

APPENDIX A: Sample Design For Pakistan Social And Living Standards Measurement Survey District Level, 2006-07

Objectives:

The data generated through PSLM Survey will be used to assist the government in formulating the poverty reduction strategy as well as development plans at district level. The indicators will be developed at district level in the following sectors.

1. Education
2. Health
3. Water Supply & Sanitation.
4. Household Assets/Amenities.
5. Satisfaction to Service Delivery.

Universe:

The universe of this survey consists of all urban and rural areas of all four provinces, from the scope of the survey.

SAMPLING FRAME

Urban area:

FBS has developed its own urban area frame. All urban areas comprising cities/towns have been divided into small compact areas known as enumeration blocks (E.Bs) identifiable through map. Each enumeration block comprises about 200-250 households and categorized into low, middle and high-income group, keeping in view the socio economic status of the majority of households. Urban area sampling frame consists of 26698 enumeration blocks has been updated in 2003.

Rural area:

With regard to the rural areas, the lists of villages/mouzas/dehs according to Population Census, 1998 have been used as sampling frame. In this frame, each village/mouza/deh is identifiable by its Name, Had Bast Number, Cadastral map etc. This frame is comprised 50590 villages/mouzas

The number of enumeration blocks in urban and mouzas/dehs/villages in rural areas of the country are as under:

NO. OF ENUMERATION BLOCKS AND VILLAGES AS PER SAMPLING FRAME

Province	Number of E. Blocks	Number of Villages
Punjab	14,549	25,875
Sindh	9,025	5,871
NWFP	1,913	7,337
Balochistan	613	6,557
A.J.K	210	1,654
Northern Area	64	566
FATA		2,596
Islamabad	324	132
Total	26,698	50,588

STRATIFICATION PLAN

Urban Areas:

Within each district large sized cities having population five lacs and above have been treated as independent stratum. Each of these cities has further been sub-stratified into low, middle and high group's areas. The remaining cities/towns within each district have been grouped together to constitute an independent stratum.

Rural Areas:

The entire rural domain of a district for Punjab, Sindh, NWFP and Balochistan provinces has been considered as independent stratum.

Sample Size and its Allocation:

To determine optimum sample size for this survey, analytical studies based on the results of Pakistan Demographic Survey, Labour Force and Pakistan Integrated Households Sample Survey were undertaken. Keeping in view the variability exist within the population for the characteristics for which estimates are to be prepared, population distribution, level of estimates and field resources available a sample size of 76520 households enumerated from 5348 sample PSUs (2262 from urban and 3086 from rural areas) has been considered sufficient to produce reliable estimates at district level in respect of all provinces. An Annexure-I showing sample sizes by districts in four provinces of Pakistan, is attached.

Sample Design: A two-stage stratified sample design has been adopted for this survey.

Selection of primary sampling Units (PSUs):

Enumeration blocks in the urban domain and mouzas/dehs/villages in rural domain have been taken as primary sampling units (PSUs). In urban domain sample PSUs from each stratum have been selected by probability proportional to size (PPS) method of sampling scheme using households in each block as measure of size (MOS).

Similarly in rural areas, population of each village has taken as MOS for selection of sample villages using probability proportional to size method of selection.

Selection of Secondary Sampling Units (SSUs):

Households within each sample Primary Sampling Unit (PSU) have been considered as Secondary Sampling Units (SSUs). 16 and 12 households have been selected from each sample village and enumeration block respectively by systematic sampling scheme with a random start.

Estimation Procedures:

Detail of estimation procedures for estimates and their variances is attached as Annexure – II.

