

Chapter3 METHOD OF SAMPLE TABULATION AND RELIABILITY OF ESTIMATES

Sample Design

- (a) Private households and institutional households with less than 30 persons were sampled.
- (b) Institutional households with 30 persons or more, residents in camps of Self-Defense Forces, inmates of reformatory institutions, etc. were complete count.

The sampling ratios used for (a) were determined by the sampling size according to respective population size of municipality (*shi,ku,machi,mura*) to take into consideration of the accuracy. The results were shown in the following table.

Table1. Average Sampling Ratio for (a)

	Sampling Ratio	
	%	1/n
Japan	9.9	10.1

Population Size	Sampling Ratio					
	<i>Shi,Machi, or Mura</i>		<i>Ku (Tokyo)</i>		<i>Ku (20 Major Cities)</i>	
	%	1/n	%	1/n	%	1/n
500,000 inhabitants or more	5.3	19.0	5.3	19.0	5.3	19.0
300,000 to 499,999 inhabitants	5.0	20.2	8.5	11.8	5.0	20.2
200,000 to 299,999 inhabitants	7.2	13.8	12.2	8.2	7.2	13.8
100,000 to 199,999 inhabitants	13.5	7.4	21.7	4.6	13.5	7.4
50,000 to 99,999 inhabitants	10.6	9.5	35.7	2.8	23.8	4.2
30,000 to 49,999 inhabitants	16.5	6.1	—	—	34.2	2.9
20,000 to 29,999 inhabitants	22.8	4.4	—	—	—	—
10,000 to 19,999 inhabitants	37.2	2.7	—	—	—	—
5,000 to 9,999 inhabitants	54.2	1.8	—	—	—	—
2,000 to 4,999 inhabitants	74.7	1.3	—	—	—	—
under 2,000 inhabitants	85.5	1.2	—	—	—	—

Method of Estimation

The results of the households (a) were estimated as the product of the sample count by the reciprocal of the sampling ratio of each municipality.

However, the result of (b) was obtained by complete count.

An estimate \hat{X}_k or \hat{X} , that is, the number of persons or households for private households only having the characteristics concerned in an area is obtained as follows.

(Municipality)

$$\hat{X}_k = \left(\frac{N_{k1}}{n_{k1}} \cdot \sum_{i1} x_{i1} \right) + \sum_{i2} x_{i2}$$

(Japan or prefectures)

$$\hat{X} = \sum_k \hat{X}_k = \sum_k \left\{ \left(\frac{N_{k1}}{n_{k1}} \cdot \sum_{i1} x_{i1} \right) + \sum_{i2} x_{i2} \right\}$$

Where

- k : k -th municipality in the area concerned
- $i1$: A person or a household of (a)
- $i2$: A person or a household of (b)
- \hat{X}_k : An estimate of k -th municipality
- N_{k1} : Total population or household of (a) in the k -th municipality
- n_{k1} : Number of sample persons or households of (a) in the k -th municipality
- x_{i1} : Number of persons or households of (a) having the characteristics concerned counted for the k -th municipality
- x_{i2} : Number of persons or households of (b) having the characteristics concerned counted for the k -th municipality
- \hat{X} : Number of sample persons or households of (a) in Japan or prefectures

In addition, figures given in the tables may not necessarily add up to the total due to rounding.

Sampling Error of Estimate

The figures obtained from the sample tabulation mentioned above are not consistent with those obtained from the complete count due to sampling error.

Though magnitude of sampling errors varies with the size of estimates and the kind of items, the ratios of standard error by size of estimates calculated under the assumption of simple random sampling of household members are shown in the table below for convenience.

The ratios of standard error have been calculated by the following formula.

(Municipality)

$$CV(\hat{X}_k) = \frac{1}{N_k \cdot \hat{p}_k} \sqrt{N_{k1} \cdot (N_{k1} - n_{k1}) \cdot \frac{\hat{p}_{k1}(1 - \hat{p}_{k1})}{n_{k1}}}$$

(Japan or prefectures)

$$CV(\hat{X}) = \frac{1}{N \cdot \hat{p}} \cdot \sqrt{\sum_k N_{k1} \cdot (N_{k1} - n_{k1}) \cdot \frac{\hat{p}_{k1}(1 - \hat{p}_{k1})}{n_{k1}}}$$

Where

- N_k : Total population or household in the k -th municipality
- \hat{p}_k : Ratio of estimate to the total population or household in the k -th municipality (= \hat{X}_k/N_k)
- \hat{p}_{k1} : Ratio of estimate to the total population or household of (a) in the k -th municipality (= \hat{X}_{k1}/N_{k1})
- N : Total people or total household in Japan or prefectures

- \hat{p} : Ratio of estimate to the total population or household in Japan or prefectures(= \hat{X}/N)
- \hat{X}_{k1} : Number of sample persons or households of (a) in the k -th municipality

$$\hat{X}_{k1} = \left(\frac{N_{k1}}{n_{k1}} \cdot \sum_{i1} x_{i1} \right)$$

表2 推定値(人口及び世帯)の大きさ別標準誤差率(全国の結果)

Table2 Ratio of Standard Error by Size of Estimates (Japan)

推定値の大きさ Size of estimates	標準誤差率 Ratio of Standard Error	
	人口 Population	世帯 Household number
	10,000,000	0.00104
8,000,000	0.00117	0.00113
6,000,000	0.00136	0.00134
5,000,000	0.00150	0.00148
4,000,000	0.00168	0.00167
3,000,000	0.00195	0.00195
2,000,000	0.00240	0.00241
1,000,000	0.00340	0.00345
800,000	0.00381	0.00386
600,000	0.00440	0.00447
400,000	0.00539	0.00548
300,000	0.00623	0.00633
200,000	0.00763	0.00776
150,000	0.00881	0.00897
100,000	0.01080	0.01099
80,000	0.01207	0.01229
60,000	0.01394	0.01419
40,000	0.01708	0.01739
30,000	0.01972	0.02008
20,000	0.02415	0.02460
15,000	0.02789	0.02840
10,000	0.03416	0.03479
8,000	0.03819	0.03889
6,000	0.04410	0.04491
4,000	0.05401	0.05500
3,000	0.06237	0.06351
2,000	0.07638	0.07779
1,500	0.08820	0.08982
1,000	0.10802	0.11001
800	0.12077	0.12300
600	0.13946	0.14203
400	0.17080	0.17394
300	0.19722	0.20085
200	0.24155	0.24600
150	0.27892	0.28405
100	0.34160	0.34789