APPENDIX A
METHODOLOGY

1. Sample design

A Stratified Two - Stage Sampling was adopted for the survey. Provinces were constituted strata. The primary and secondary sampling units were enumeration areas (EAs) for municipal areas and non - municipal areas and private households / persons in the collective households respectively.

Stratification

Provinces were constituted strata. There were altogether 77 strata. Each stratum was divided into two parts according to the type of local administration, namely municipal areas and non - municipal areas.

Selection of primary sampling unit

The sample selection of enumeration areas were performed separately and independently in each part by using probability proportional to size - total number of households. The total sample enumeration areas was 5,970 from 127,460 EAs.

The total number of sample enumeration areas selected for enumeration by region and type of local administration was as follows :

Region / Stratum	Total	Municipal Areas	Non - Municipal Areas
Bangkok Metropolis	300	300	-
Central (Excluding Bangkok Metropolis)	1,902	900	1,002
North	1,278	630	648
Northeast	1,476	732	744
South	1,014	498	516
Total	**5,970**	**3,060**	**2,910**

Selection of secondary sampling unit

Private households were our ultimate sampling units. A new listing of private households were made for every sample enumeration areas to serve as the sampling frame. In each sample EAs, a systematic sample of private households were selected with the following sample size :

Municipal areas : 16 sample households per EAs

Non - municipal areas : 12 sample households per EAs

Before selecting sample private households in each sample EAs, the list of private households was rearranged by household ' s size - member of the households.

All collective households located within the sample areas were included in the sample and the persons in the collective household were systematically selected for the interviewing.

The total number of sample private households selected for enumeration by region and type of local administration was as follows :

Region / Stratum	Total	Municipal Areas	Non - Municipal Areas
Bangkok Metropolis	4,800	4,800	-
Central (Excluding Bangkok Metropolis)	26,424	14,400	12,024
North	17,856	10,080	7,776
Northeast	20,640	11,712	8,928
South	14,160	7,968	6,192
Total	**83,880**	**48,960**	**34,920**

2. Method of estimation

The survey results were presented at provincial level and regional level. At regional level, the results were presented separately for the Bangkok Metropolis and the remaining 75 provinces were classified by region, municipal areas and non-municipal areas.

Let g = 1 , 2 , 3 , ... , 20 (age - sex group)

k = 1 , 2 , 3 , ... , m_{hij} (sample EAs)

j = 1 , 2 (type of local administration)

i = 1 , 2 , 3 , ... , A_h (province)

h = 1 , 2 , 3 , 4 , 5 (region)

Estimate of the total number of persons with characteristic X

1. Adjusted estimate of the total number of persons with characteristic X for the g^{th} age - sex group, j^{th} area, i^{th} province, h^{th} region was based on the formula :

$$x''_{hijg} = \frac{x'_{hijg}}{y'_{hijg}} Y_{hijg} = r_{hijg} Y_{hijg} \qquad \text{..... (1)}$$

where x'_{hijg} is the ordinary estimate of the total number of persons with characteristic X for the g^{th} age - sex group, j^{th} area, i^{th} province, h^{th} region.

y'_{hijg} is the ordinary estimate of the total population for the g^{th} age - sex group, j^{th} area, i^{th} province, h^{th} region.

Y_{hijg} [/1] is the estimate, based on the population projection of the total population for the g^{th} age - sex group, j^{th} area, i^{th} province, h^{th} region.

r_{hijg} is the ratio of the estimate of the total number of persons with characteristic X to the estimate of the total population for the g^{th} age - sex group, j^{th} area, i^{th} province, h^{th} region.

1/ Population Projections for Thailand 2000 - 2030, National Economic and Social Development Board, The Tenth National Economic and Social Development Planning, October 2007.

The formula of the estimate from a stratified two-stage sampling was as follows.

$$i) \quad x'_{hijg} = \frac{1}{m_{hij}} \sum_{k=1}^{m_{hij}} \frac{1}{P_{hijk}} \frac{N_{hijk}}{n_{hijk}} x_{hijkg} \qquad \text{..... (2)}$$

where x_{hijkg} is the total number of persons with characteristic X for the g^{th} age-sex group, k^{th} sample EAs, j^{th} area, i^{th} province, h^{th} region.

N_{hijk} is the total number of listing households in the k^{th} sample EAs, j^{th} area, i^{th} province, h^{th} region.

n_{hijk} is the total number of sample households in the k^{th} sample EAs, j^{th} area, i^{th} province, h^{th} region.

P_{hijk} is the probability of selection of the k^{th} sample EAs, j^{th} area, i^{th} province, h^{th} region.

m_{hij} is the total number of sample EAs in the j^{th} area, i^{th} province, h^{th} region.

$$ii) \; y'_{hijg} = \frac{1}{m_{hij}} \sum_{k=1}^{m_{hij}} \frac{1}{P_{hijk}} \frac{N_{hijk}}{n_{hijk}} y_{hijkg} \qquad \text{..... (3)}$$

where y_{hijkg} is the total number of the population enumerated for the g^{th} age - sex group, k^{th} sample EAs, j^{th} area, i^{th} province, h^{th} region.

