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 *shi*, *ku*, *machi*, or *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	9.8	10.2

Population Size	Sampling Ratio			
	Shi, Machi, or Mura		*Ku*	
	%	1 / *n*	%	1 / *n*
500,000 inhabitants or more	5.1	19.4	5.0	19.9
300,000 to 499,999 inhabitants	5.1	19.8	5.0	19.9
200,000 to 299,999 inhabitants	6.0	16.6	6.4	15.7
100,000 to 199,999 inhabitants	10.2	9.8	9.9	10.1
50,000 to 99,999 inhabitants	8.0	12.5	16.5	6.1
30,000 to 49,999 inhabitants	13.5	7.4	27.6	3.6
20,000 to 29,999 inhabitants	19.6	5.1	—	—
10,000 to 19,999 inhabitants	28.8	3.5	—	—
5,000 to 9,999 inhabitants	44.8	2.2	—	—
2,000 to 4,999 inhabitants	62.5	1.6	—	—
under 2,000 inhabitants	81.5	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 *shi*, *ku*, *machi*, and *mura*.

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.

(*shi,ku,machi,or mura*)

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

(*Japan*)

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

Where

k	:	k-th *shi,ku,machi,mura*(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

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.

(*shi,ku,machi,or mura*)

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

(*Japan*)

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

Where

N_k : Total population or household in the k-th *shi*,*ku*,*machi*,*mura* (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

$\hat{p}$: Ratio of estimate to the total population or household in Japan$(= \hat{X} / N)$

$\hat{X}_{k1}$: Number of sample persons or households of (a) in the k-th municipality

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

Table2 Ratio of Standard Error by Size of Estimates

(Japan)

Size of estimates	Ratio of Standard Error		Size of estimates	Ratio of Standard Error	
	Population	Household number		Population	Household number
10,000,000	0.00105	0.00100	30,000	0.01992	0.02026
8,000,000	0.00118	0.00114	20,000	0.02440	0.02482
6,000,000	0.00138	0.00135	15,000	0.02817	0.02866
5,000,000	0.00151	0.00149	10,000	0.03450	0.03510
4,000,000	0.00170	0.00169	8,000	0.03858	0.03925
3,000,000	0.00197	0.00197	6,000	0.04454	0.04532
2,000,000	0.00242	0.00243	4,000	0.05456	0.05551
1,000,000	0.00344	0.00348	3,000	0.06300	0.06410
800,000	0.00385	0.00389	2,000	0.07715	0.07850
600,000	0.00444	0.00451	1,500	0.08909	0.09065
400,000	0.00545	0.00553	1,000	0.10911	0.11102
300,000	0.00629	0.00639	800	0.12199	0.12412
200,000	0.00771	0.00784	600	0.14086	0.14333
150,000	0.00890	0.00905	400	0.17252	0.17554
100,000	0.01091	0.01109	300	0.19921	0.20270
80,000	0.01220	0.01240	200	0.24398	0.24825
60,000	0.01408	0.01432	150	0.28173	0.28665
40,000	0.01725	0.01755	100	0.34504	0.35108

Ration of Standard Error by Size of Estimates (*Shi* ,*Ku* ,*Machi* , or *Mura*)