**District-Wise Distribution of Sample Areas (Villages and Enumeration Blocks) and Household –
PSLM 2006-07**

S.No	Districts	Sample Areas			Sample Households		
		Urban	Rural	Total	Urban	Rural	Total
	PUNJAB	<u>1086</u>	<u>1182</u>	<u>2268</u>	<u>12842</u>	<u>18840</u>	<u>31682</u>
101.	Attock	15	27	42	175	426	601
102.	Rawalpindi	72	36	108	830	571	1401
103.	Jhelum	15	24	39	175	379	554
104.	Chakwal	15	27	42	179	429	608
105.	Sargodha	39	39	78	462	613	1075
106.	Bhakkar	15	24	39	179	383	562
107.	Khushab	15	21	36	180	335	515
108.	Mianwali	15	21	36	179	336	515
109.	Faisalabad	102	69	171	1221	1103	2324
110.	Jhang	27	54	81	321	863	1184
111.	T.T.Singh	21	33	54	251	526	777
112.	Gujranwala	57	36	93	677	573	1250
113.	Gujrat	22	33	55	257	522	779
114.	Sialkot	36	21	57	428	336	764
115.	Hafiza Abad	15	27	42	178	432	610
116.	Mandi Bahauddin	15	27	42	179	432	611
117.	Narowal	15	30	45	180	480	660
118.	Lahore	208	27	235	2409	424	2833
119.	Kasur	27	42	69	319	665	984
120.	Okara	24	45	69	288	719	1007
121.	Sheikhupura	33	51	84	391	808	1199
122.	Vehari	19	42	61	227	672	899
123.	Sahiwal	15	36	51	180	576	756
124.	Multan	56	42	98	669	672	1341
125.	Khanewal	15	39	54	180	624	804
126.	Pakpattan	15	27	42	179	432	611
127.	Lodhran	15	21	36	180	335	515
128.	D.G.Khan	19	33	52	228	528	756
129.	Rajanpur	15	27	42	180	432	612
130.	Leiah	15	24	39	180	384	564
131.	Muzaffargarh	15	39	54	180	624	804
132.	Bahawalpur	39	42	81	461	671	1132
133.	Bahawalnagar	21	42	63	252	672	924
134.	R. Y. Khan	24	54	78	288	863	1151

	SINDH	<u>642</u>	<u>678</u>	<u>1320</u>	<u>7694</u>	<u>10838</u>	<u>18532</u>
201.	Khairpur	15	45	60	179	720	899
202.	Sukkur	39	18	57	467	288	755
203.	Nawab Shah	15	30	45	180	480	660
204.	Neshero Feroz	15	36	51	180	576	756
205.	Ghotki	15	36	51	180	576	756
206.	Jacobabad	20	45	65	240	720	960
207.	Shikarpur	15	30	45	180	480	660
208.	Larkana	20	60	80	240	960	1200
209.	Dadu	15	57	72	180	911	1091
210.	Hyderabad	57	60	117	681	956	1637
211.	Badin	15	42	57	177	670	847
212.	Thatta	15	48	63	180	768	948
213.	Sanghar	15	51	66	179	815	994
214.	Mirpur Khas	21	54	75	252	862	1114
215.	Tharparkar	12	39	51	144	624	768
216.	DISTRICT OF KARACHI	338	27	365	4055	432	4487
	N.W.F.P. TOTAL	<u>258</u>	<u>591</u>	<u>849</u>	<u>3082</u>	<u>9443</u>	<u>12525</u>
301.	SWAT	12	27	39	144	432	576
302.	UPPER DIR	5	26	31	59	416	475
303.	LOWER DIR	6	27	33	72	432	504
304.	CHITRAL	5	26	31	60	414	474
305.	SHANGLA	0	27	27	0	432	432
306.	MALAKAND	6	26	32	72	416	488
307.	BONAIR	0	30	30	0	480	480
308.	PESHAWAR	60	24	84	714	384	1098
309.	CHARSADA	14	22	36	168	352	520
310.	NOWSHERA	16	26	42	191	415	606
311.	KOHAT	14	24	38	168	384	552
312.	KARK	6	24	30	72	382	454
313.	HANGU	8	21	29	96	335	431
314.	D. I. KHAN	12	25	37	144	399	543
315.	TANK	6	20	26	71	319	390
316.	MANSEHRA	10	27	37	118	431	549
317.	ABBOTABAD	16	21	37	190	336	526
318.	BATAGRAM	0	27	27	0	431	431
319.	KOHISTAN	0	25	25	0	400	400
320.	HARIPUR	14	22	36	168	351	519
321.	BANNU	8	22	30	95	351	446
322.	LAKKI MARWAT	8	21	29	96	335	431
323.	MARDAN	18	27	45	216	432	648
324.	SWABI	14	24	38	168	384	552

