

**APPENDIX A: SAMPLE DESIGN FOR PAKISTAN SOCIAL AND LIVING STANDARDS
MEASUREMENT SURVEY DISTRICT LEVEL, 2010-11**

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/deh according to Population Census, 1998 have been used as sampling frame. In this frame, each village/mouzas/deh is identifiable by its Name, Had Bast Number, Cadastral map etc. This frame is comprised 50590 villages/mouzas

The numbers 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
Khyber Pakhtunkhwa	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 lack 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 77488 households enumerated from 5413 sample PSUs (2280 from urban and 3133 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 Random Sampling scheme was adopted for this survey. Enumeration Blocks in urban areas and villages in rural areas were selected at first stage while households within the sample Enumeration Blocks / Villages were selected at second stage.

Selection of primary sampling Units (PSUs):

Enumeration blocks in the urban domain and mouzas/deh/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.

Annexure-I

District-Wise Distribution of Sample Areas and Household – PSLM 2010-11

S.No	Districts		Sample Areas			Sample Households		
			Urban	Rural	Total	Urban	Rural	Total
	PUNJAB	TOTAL	1103	1196	2299	13236	19136	32372
101.	Attock		15	27	42	180	432	612
102.	Rawalpindi		72	36	108	864	576	1440
103.	Jhelum		15	24	39	180	384	564
104.	Chakwal		15	27	42	180	432	612
105.	Sargodha		39	39	78	468	624	1092
106.	Bhakhar		15	24	39	180	384	564
107.	Khushab		15	21	36	180	336	516
108.	Mianwali		15	21	36	180	336	516
109.	Faisalabad		102	69	171	1224	1104	2328
110.	Jhang		24	44	68	288	704	992
111.	T.T.Singh		21	33	54	252	528	780
112.	Chiniot		20	24	44	240	384	624
113.	Gujranwala		57	36	93	684	576	1260
114.	Gujrat		22	33	55	264	528	792
115.	Sialkot		36	21	57	432	336	768
116.	Hafiz Abad		15	27	42	180	432	612
117.	Mandi Bahauddin		15	27	42	180	432	612
118.	Narowal		15	30	45	180	480	660
119.	Lahore		208	27	235	2496	432	2928
120.	Kasur		27	42	69	324	672	996
121.	Sheikhupura		21	29	50	252	464	716
122.	Nankana Sahib		12	22	34	144	352	496
123.	Vehari		19	42	61	228	672	900
124.	Multan		56	42	98	672	672	1344
125.	Khanewal		15	39	54	180	624	804
126.	Lodhran		15	21	36	180	336	516
127.	D.G.Khan		19	33	52	228	528	756
128.	Rajanpur		15	27	42	180	432	612
129.	Layyah		15	24	39	180	384	564
130.	Muzaffar Garh		15	39	54	180	624	804
131.	Bahawalpur		39	42	81	468	672	1140
132.	Bahawalnager		21	42	63	252	672	924
133.	R. Y. Khan		24	54	78	288	864	1152
134.	Sahiwal		15	36	51	180	576	756
135.	Pakpatten		15	27	42	180	432	612
136.	Okara		24	45	69	288	720	1008

	SINDH	TOTAL	696	711	1407	8352	11376	19728
201.	Khairpur		15	45	60	180	720	900
202.	Sukkur		39	21	60	468	336	804
203.	Nawab Shah		15	30	45	180	480	660
204.	Nowshero Feroze		15	36	51	180	576	756
205.	Ghotki		15	36	51	180	576	756
206.	Jacobabad		11	24	35	132	384	516
207.	Kashmore		10	21	31	120	336	456
208.	Shikarpur		15	30	45	180	480	660
209.	Larkana		13	27	40	156	432	588
210.	Shahdadkot		7	33	40	84	528	612
211.	Dadu		9	37	46	108	592	700
212.	Jamshoro		16	20	36	192	320	512
213.	Hyderabad		48	18	66	576	288	864
214.	Matiali		10	20	30	120	320	440
215.	Tando Allah Yar Tando Muhammad		13	17	30	156	272	428
216.	Khan		12	18	30	144	288	432
217.	Badin		15	45	60	180	720	900
218.	Thatta		15	48	63	180	768	948
219.	Sanghar		15	51	66	180	816	996
220.	Mirpur Khas		20	38	58	240	608	848
221.	Umer Kot		18	30	48	216	480	696
222.	Tharparkar		12	39	51	144	624	768
223.	DISTRICT OF KARACHI		338	27	365	4056	432	4488
Khyber Pakhtunkhwa TOTAL			258	591	849	3096	9456	12552
301.	Swat		12	27	39	144	432	576
302.	Upper Dir		5	26	31	60	416	476
303.	Lower Dir		6	27	33	72	432	504
304.	Chitral		5	26	31	60	416	476
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	720	384	1104
309.	Charsada		14	22	36	168	352	520
310.	Nowshera		16	26	42	192	416	608
311.	Kohat		14	24	38	168	384	552
312.	Karak		6	24	30	72	384	456
313.	Hangu		8	21	29	96	336	432
314.	D.I.Khan		12	25	37	144	400	544
315.	Tank		6	20	26	72	320	392
316.	Mansehra		10	27	37	120	432	552

317.	Abbottabad	16	21	37	192	336	528
318.	Batagram	0	27	27	0	432	432
319.	Kohistan	0	25	25	0	400	400
320.	Haripur	14	22	36	168	352	520
321.	Bannu	8	22	30	96	352	448
322.	Lakki Marwat	8	21	29	96	336	432
323.	Mardan	18	27	45	216	432	648
324.	Swabi	14	24	38	168	384	552
	BALOCHISTAN TOTAL	193	620	813	2316	9920	12236
401.	Quetta	45	21	66	540	336	876
402.	Pashin	5	20	25	60	320	380
403.	Qilla Abdullah	8	20	28	96	320	416
404.	Chaghi	3	22	25	36	352	388
405.	Nushki	4	24	28	48	384	432
406.	Sibbi	12	17	29	144	272	416
407.	Ziarat	2	20	22	24	320	344
408.	Kohlu	2	20	22	24	320	344
409.	Dera Bugti	4	19	23	48	304	352
410.	Harnai	0	18	18	0	288	288
411.	Kalat	6	20	26	72	320	392
412.	Mastung	8	20	28	96	320	416
413.	Khuzdar	11	20	31	132	320	452
414.	Awaran	0	20	20	0	320	320
415.	Kharan	5	26	31	60	416	476
416.	Washuk	0	30	30	0	480	480
417.	Lasbilla	12	20	32	144	320	464
418.	Ketch	8	22	30	96	352	448
419.	Gwadar	12	14	26	144	224	368
420.	Panjgur	3	18	21	36	288	324
421.	Zhob	8	21	29	96	336	432
422.	Loralai	6	21	27	72	336	408
423.	Barkhan	2	20	22	24	320	344
424.	Musa Khel	0	22	22	0	352	352
425.	Qilla Saifullah	4	22	26	48	352	400
426.	Sherani	0	22	22	0	352	352
427.	Nasirabad	6	21	27	72	336	408
428.	Jafarabad	8	20	28	96	320	416
429.	Jhal Magsi	2	20	22	24	320	344
430.	Bolan	7	20	27	84	320	404
1.	ISLAMABAD	30	15	45	360	240	600
	PAKISTAN	2280	3133	5413	27360	50128	77488

Note: Non Contacted and Refusal households are included in the list of sample households.

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

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

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

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

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

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

(ii): FORMULA FOR RATIO ESTIMATES

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

Where \bar{Y} and \bar{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

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

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

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

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

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

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

And

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

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

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

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