2. Adjusted estimate of the total number of persons with characteristic X for the j^{th} area, i^{th} province, h^{th} region was based on the formula :

$$x''_{hij} = \sum_{g=1}^{20} x''_{hijg} \qquad \text{..... (4)}$$

3. Adjusted estimate of the total number of persons with characteristic *X* for the g^{th} age - sex group, i^{th} province, h^{th} region was based on the formula :

$$x''_{hig} = \sum_{j=1}^{2} x''_{hijg} \qquad \text{..... (5)}$$

4. Adjusted estimate of the total number of persons with characteristic *X* for the i^{th} province, h^{th} region was based on the formula :

$$x''_{hi} = \sum_{j=1}^{2} x''_{hij} = \sum_{g=1}^{20} x''_{hig} \qquad \text{..... (6)}$$

5. Adjusted estimate of the total number of persons with characteristic *X* for the g^{th} age - sex group, j^{th} area, h^{th} region was based on the formula :

$$x''_{hjg} = \sum_{i=1}^{A_h} x''_{hijg} \qquad \text{..... (7)}$$

where A_h is the total number of provinces in the h^{th} region and $\sum_{h=1}^{5} A_h = 76$

6. Adjusted estimate of the total number of persons with characteristic *X* for the j^{th} area, h^{th} region was based on the formula :

$$x''_{hj} = \sum_{i=1}^{A_h} x''_{hij} = \sum_{g=1}^{20} x''_{hjg} \qquad \text{..... (8)}$$

7. Adjusted estimate of the total number of persons with characteristic *X* for the g^{th} age - sex group, h^{th} region was based on the formula :

$$x''_{hg} = \sum_{i=1}^{A_h} x''_{hig} = \sum_{j=1}^{2} x''_{hjg} \qquad \text{..... (9)}$$

8. Adjusted estimate of the total number of persons with characteristic *X* for the h^{th} region was based on the formula :

$$x''_h = \sum_{i=1}^{A_h} x''_{hi} = \sum_{j=1}^{2} x''_{hj} = \sum_{g=1}^{20} x''_{hg} \qquad \text{..... (10)}$$

9. Adjusted estimate of the total number of persons with characteristic X for the j^{th} area was based on the formula :

$$x''_j = \sum_{h=1}^{5} x''_{hj} \qquad \text{..... (11)}$$

10. Adjusted estimate of the total number of persons with characteristic X for the g^{th} age - sex group of the whole kingdom was based on the formula :

$$x''_g = \sum_{h=1}^{5} x''_{hg} \qquad \text{..... (12)}$$

11. Adjusted estimate of the total number of persons with characteristic X for the whole kingdom was based on the formula :

$$x'' = \sum_{h=1}^{5} x''_h = \sum_{j=1}^{2} x''_j = \sum_{g=1}^{20} x''_g \qquad \text{..... (13)}$$

Estimate of Variance of the Total Number of Persons with Characteristic X

1. The estimate variance of x''_{hijg} was

$$\hat{V}(x''_{hijg}) = \left[\frac{Y_{hijg}}{y'_{hijg}}\right]^2 \frac{m_{hij}}{m_{hij}-1} \sum_{k=1}^{m_{hij}} z^2_{hijkg} \qquad \text{..... (14)}$$

where $z_{hijkg} = \bar{x}'_{hijkg} - r_{hijg}\,\bar{y}'_{hijkg}$

$$\bar{x}'_{hijkg} = \frac{1}{m_{hij}} \frac{1}{P_{hijk}} \frac{N_{hijk}}{n_{hijk}} x_{hijkg}$$

$$\bar{y}'_{hijkg} = \frac{1}{m_{hij}} \frac{1}{P_{hijk}} \frac{N_{hijk}}{n_{hijk}} y_{hijkg}$$

2. The estimate variance of x''_{hij} was

$$\hat{V}(x''_{hij}) = \sum_{g=1}^{20} \hat{V}(x''_{hijg}) \quad \text{..... (15)}$$

3. The estimate variance of x''_{hig} was

$$\hat{V}(x''_{hig}) = \sum_{j=1}^{2} \hat{V}(x''_{hijg}) \quad \text{..... (16)}$$

4. The estimate variance of x''_{hi} was

$$\hat{V}(x''_{hi}) = \sum_{j=1}^{2} \hat{V}(x''_{hij}) = \sum_{g=1}^{20} \hat{V}(x''_{hig}) \quad \text{..... (17)}$$

5. The estimate variance of x''_{hjg} was

$$\hat{V}(x''_{hjg}) = \sum_{i=1}^{A_h} \hat{V}(x''_{hijg}) \quad \text{..... (18)}$$