	BALUCHISTAN	TOTAL	<u>195</u>	<u>521</u>	<u>716</u>	<u>2329</u>	<u>8325</u>	<u>10654</u>
401.	QUETTA		45	21	66	533	334	867
402.	PASHIN		5	20	25	60	320	380
403.	QILLA ABDULLAH		8	20	28	95	320	415
404.	CHAGHI		7	20	27	84	320	404
405.	SIBBI		12	17	29	142	270	412
406.	ZIARAT		2	20	22	24	320	344
407.	KOHLU		2	20	22	24	320	344
408.	DERA BUGTI		4	19	23	48	304	352
409.	KALAT		6	20	26	72	319	391
410.	MASTUNG		8	20	28	96	320	416
411.	KHUZDAR		11	20	31	132	320	452
412.	AWARAN		0	20	20	0	320	320
413.	KHARAN		5	20	25	60	320	380
414.	LASBILLA		12	20	32	144	320	464
415.	KETCH/TURBAT		8	22	30	96	352	448
416.	GWADAR		12	14	26	144	224	368
417.	PANJGUR		5	21	26	60	336	396
418.	ZHOB		8	21	29	96	336	432
419.	LORALAI		6	21	27	72	336	408
420.	BARKHAN		2	20	22	24	320	344
421.	MUSA KHEL		0	22	22	0	352	352
422.	QILLAH SIAFULLAH		4	22	26	48	352	400
423.	NASIRABAD		6	21	27	72	336	408
424.	JAFARABAD		8	20	28	96	320	416
425.	JHAL MAGSI		2	20	22	23	318	341
426.	BOLAN/KACHHI		7	20	27	84	316	400
1.	ISLAMABAD		30	15	45	326	234	560
	PAKISTAN		2211	2987	5198	26273	47680	73953

Estimation Procedure:

ESTIMATION PROCEDURE ADOPTED FOR PSLM SURVEY

NOTATIONS:

N_h = Total number of Primary Sampling Units (PSUs) in the h th stratum of a province.

n_h = Total number of sample PSUs in the h th stratum of a province.

M_{hi} = Total number of Secondary Sampling Units (SSUs) in the i th sample PSU of h th stratum of a province.

m_{hi} = Number of sample SSUs in the i th sample PSU of h th stratum of a province.

P_{hi} = Assigned probability of selection of i th PSU of the h th stratum of a province.

y_{hij} = Value of any characteristic y of j th SSU within i th PSU of h th stratum of a province.

x_{hij} = Value of any characteristic x of j th SSU within i th PSU of h th stratum of a province with whose respect proportion is required.

(i): ESTIMATION FORMULAE FOR TOTALS AND THEIR VARIANCES

$$N = \sum_{h=1}^L N_h$$

$$n = \sum_{h=1}^L n_h$$

$$\bar{Y}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}}{p_{hi}}$$

OR

$$\bar{Y}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{1}{p_{hi}} \frac{M_{hi}}{m_{hi}} \sum_{j=1}^{m_{hi}} y_{hij}$$

$$\bar{Y} = \sum_{h=1}^L \bar{Y}_h = \sum_{h=1}^L \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}}{p_{hi}}$$