Population size / Size of estimates	*Shi,Machi,or Mura*							
	500,000	300,000	200,000	100,000	50,000	30,000	20,000	10,000
400,000	0.00358	-	-	-	-	-	-	-
300,000	0.00532	-	-	-	-	-	-	-
200,000	0.00767	0.00664	-	-	-	-	-	-
150,000	0.00946	0.00868	0.00637	-	-	-	-	-
100,000	0.01227	0.01174	0.00960	-	-	-	-	-
80,000	0.01402	0.01358	0.01144	0.00657	-	-	-	-
60,000	0.01652	0.01620	0.01397	0.00890	-	-	-	-
40,000	0.02063	0.02045	0.01799	0.01227	0.01065	-	-	-
30,000	0.02405	0.02395	0.02127	0.01489	0.01443	-	-	-
20,000	0.02973	0.02975	0.02663	0.01908	0.01990	0.01218	-	-
15,000	0.03449	0.03459	0.03109	0.02250	0.02416	0.01591	0.01025	-
10,000	0.04244	0.04266	0.03848	0.02812	0.03096	0.02149	0.01549	-
8,000	0.04753	0.04782	0.04320	0.03169	0.03520	0.02487	0.01846	0.01141
6,000	0.05498	0.05537	0.05009	0.03687	0.04132	0.02965	0.02256	0.01518
4,000	0.06746	0.06799	0.06160	0.04551	0.05142	0.03742	0.02907	0.02071
3,000	0.07797	0.07861	0.07128	0.05275	0.05984	0.04384	0.03437	0.02504
2,000	0.09558	0.09641	0.08747	0.06484	0.07385	0.05444	0.04305	0.03198
1,500	0.11041	0.11139	0.10111	0.07501	0.08560	0.06330	0.05025	0.03767
1,000	0.13529	0.13652	0.12396	0.09204	0.10523	0.07805	0.06220	0.04701
800	0.15128	0.15267	0.13864	0.10298	0.11782	0.08750	0.06984	0.05295
600	0.17472	0.17634	0.16016	0.11900	0.13625	0.10130	0.08098	0.06159
400	0.21403	0.21603	0.19623	0.14585	0.16712	0.12440	0.09959	0.07598
300	0.24716	0.24948	0.22663	0.16848	0.19312	0.14383	0.11523	0.08804
200	0.30273	0.30559	0.27762	0.20642	0.23669	0.17639	0.14142	0.10821
150	0.34958	0.35288	0.32061	0.23839	0.27341	0.20381	0.16346	0.12517
100	0.42817	0.43222	0.39270	0.29203	0.33498	0.24978	0.20040	0.15356

Shi,Machi,or Mura -Continued			*Ku*					
5,000	2,000	under 2,000	500,000	300,000	200,000	100,000	50,000	30,000
-	-	-	0.00427	-	-	-	-	-
-	-	-	0.00583	-	-	-	-	-
-	-	-	0.00809	0.00627	-	-	-	-
-	-	-	0.00984	0.00841	0.00582	-	-	-
-	-	-	0.01262	0.01155	0.00908	-	-	-
-	-	-	0.01436	0.01343	0.01090	0.00691	-	-
-	-	-	0.01687	0.01608	0.01339	0.00923	-	-
-	-	-	0.02100	0.02037	0.01733	0.01263	0.00783	-
-	-	-	0.02445	0.02391	0.02052	0.01529	0.01014	-
-	-	-	0.03018	0.02974	0.02575	0.01529	0.01362	0.00804
-	-	-	0.03498	0.03460	0.03008	0.02303	0.01638	0.01033
-	-	-	0.04301	0.04270	0.03726	0.02876	0.02083	0.01380
-	-	-	0.04816	0.04788	0.04185	0.03239	0.02362	0.01592
-	-	-	0.05569	0.05545	0.04854	0.03768	0.02765	0.01893
0.01135	-	-	0.06832	0.06811	0.05971	0.04649	0.03433	0.02383
0.01510	-	-	0.07894	0.07876	0.06910	0.05388	0.03990	0.02788
0.02062	-	-	0.09676	0.09660	0.08481	0.06622	0.04919	0.03459
0.02493	0.01452	0.00484	0.11177	0.11163	0.09804	0.07660	0.05698	0.04020
0.03185	0.01997	0.00899	0.13694	0.13681	0.12020	0.09399	0.07001	0.04954
0.03618	0.02322	0.01091	0.15313	0.15301	0.13444	0.10516	0.07837	0.05553
0.04243	0.02780	0.01350	0.17685	0.17673	0.15531	0.12151	0.09061	0.06428
0.05275	0.03521	0.01792	0.21662	0.21651	0.19030	0.14892	0.11111	0.07891
0.06136	0.04132	0.02148	0.25016	0.25004	0.21978	0.17202	0.12838	0.09123
0.07569	0.05139	0.02765	0.30640	0.30628	0.26924	0.21076	0.15733	0.11187
0.08771	0.05979	0.03290	0.35381	0.35369	0.31092	0.24341	0.18173	0.12926
0.10780	0.07378	0.04138	0.43335	0.43321	0.38084	0.29816	0.22265	0.15841