SMAs (Chittagong, Dhaka, Khulna, and Rajshahi). Out of the 16 original strata, six are classified as rural, and 10 are classified as urban.[6]

Once the food poverty lines were estimated for each stratum, the second step consisted of computing non-food allowances using two different methods. In the first one, the non-food allowance was estimated by taking the median amount spent for non-food items by a reference group of households whose *total* per capita expenditure was close to the food poverty line. The non-food allowance estimated using this method is called the "lower non-food allowance." In the second method, the non-food allowance was estimated by taking the median amount spent for non-food items by a reference group of households whose *food* per capita expenditure was close to the food poverty line. The non-food allowance estimated

5 The reference groups are the households belonging to the 2nd to 6th deciles of the per capita consumption distribution that fall within the strata and reflects the median prices that are faced by households located within a reasonable range around the level of consumption where the poverty line is expected to be.

6 In the HIES 2000-05-10 the large cities were defined based on the concept of Statistical Metropolitan Areas (SMA), following the IMPS sampling frame. This concept of SMA was replaced by the concept of Rural/Urban/City Corporation (RUC) in the 2011 Census of Population and Housing. Of the 64 districts, only in three the old SMA concept not match perfectly with the new RUC.

using this method is called the "upper non-food allowance." Lastly, the food poverty lines were added to the lower and upper non-food allowances, and this yielded the official upper and lower poverty rates at the stratum level (16 upper poverty lines and 16 lower poverty lines). Table 3 shows a summary of when poverty lines were estimated for Bangladesh for the latest four rounds of the HIES.

Table 3. Poverty Lines in HIES

YEAR	2000	2005	2010	25016/17
Food PL	Updated from 1991/92	Re-estimated (CBN)	Updated from 2005	Updated from 2010
Non-food PL	Updated from 1991/92	Re-estimated (CBN)	Re-estimated (CBN)	Updated from 2010

Updating the Poverty Lines

The 2016/17 poverty lines took the 2010 poverty lines and adjusted them by inflation to keep them in real terms. The upper and lower poverty lines for each quarter were estimated by updating the official upper and lower poverty lines available for the HIES 2010 using price indices constructed for each quarter. The annual upper and lower poverty lines were updated using a set of price indices constructed with the full HIES 2016/17.

For each quarterly and annual poverty line, a set of composite price indices were constructed for each of the 16 original strata using a combination of the Törnqvist food price index and the non-food Consumer Price Index (CPI) for urban and rural areas.[7] The stratum-specific Törnqvist food price indices were constructed using a set of 13 food expenditure groups, including coarse rice, pulses, meat, potatoes, milk, fruits, sugar, fish, eggs, cooking oil, salt/spices, soft drinks, and betel/cigarette.[8] These food expenditure groups were selected because they represented some of the most frequently consumed items by households but also because they allowed minimizing the inherent issue of differences in item quality. For each of the food expenditure groups and stratum, the median unit-values were calculated as well as the average budget shares using the 2010 and the 2016/17 data.[9]

7 The Törnqvist price index was selected instead of the Laspeyres or Paasche indexes because it uses budget shares averaged between consecutive years, and therefore allows for changes in consumption patterns over time.

8 Traditionally, the group of 13 food items used in the HIES to update the poverty lines does not perfectly overlap with the 11 food items used to estimate the poverty lines.

9 Using the median unit-values instead of the mean unit-values for each group allows minimizing the issue of the difference in item qualities which is inherently present in the estimation of all unit values and also the effect of outliers.

Before calculating the median-unit values, outliers were identified and replaced.[10] An outlier was identified if the unit-value was above 2.5 standard deviations of the distribution within the strata. Those cases were replaced using median values from the lowest level (household) to the highest level (national) distribution. If the household reported more than nine observations for the item, the median of those values was used to impute the outlier at this level. If the household did not have enough observations, then the outlier was replaced by the median of the PSU, district, stratum, area (urban/rural) or national, with the condition that there were enough observations to compute the median at that level.

The Törnqvist food price indices for each of the food expenditure groups and each stratum *k* were calculated as follows:

$$\ln P_{10}^{Tk} = \sum_{j=1}^{n} \frac{w_{1j}^{k} + w_{0j}^{k}}{2} \ln\left(\frac{p_{1j}^{k}}{p_{0j}^{k}}\right)$$

where P^{Tk}_{10} denotes the Törnqvist price index for region k, 1 and 0 denote the two years of comparison (2010 and 2016/17 in this case), w^{k}_{1j} and w^{k}_{0j} are the respective budget shares, and p^{k}_{1j} and p^{k}_{0j} are the respective prices for good *j* in the two years of comparison.