For X , another variable of interest, we have

$$\bar{X}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{\bar{X}_{hi}}{P_{hi}} = \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{1}{P_{hi}} \frac{M_{hi}}{m_{hi}} \sum_{j=1}^{m_{hi}} x_{hij}$$

$$\bar{X} = \sum_{h=1}^L \bar{X}_h = \sum_{h=1}^L \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{\bar{X}_{hi}}{P_{hi}}$$

$$\bar{Y} = \frac{\bar{Y}}{\bar{X}}$$

$$v(\bar{Y}_h) = \frac{1}{n_h} s_{ht}^2 = \frac{1}{n_h(n_h - 1)} \left(\sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}^2}{P_{hi}^2} - \frac{(\sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}}{P_{hi}})^2}{n_h} \right)$$

$$v(\bar{Y}) = \sum_{h=1}^L \frac{1}{n_h} s_{ht}^2 = \sum_{h=1}^L \frac{1}{n_h(n_h - 1)} \left(\sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}^2}{P_{hi}^2} - \frac{(\sum_{i=1}^{n_h} \frac{\bar{Y}_{hi}}{P_{hi}})^2}{n_h} \right)$$

(ii): FORMULA FOR RATIO ESTIMATES

$$r = \frac{\bar{Y}}{\bar{X}}$$

where \hat{Y} and \hat{X} can be estimated by equations under item (i) given above.

$$Rel V(r) = \frac{1}{\bar{X}^2} \sum_{h=1}^L \frac{1}{n_h} s_{hb}^2 + \frac{1}{\bar{X}^2} \sum_{h=1}^L \frac{1}{n_h} \sum_{i=1}^{n_h} \frac{M_{hi}^2}{p_{hi}^2 m_{hi}} \frac{(M_{hi} - m_{hi})}{M_{hi}} s_{hw}^2$$

where

$$s_{hb}^2 = s_{ht}^2 - s_{hw}^2$$

$$s_{ht}^2 = s_{hy}^2 + r^2 s_{hx}^2 - 2r s_{hxy}$$

$$s_{hx}^2 = \frac{1}{(n_h - 1)} \left[\sum_{i=1}^{n_h} \frac{\hat{x}_{hi}^2}{p_{hi}^2} - \frac{(\sum_{i=1}^{n_h} \frac{\hat{x}_{hi}}{p_{hi}})^2}{n_h} \right]$$

$$s^2_{hy} = \frac{1}{(n_h - 1)} \left[\sum_{i=1}^{n_h} \frac{\bar{y}_{hi}^2}{p_{hi}^2} - \frac{\left(\sum_{i=1}^{n_h} \bar{y}_{hi} \right)^2}{n_h} \right]$$

$$s_{hxy} = \frac{1}{n_h - 1} \left[\sum_{i=1}^{n_h} \left(\frac{\bar{x}_{hi}}{p_{hi}} \frac{\bar{y}_{hi}}{p_{hi}} \right) - \frac{\left(\sum_{i=1}^{n_h} \frac{\bar{x}_{hi}}{p_{hi}} \right) \left(\sum_{i=1}^{n_h} \frac{\bar{y}_{hi}}{p_{hi}} \right)}{n_h} \right]$$

$$s^2_{hw} = \frac{1}{n_h - 1} \sum_{i=1}^{n_h} \frac{1}{p_{hi}^2} \frac{M_{hi}^2 (M_{hi} - m_{hi})}{m_{hi} M_{hi}} s^2_{hi}$$

and

$$s^2_{hi} = s^2_{hiy} + r^2 s^2_{hix} - 2r s_{hixy}$$

$$s^2_{hiy} = \frac{1}{(m_{hi} - 1)} \left[\sum_{j=1}^{m_{hi}} y_{hij}^2 - \frac{\left(\sum_{j=1}^{m_{hi}} y_{hij} \right)^2}{m_{hi}} \right]$$

$$s^2_{hix} = \frac{1}{(m_{hi} - 1)} \left[\sum_{j=1}^{m_{hi}} x_{hij}^2 - \frac{\left(\sum_{j=1}^{m_{hi}} x_{hij} \right)^2}{m_{hi}} \right]$$

$$s^2_{hixy} = \frac{1}{(m_{hi} - 1)} \left[\sum_{j=1}^{m_{hi}} x_{hij} y_{hij} - \frac{\left(\sum_{j=1}^{m_{hi}} x_{hij} \sum_{j=1}^{m_{hi}} y_{hij} \right)}{m_{hi}} \right]$$