6. The estimate variance of x''_{hj} was

$$\hat{V}(x''_{hj}) = \sum_{i=1}^{A_h} \hat{V}(x''_{hij}) = \sum_{g=1}^{20} \hat{V}(x''_{hjg}) \quad \text{..... (19)}$$

7. The estimate variance of x''_{hg} was

$$\hat{V}(x''_{hg}) = \sum_{i=1}^{A_h} \hat{V}(x''_{hig}) = \sum_{j=1}^{2} \hat{V}(x''_{hjg}) \quad \text{..... (20)}$$

8. The estimate variance of x''_{h} was

$$\hat{V}(x''_{h}) = \sum_{i=1}^{A_h} \hat{V}(x''_{hi}) = \sum_{j=1}^{2} \hat{V}(x''_{hj}) = \sum_{g=1}^{20} \hat{V}(x''_{hg}) \quad \text{..... (21)}$$

9. The estimate variance of x''_j was

$$\hat{V}(x''_j) = \sum_{h=1}^{5} \hat{V}(x''_{hj}) \quad \text{..... (22)}$$

10. The estimate variance of x''_g was

$$\hat{V}(x''_g) = \sum_{h=1}^{5} \hat{V}(x''_{hg}) \quad \text{..... (23)}$$

11. The estimate variance of x'' was

$$\hat{V}(x'') = \sum_{h=1}^{5} \hat{V}(x''_h) = \sum_{j=1}^{2} \hat{V}(x''_j) = \sum_{g=1}^{20} \hat{V}(x''_g) \quad \text{..... (24)}$$

Estimate of Coefficient of Variation of the Total Number of Persons with Characteristic *X*

1. The estimate coefficient of variation of x''_{hijg} was

$$cv(x''_{hijg}) = \frac{\sqrt{\hat{V}(x''_{hijg})}}{x''_{hijg}} \times 100\% \quad \text{..... (25)}$$

2. The estimate coefficient of variation of x''_{hij} was

$$cv(x''_{hij}) = \frac{\sqrt{\hat{V}(x''_{hij})}}{x''_{hij}} \times 100\% \quad \text{..... (26)}$$

3. The estimate coefficient of variation of x''_{hig} was

$$cv(x''_{hig}) = \frac{\sqrt{\hat{V}(x''_{hig})}}{x''_{hig}} \times 100\% \quad \text{..... (27)}$$

4. The estimate coefficient of variation of x''_{hi} was

$$cv(x''_{hi}) = \frac{\sqrt{\hat{V}(x''_{hi})}}{x''_{hi}} \times 100\% \quad \text{..... (28)}$$

5. The estimate coefficient of variation of x''_{hjg} was

$$cv(x''_{hjg}) = \frac{\sqrt{\hat{V}(x''_{hjg})}}{x''_{hjg}} \times 100\% \quad \text{..... (29)}$$

6. The estimate coefficient of variation of x''_{hj} was

$$cv(x''_{hj}) = \frac{\sqrt{\hat{V}(x''_{hj})}}{x''_{hj}} \times 100\% \quad \text{..... (30)}$$

7. The estimate coefficient of variation of x''_{hg} was

$$cv(x''_{hg}) = \frac{\sqrt{\hat{V}(x''_{hg})}}{x''_{hg}} \times 100\% \quad \text{..... (31)}$$

8. The estimate coefficient of variation of x''_{h} was

$$cv(x''_{h}) = \frac{\sqrt{\hat{V}(x''_{h})}}{x''_{h}} \times 100\% \quad \text{..... (32)}$$

9. The estimate coefficient of variation of x''_{j} was

$$cv(x''_{j}) = \frac{\sqrt{\hat{V}(x''_{j})}}{x''_{j}} \times 100\% \quad \text{..... (33)}$$

10. The estimate coefficient of variation of x''_{g} was

$$cv(x''_g) = \frac{\sqrt{\hat{V}(x''_g)}}{x''_g} \times 100\% \quad \text{..... (34)}$$

11. The estimate coefficient of variation of x'' was

$$cv(x'') = \frac{\sqrt{\hat{V}(x'')}}{x''} \times 100\% \quad \text{..... (35)}$$

3. Data Collection

Labor force information for this survey quarterly which was conducted during the 1st-12th of January-March 2014 was obtained through interviews head or member of households of 4,800 households in the Bangkok, 48,960 households in other municipal areas and 34,920 households in non-municipal areas or a total of 83,880 households throughout the kingdom. Fourty four enumerators with previous experience in survey operations were employed in the Bangkok, while in the other provinces (changwats), the field staff comprised 830 enumerators.

4. In round figures

In the statistical tables, all absolute figures are independently rounded to the nearest thousand; hence the group total may not always be equal to the sum of the individual figures.