Once the HIES-based Törnqvist food price indices were computed for each stratum, a set of stratum-specific composite price indices were constructed to update the poverty lines. These composite price indices were constructed by creating a weighted average of the non-food CPI inflation rate for urban and rural areas between 2010 and 2016/17 and the Törnqvist food price indices for each stratum. The relative weights used for this calculation of the composite price index were the stratum-level average food budget shares for 2010 and 2016/17. The non-food CPI inflation rate was computed using the average CPI from February 2010–January 2011 (data collection for the HIES 2010) and the average non-food CPI for each quarter in 2016/17, (e.g., April–June 2016/17 for Q1, July–September 2016/17 for Q2, October–December 2016/17 for Q3 and January–March 2017 for Q4) separated for urban and rural areas. The annual non-food CPI for 2016/17 was computed taking the average from April 2016 to March 2017. These composite price indices are used to update the 2010 lower and upper poverty lines to 2016/17. Quarterly poverty lines are presented in Annex 1 and annual poverty lines in table 4.

10 The replacement was done for 1.94% of unit values reported in the daily consumption section and 2.36% of unit values reported in the weekly consumption section.

Table 4. Annual Poverty Lines 2016/17

STRATUM	HIES 2016/17	
	LOWER	UPPER
Barisal Rural	1,778	2,056
Barisal Urban	1,993	2,756
Chittagong Rural	2,030	2,439
Chittagong Urban	2,135	2,606
Chittagong City Corp.	2,097	2,660
Dhaka Rural	1,835	2,152
Dhaka Urban	1,947	2,657
Dhaka City Corp.	2,020	2,929
Khulna Rural	1,677	2,019
Khulna Urban	1,817	2,419
Khulna City Corp.	1,942	2,360
Rajshahi Rural	1,716	2,065
Rajshahi Urban	1,864	2,251
Rajshahi City Corp.	1,764	2,244
Sylhet Rural	1,764	1,865
Sylhet Urban	1,911	2,315

Note: In monthly Takas

3 Poverty Estimates

The latest HIES 2016/17 annual poverty estimates show that Bangladesh is continuing its remarkable progress in poverty reduction. Per the latest 2016/17 estimates, 24.3 percent of the population lived in poverty, and 12.9 percent were in extreme poverty (Table 5). This represents a 24.5 percentage point reduction in the upper poverty rate since 2000 and 7.2 percentage points since 2010. Annex 2 presents the estimated poverty rates for all analytical domains.

Importantly, the HIES design is characterized by the following: (i) Sampling weights; (ii) Sampling of households within clusters or PSUs; and (ii) Geographic stratification. These three elements need to be considered to compute adequate statistics using the survey. Using sampling weights (variable POPWGT) is important to calculate correct point estimates (e.g., poverty rate). In addition to the weights, the clustering (PSU variable) and stratification (ZILAID for annual estimates and STRATUM16 for quarterly estimates) of the survey design need to be considered to calculate the correct standard errors. If the analysis ignores the clustering of the survey design, we would probably produce standard errors that are smaller than they should be (for more details see Ahmed et al. 2017).

Table 5. National Poverty Rates, HIES 2000-2016/17

A. Upper Poverty (Percentage of Population)

YEAR	RATE	STANDARD ERROR	95% CONFIDENCE INTERVAL	
2000	48.9	1.2	46.4	51.3
2005	40.0	1.1	37.8	42.2
2010	31.5	1.0	29.6	33.4
2016/17	24.3	0.5	23.3	25.4

B. Lower Poverty (Percentage of Population)

YEAR	RATE	STANDARD ERROR	95% CONFIDENCE INTERVAL	
2000	34.3	1.2	31.9	36.7
2005	25.1	0.9	23.3	27.0
2010	17.6	0.8	16.0	19.1
2016/17	12.9	0.4	12.2	13.6

Table 6. Quarterly National Poverty Rates, HIES 2016/17

A. Upper Poverty (Percentage of Population)

QUARTERS	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Q1 (April-June 2016)	22.5	1.4	19.9	25.2
Q2 (July-September 2016)	23.0	1.2	20.6	25.3
Q3 (October-December 2016)	26.1	1.2	23.8	28.4
Q4 (January-March 2017)	27.1	1.4	24.4	29.8

B. Lower Poverty (Percentage of Population)

QUARTERS	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Q1 (April-June 2016)	12.4	0.9	10.6	14.2
Q2 (July-September 2016)	12.3	0.9	10.5	14.1
Q3 (October-December 2016)	13.5	0.9	11.8	15.1
Q4 (January-March 2017)	14.1	1.0	12.0	16.1

Photo by Laurent Porte

4 Robustness Checks

In this section, we investigate the sensitivity of the poverty rates to the imputation of education expenditures, correction of outliers in unit-values, deflation within the year, and the effect of using SMAs instead of CCs for updating the poverty lines.

Correction of zeros and missings in education. Education expenditures were collected in Sections 2 and 9 of the survey. Traditionally, for the computation of the consumption aggregate, education expenditures are added using the information from section 9. In 2016/17, 5.6% of households reported missing or zero education expenditures in Section 9, but had positive values in Section 2. In 2010, this was only true for 1.2% of households. The current estimates for 2016/17 replace zeros and missing values in the consumption module with the information from the education section. This imputation is considered to be important for comparability with 2010.

Outlier adjustment of unit-values. When comparing the distribution of unit values between 2010 and 2016/17, it was found that the 2016/17 data had more extreme values. Table 7 presents the distribution of unit values at the national level for some key items as an example.

Table 7. Right tail distribution of unit values at the national level, HIES 2010 and 2016/17

ITEM	2010				2016/17			
	MEAN	P95	P99	MAX	MEAN	P95	P99	MAX
Coarse rice	3	4	4	38	3	4	5	3,600
Lentil (musur)	11	12	13	24	13	16	20	1,841
Puti/Big Puti/Tilapia/Nilotica	10	16	20	48	13	20	30	1,400
Hen eggs	633	700	800	7,000	877	1,000	1,050	85,000
Beef	24	26	27	42	48	50	80	45,000
Potato	1	2	2	14	2	3	4	3,250
Liquid milk	4	5	6	12	7	8	12	9,000
Sugar	5	6	6	14	8	10	25	10,000
Mustard oil	13	20	20	25	16	25	50	10,000
Ripe banana	5	9	10	13	17	15	500	10,000
Soft drinks	5	8	9	16	14	12	50	6,500
Cigarettes	149	325	600	1,000	300	600	1,100	35,300

Note: Author's calculations using HIES 2010 and 2016/17

Two approaches to deal with unit values were compared: (i) identification of outliers using their distribution at the stratum level and imputation of unit values using median values from the lowest level possible (household) to the highest (national); (ii) identification of unit values using the distribution at the division level and imputation of median values of the division.

Quarterly inflation adjustment. Another option that was explored was to deflate the consumption aggregate within the year, to express all values to one quarter of the year. The objective of the adjustment was to test the importance of accounting for inflation within the year to calculate the 2016/17 poverty numbers.

Table 8 presents the estimated upper and lower poverty rates under the different adjustments. Overall, the imputation of education expenditures, outlier corrections, or deflating expenditures within the year do not change the poverty rates in a statistically significant sense. Analysis available by request also shows limited changes to the consumption distribution. Therefore, the preferred methodology was option 3, where education expenditures were imputed, and outliers were corrected using the distribution at the stratum level. This option was considered the most comparable to the 2010 methodology.

Photo by Scott Wallace

Table 8. National Poverty Rate 2016/17, different approaches

A. Upper Poverty (Percentage of Population)

OPTIONS	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
1. No corrections	25.1	0.5	24.0	26.2
2. Imputing zeros and missings in education	24.8	0.5	23.7	25.9
3. Imputing zeros and missings in education + Outlier adjustment using stratum	24.3	0.5	23.3	25.4
4. Imputing zeros and missings in education + Outlier adjustment using division	24.0	0.5	23.0	25.1
5. Imputing zeros and missings in education + Outlier adjustment using stratum + quarterly inflation adjustment	24.7	0.5	23.6	25.8

B. Lower Poverty (Percentage of Population)

OPTIONS	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
1. No corrections	13.5	0.4	12.8	14.3
2. Imputing zeros and missings in education	13.3	0.4	12.5	14.0
3. Imputing zeros and missings in education + Outlier adjustment using stratum	12.9	0.4	12.2	13.6
4. Imputing zeros and missings in education + Outlier adjustment using division	12.7	0.4	12.0	13.4
5. Imputing zeros and missings in education + Outlier adjustment using stratum + quarterly inflation adjustment	13.1	0.4	12.3	13.8

Note: Quarterly inflation adjustment means that the consumption aggregate for Q2, Q3 and Q4 was expressed in prices of Q1.

Effect of using SMAs instead of CCs for updating the poverty lines. In the HIES 2000-05-10, divisions were divided into rural areas, other urban areas, and SMAs, following the IMPS sampling frame. In the 2011 Census of Population and Housing, this stratification was replaced by rural areas, other urban areas, and CCs. For four out of the 64 districts in the country, the old stratification did not match the one from HIES 2016. The four districts were Gazipur and Narayanganj in Dhaka division, Khulna in Khulna division, and Rajshahi in Rajshahi division. To reconstruct the original STRATUM16 variable, nine upazilas in Dhaka division, three in Chittagong division, two in Khulna division, and one in Rajshahi division were reallocated to recreate the previous definition. We checked the impact of this issue for all the poverty numbers, and there were slight changes. The national poverty rates estimated using this adjustment were 24.1% (upper) and 12.8% (lower) (see tables 9 and 10). For rural and urban areas, as well as divisions, the changes are very small and do not exceed 1 percentage point from the original estimates.

Table 9. Upper Poverty Rates Using the Statistical Metropolitan Areas Definition
(Percentage of Population)

AREA	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
National	24.1	0.5	23.0	25.1
Rural	25.9	0.6	24.7	27.1
Urban	17.9	1.1	15.7	20.1
Barisal	25.2	1.5	22.3	28.2
Chittagong	18.4	1.3	16.0	20.9
Dhaka	16.0	1.3	13.5	18.5
Khulna	26.6	1.2	24.2	29.1
Mymensingh	32.0	2.0	28.0	35.9
Rajshahi	28.7	1.5	25.7	31.7
Rangpur	47.0	1.3	44.4	49.6
Sylhet	16.2	1.7	12.9	19.5

Table 10. Lower Poverty Rates Using the Statistical Metropolitan Areas Definition
(Percentage of Population)

AREA	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
National	12.8	0.4	12.0	13.5
Rural	14.5	0.4	13.7	15.4
Urban	6.7	0.7	5.4	8.1
Barisal	14.1	1.2	11.7	16.6
Chittagong	8.9	0.9	7.1	10.8
Dhaka	6.9	0.6	5.8	8.1
Khulna	12.0	0.9	10.3	13.7
Mymensingh	17.5	1.5	14.5	20.4
Rajshahi	14.2	1.0	12.2	16.2
Rangpur	30.1	1.2	27.9	32.5
Sylhet	11.5	1.4	8.7	14.3

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Glossary of Acronyms

BBS	Bangladesh Bureau of Statistics
CAFE	Computer-Assisted Field-Based Data Entry
CBN	Cost of Basic Needs
CCs	City Corporation
CPI	Consumer Price Index
DHS	Demographic and Health Survey
EAs	Enumeration Areas
GPVDR	Poverty and Equity Global Practice
HES	Household Expenditure Survey
HIES	Household Income and Expenditure Survey
IMPS	Integrated Multiple-Purpose Sample
PAPI	Paper and Pencil
PSU	Primary Sampling Units
MICS	Multiple Indicator Cluster Survey
SMAs	Statistical Metropolitan Areas
QLFS	Quarterly Labor Force Survey

Annex 1.

HIES 2016/17 Quarterly Poverty Lines

STRATUM16	LOWER POVERTY LINES				UPPER POVERTY LINES			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Barisal Rural	1,770	1,802	1,827	1,829	2,047	2,085	2,113	2,116
Barisal Urban	1,983	1,977	2,041	2,020	2,742	2,733	2,822	2,793
Chittagong Rural	1,974	2,010	2,087	2,056	2,373	2,415	2,508	2,471
Chittagong Urban	2,044	2,153	2,202	2,193	2,495	2,629	2,688	2,677
Chittagong City Corp.	2,039	2,104	2,172	2,105	2,587	2,670	2,756	2,670
Dhaka Rural	1,793	1,837	1,898	1,882	2,103	2,154	2,226	2,208
Dhaka Urban	1,894	1,949	1,928	1,991	2,584	2,659	2,631	2,717
Dhaka City Corp.	1,973	2,013	2,043	2,032	2,860	2,919	2,962	2,946
Khulna Rural	1,621	1,663	1,757	1,703	1,952	2,003	2,115	2,051
Khulna Urban	1,788	1,796	1,861	1,836	2,380	2,391	2,478	2,444
Khulna City Corp.	1,919	1,913	1,952	1,982	2,332	2,325	2,373	2,409
Rajshahi Rural	1,592	1,677	1,776	1,740	1,915	2,018	2,137	2,094
Rajshahi Urban	1,799	1,834	1,929	1,903	2,174	2,216	2,330	2,299
Rajshahi City Corp.	1,659	1,767	1,825	1,850	2,111	2,248	2,321	2,354
Sylhet Rural	1,706	1,785	1,826	1,842	1,804	1,887	1,931	1,948
Sylhet Urban	1,837	1,833	1,954	1,952	2,226	2,221	2,367	2,365

Note: In monthly Takas

Annex 2.

HIES 2016/17 Poverty Estimates

2.1. National Upper Poverty Rates by Area, 2016/17 (Percentage of Population)

AREA	MEAN	STANDARD ERROR	95 CONFIDENCE INTERVAL	
Rural	26.4	0.6	25.2	27.5
Urban	18.9	1.2	16.5	21.3

2.2. National Lower Poverty Rates by Area, 2016/17 (Percentage of Population)

AREA	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Rural	14.9	0.4	14.0	15.7
Urban	7.6	0.7	6.3	8.9

2.3. National Upper Poverty Rates by Division, 2016/17 (Percentage of Population)

DIVISION NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Barisal	26.5	1.5	23.5	29.5
Chittagong	18.4	1.2	16.0	20.8
Dhaka	16.0	1.3	13.4	18.5
Khulna	27.5	1.3	25.0	30.0
Mymensingh	32.8	2.0	28.8	36.7
Rajshahi	28.9	1.5	25.9	32.0
Rangpur	47.2	1.3	44.6	49.8
Sylhet	16.2	1.7	12.9	19.6

2.4. National Lower Poverty Rates by Division, 2016/17 (Percentage of Population)

DIVISION NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Barisal	14.5	1.3	12.0	17.0
Chittagong	8.7	0.8	7.1	10.3
Dhaka	7.2	0.7	5.8	8.6
Khulna	12.4	0.8	10.8	14.0
Mymensingh	17.6	1.5	14.7	20.4
Rajshahi	14.2	1.0	12.2	16.3
Rangpur	30.6	1.2	28.3	32.9
Sylhet	11.5	1.4	8.7	14.3

2.5. National Upper Poverty Rates by District, 2016/17 (Percentage of Population)

DIVISION/DISTRICT NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Barisal	**26.5**	**1.5**	**23.5**	**29.5**
Barguna	25.7	3.2	19.3	32.1
Barisal	27.4	3.1	21.2	33.5
Bhola	15.5	2.9	9.9	21.1
Jhalokati	21.5	2.5	16.7	26.4
Patuakhali	37.2	5.0	27.4	47.0
Pirojpur	32.2	3.3	25.7	38.7
Chittagong	**18.4**	**1.2**	**16.0**	**20.8**
Bandarban	63.2	7.7	48.1	78.3
Brahmanbaria	10.3	2.7	5.0	15.6
Chandpur	29.3	4.3	20.9	37.7
Chittagong	13.7	3.2	7.5	19.9
Comilla	13.5	2.0	9.7	17.4
Cox's bazar	16.6	4.1	8.6	24.6
Feni	8.1	1.8	4.6	11.6
Khagrachhari	52.7	7.6	37.8	67.5
Lakshmipur	32.5	4.0	24.8	40.3
Noakhali	23.3	4.2	14.9	31.6
Rangamati	28.5	4.6	19.6	37.5
Dhaka	**16.0**	**1.3**	**13.4**	**18.5**
Dhaka	10.0	3.7	2.8	17.2
Faridpur	7.7	2.0	3.8	11.7
Gazipur	6.9	1.4	4.2	9.7
Gopalganj	29.5	3.3	23.0	36.0
Kishoreganj	53.5	4.3	45.1	61.9
Madaripur	3.7	1.0	1.6	5.7
Manikganj	30.7	3.6	23.7	37.6
Munshiganj	3.1	1.0	1.1	5.0
Narayanganj	2.6	1.0	0.6	4.5
Narsingdi	10.5	2.7	5.1	15.8
Rajbari	33.8	3.2	27.6	40.0
Shariatpur	15.7	2.7	10.5	20.9
Tangail	19.0	3.0	13.1	24.9

DIVISION/DISTRICT NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Khulna	**27.5**	**1.3**	**25.0**	**30.0**
Bagerhat	31.0	4.3	22.6	39.5
Chuadanga	31.9	2.8	26.5	37.4
Jessore	26.9	3.0	21.0	32.7
Jhenaidah	26.5	4.5	17.8	35.2
Khulna	30.8	4.6	21.9	39.8
Kushtia	17.5	2.6	12.4	22.7
Magura	56.7	4.8	47.4	66.0
Meherpur	31.5	3.6	24.5	38.5
Narail	16.8	2.8	11.3	22.3
Satkhira	18.6	3.3	12.0	25.1
Mymensingh	**32.8**	**2.0**	**28.8**	**36.7**
Jamalpur	52.5	3.3	46.1	58.9
Mymensingh	22.0	3.6	15.0	29.0
Netrakona	34.0	3.7	26.8	41.1
Sherpur	41.3	4.2	33.1	49.5
Rajshahi	**28.9**	**1.5**	**25.9**	**32.0**
Bogra	27.2	3.7	20.0	34.4
Chapai nababganj	39.6	3.0	33.8	45.5
Joypurhat	21.4	2.8	15.8	26.9
Naogaon	32.2	3.1	26.1	38.2
Natore	24.0	3.3	17.5	30.4
Pabna	33.0	3.3	26.6	39.4
Rajshahi	20.1	6.8	6.8	33.5
Sirajganj	30.5	3.7	23.3	37.7
Rangpur	**47.2**	**1.3**	**44.6**	**49.8**
Dinajpur	64.3	3.3	57.9	70.7
Gaibandha	46.7	3.5	39.8	53.5
Kurigram	70.8	3.4	64.2	77.4
Lalmonirhat	42.0	4.5	33.2	50.8
Nilphamari	32.3	2.7	27.0	37.6
Panchagarh	26.3	5.0	16.6	36.1
Rangpur	43.8	3.6	36.7	50.8
Thakurgaon	23.4	3.5	16.5	30.4
Sylhet	**16.2**	**1.7**	**12.9**	**19.6**
Habiganj	13.4	2.9	7.8	19.0
Maulvibazar	11.0	2.5	6.1	15.9
Sunamganj	26.0	4.7	16.9	35.1
Sylhet	13.0	2.5	8.1	18.0

2.6. National Lower Poverty Rates by District, 2016/17 (Percentage of Population)

DIVISION/DISTRICT NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Barisal	**14.5**	**1.2**	**12.0**	**16.9**
Barguna	12.1	2.5	7.2	17.0
Barisal	13.6	2.6	8.5	18.6
Bhola	8.5	2.4	3.8	13.2
Jhalokati	9.8	1.9	6.0	13.6
Patuakhali	24.4	4.0	16.6	32.1
Pirojpur	17.6	2.8	12.2	23.1
Chittagong	**8.7**	**0.8**	**7.1**	**10.3**
Bandarban	50.3	8.0	34.7	65.9
Brahmanbaria	4.6	1.5	1.6	7.5
Chandpur	15.3	3.2	9.0	21.5
Chittagong	3.5	1.7	0.1	6.9
Comilla	5.4	1.0	3.4	7.4
Cox's bazar	7.7	3.3	1.2	14.3
Feni	3.4	1.1	1.2	5.5
Khagrachhari	32.8	6.2	20.7	44.8
Lakshmipur	20.5	3.1	14.3	26.6
Noakhali	13.4	3.0	7.4	19.3
Rangamati	10.7	2.6	5.6	15.9
Dhaka	**7.2**	**0.7**	**5.8**	**8.6**
Dhaka	1.7	1.4	-1.1	4.4
Faridpur	3.2	1.9	-0.5	6.8
Gazipur	1.9	0.8	0.3	3.6
Gopalganj	15.5	2.8	9.9	21.1
Kishoreganj	34.1	4.8	24.7	43.5
Madaripur	0.9	0.4	0.0	1.8
Manikganj	16.3	2.6	11.2	21.4
Munshiganj	1.2	0.7	-0.2	2.7
Narayanganj	0.0	0.0	0.0	0.1
Narsingdi	4.7	2.3	0.2	9.2
Rajbari	16.0	2.7	10.8	21.3
Shariatpur	5.0	1.7	1.7	8.2
Tangail	8.6	2.1	4.5	12.8

DIVISION/DISTRICT NAME	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
Khulna	**12.4**	**0.8**	**10.8**	**14.0**
Bagerhat	14.4	3.1	8.3	20.4
Chuadanga	12.1	1.3	9.5	14.6
Jessore	9.0	1.5	6.1	11.9
Jhenaidah	12.7	3.2	6.5	18.9
Khulna	13.8	2.9	8.2	19.4
Kushtia	7.1	1.6	3.9	10.2
Magura	37.7	4.8	28.3	47.1
Meherpur	12.4	1.9	8.6	16.1
Narail	5.8	1.7	2.5	9.2
Satkhira	9.3	2.1	5.3	13.3
Mymensingh	**17.6**	**1.5**	**14.7**	**20.4**
Jamalpur	35.2	3.2	28.9	41.5
Mymensingh	9.6	2.5	4.7	14.4
Netrakona	15.6	2.1	11.5	19.7
Sherpur	24.3	3.4	17.7	30.9
Rajshahi	**14.2**	**1.0**	**12.2**	**16.3**
Bogra	13.5	2.1	9.3	17.7
Chapai nababganj	23.7	2.6	18.5	28.9
Joypurhat	9.6	1.6	6.4	12.7
Naogaon	18.2	3.0	12.3	24.1
Natore	12.6	2.3	8.1	17.2
Pabna	16.8	2.3	12.4	21.3
Rajshahi	7.3	4.6	-1.7	16.3
Sirajganj	12.4	2.1	8.3	16.5
Rangpur	**30.6**	**1.2**	**28.3**	**32.9**
Dinajpur	45.0	3.3	38.5	51.6
Gaibandha	28.9	3.2	22.7	35.1
Kurigram	53.9	3.9	46.2	61.6
Lalmonirhat	23.0	3.5	16.1	30.0
Nilphamari	14.2	1.8	10.8	17.7
Panchagarh	14.2	3.5	7.3	21.0
Rangpur	27.0	2.6	21.8	32.1
Thakurgaon	15.5	2.9	9.9	21.0
Sylhet	**11.5**	**1.4**	**8.7**	**14.3**
Habiganj	9.9	2.6	4.7	15.0
Maulvibazar	7.0	1.9	3.2	10.8
Sunamganj	19.3	3.7	12.0	26.6
Sylhet	8.8	2.2	4.5	13.0

Annex 3.

Assessing Consistency of Household Size Estimates

The average household size obtained from the HIES 2016/17 was 4.06 members. This implies a significant reduction in the average household size compared to the latest HIES 2010, which it is not explained by differences in the definition of households (Table Annex 3.1)

Table Annex 3.1. Average household size in HIES

HIES	MEAN	STANDARD ERROR	95% CONFIDENCE INTERVAL	
2000	5.18	0.04	5.10	5.26
2005	4.85	0.03	4.78	4.91
2010	4.50	0.03	4.44	4.55
2016/17	4.06	0.02	4.03	4.09

Source: HIES 2000, 2005, 2010, 2016/17

Other recent nationally representative surveys like the Multiple Indicator Cluster Survey (MICS, 2012/13) and Demographic and Health Survey (DHS, 2014), which have in principle consistent definitions of households show a larger average household size — 4.57 and 4.69 members. However, more recent national representative surveys collected by BBS show consistent large reductions in household size. For example, the first quarter of the new Quarterly Labor Force Survey (QLFS, 2015/16) collected between July and September, 2015 shows an average household size of 4.2. Similarly, HIES estimates of the percentage of single member household seems aligned with the most recent QLFS (Table Annex 3.2.)

Table Annex 3.2. Household size based on different nationally representative surveys

YEAR	HIES 2010	POPU-LATION CENSUS 2011	MICS 2012/13	LFS 2013	DHS 2014	QLFS 2015	HIES 2016/17
Average household size	4.50	4.45	4.57	4.30	4.69	4.20	4.06
Single-member households (%)	2.4	3.4	1.9	—	1.5	3.3	2.8

To assess the consistency of the average household size estimates based on the HIES 2016/17, we compared projections starting from a baseline using HIES 2000. Table Annex 3.3 compares two types of projections (linear and compound) with observed estimates from HIES and the Census. The results suggest that the reduction in household size is consistent with an expected declining trend.

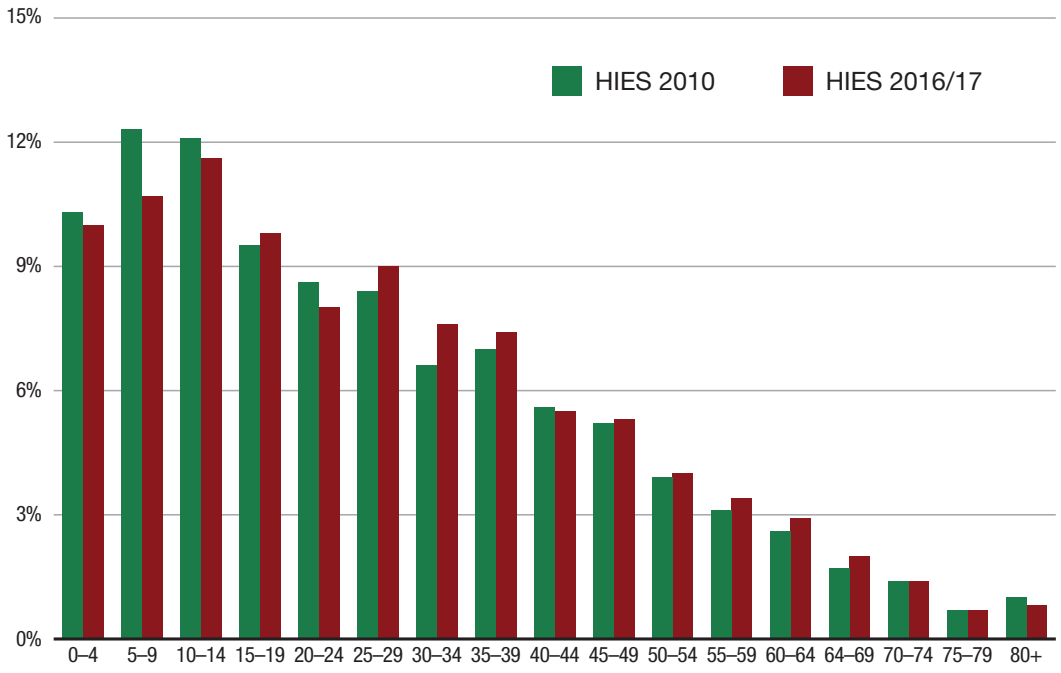
Table Annex 3.3. Projections of household size

NAME OF SURVEY OR CENSUS	DIRECT ESTIMATION	PROJECTIONS	
		COMPOUND	LINEAR
HIES 2000	5.18	5.18	5.18
HIES 2005	4.85	4.83	4.85
HIES 2010	4.50	4.5	4.51
Population Census 2011	4.45	4.44	4.44
HIES 2016/17	4.06	4.12	4.07

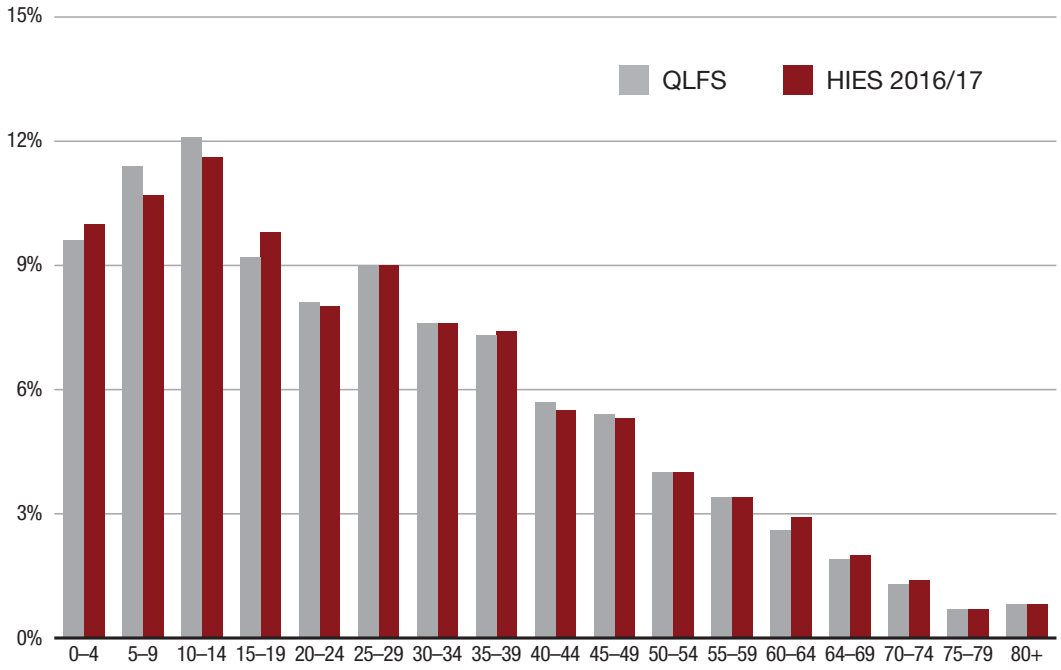
In addition, we compared the population pyramids based on the HIES 2016/17 with the ones produced using the HIES 2010 data, the official BBS population projections (BBS, 2015), and the QLFS. The different population pyramids estimated are shown in Figure Annex 3.1 and none of them seem to suggest any strange pattern or important differences.

Figure Annex 3.1. Population pyramids

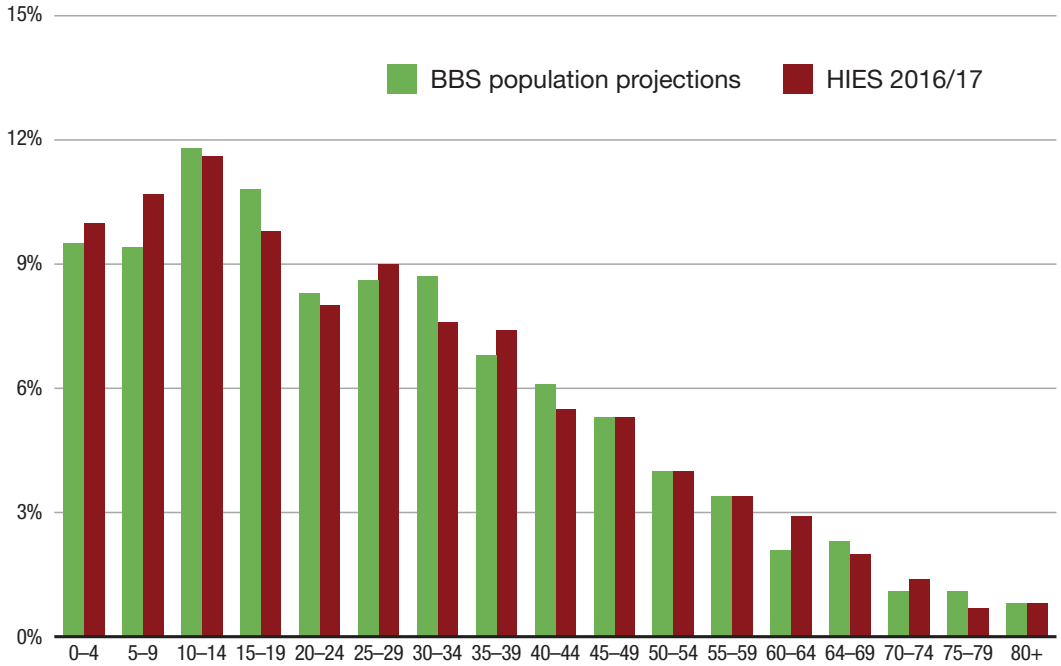
Panel A: HIES 2010 versus HIES 2016/17, Population by age-groups



Panel B: QLFS versus HIES 2016/17, Population by age-groups



Panel C: BBS population projections versus HIES 2016/17, Population by age-groups



Note: QLFS estimates reported are based on July–September 2015. BBS population projections are based on the official publication disseminated in 2015.

Consequently, there does not seem to be any reason to suspect that the average household size estimated based on the HIES 2016/17 round is much lower or inconsistent with what other official national representative surveys are suggesting.