وزارة التخطيط التنموي والاحصاء
Ministry of Development Planning and Statistcs

State of Qatar
Ministry Of Development Planning
and Statistics

Survey Methodology of labor force sample survey 2012

Index

Sample Design, Field Operations and Weighting Procedures

1- Sample Design

As other countries in the region, Qatar has two particularities in respect to its population and its housing arrangement. These have important bearing on the sample design of labour force surveys as well as other types of household surveys. One of the particularities is the high proportion of non- Qatari workers, living in dispersed areas generally distinct from residential areas of Qataris. Another particularity is the existence of many collective housing quarters where non-Qatari workers live in units provided by employers or rented directly from landlords.

Because of these features, the commonly used methodology of multistage area sampling with a single set of PSUs is not efficient. Primary sampling units (PSU) selected in the first stage may not contain sufficient number of households of either types, Qatari and non-Qatari, and may not include any collective households because of their geographical concentration.

For these reasons, the sample design of the 2012 labour force survey, like the design of the earlier surveys, has been based on independent samples drawn from distinct sets of especially constructed PSUs, each set covering the entire nation and designed to include a target number of households of given type, namely:

(i) Qatari regular households,

(ii) Non-Qatari regular households;

(iii) Small labour gatherings; and

(iv) Large non-Qatari collective households.

The following sections describe the sample design of the two main domains of the survey dealing with Qatari households and non-Qatari regular households. The sample design of the small and large collective non-Qatari households is described in separate section at the end of the chapter.

- **Sample Size**

Initially the target sample size of each of the two main domains of the survey has been set : 2,520 Qatari households and 2,541 non-Qatari regular households from 120 Qatari and 121 non-Qatari PSUs. As the Census was conducted in 2010, it was decided to do listing operation in the selected PSUs before the actual enumeration. As the result of the listing operation we left with 119 Qatari PSUs instead of 120 PSUs and 119 non-Qatari PSUs instead of 121 PSUs(some of the areas were demolished) and also in some of the clusters we found less than 21 households. Therefore the resulting sample size was 2454 Qatari households and 2378 Non-Qatari households.

The large sample for non-Qatari group is to ensure the representation in all municipalities. In relative terms, this sample allocation assigns a higher rate of coverage of Qatari households as compared to non-Qatari households. The disproportionate allocation is justified by two considerations. The precision required for Qatari households is higher than the required precision for non-Qatari households. Also, as the non-Qatari population is generally more homogeneous in terms of age distribution and other socio demographic characteristics, the sample requirement for the same level of precision may be assumed to be lower for the non-Qatari population than the corresponding sample requirement for the more heterogeneous Qatari population.

- **Primary sampling units**

Like in earlier surveys, the State of Qatar has been divided into Primary Sampling Units, separately for Qatari households, non-Qatari households, small and large collective households. Each area sample is composed of a set of PSUs, constructed by grouping contiguous blocks such that each PSU contains about 60 households of a given type according to the 2010 Census frame. The formation of PSUs respects the administrative structure of the State of Qatar.

The resulting area frame is composed of 603 PSUs for selecting Qatari households, 1580 PSUs for non-Qatari regular households. The distribution in municipalities is given in table-1 below.

Table (1) Preliminary Area Frames of PSU_s of Qatari Households and non-Qatari Regular Households

Municipality	Qatari Area Frame		Non-Qatari Area Frame	
	PSU_s	H/Hs	PSU_s	H/Hs
Total	603	36,168	1,580	110,539
Doha	190	11,506	957	67,917
Al Rayyan	265	15,979	418	28,771
Al Wakra	41	2,295	93	7,289
Umm Salal	58	3,291	34	1,872
Al Khor	19	1,219	61	3,736
Al Shamal	6	371	6	324
Al Daayeen	24	1,507	11	630

The average size of a PSU is about 60 households in the Qatari frame and about 70 in the non-Qatari frame. The sample selection is designed so that at least one PSU is selected per municipality.

- **Probability sampling of PSU_s**

For a total sample size of 2,454 households for Qatari and 2,378 for Non-Qatari households, 21 sample households were selected per PSU and if any PSU has less than 21 households, all the households were selected for the survey. The first-stage sampling procedure involves ordering the PSUs and selecting the sample systematically with probability proportional to size (PPS). The measure of size would be the number of households in the PSU.

The sampling scheme for selecting the PSUs has been carried out by proportionally allocation to all the municipalities based on the number of households in each municipality and also keeping the representation of all the municipalities in the sample.

The following table presents the results for the two separate draws, one from the Qatari frame and the other from the non-Qatari frame.

Table (2) Qatari and Non-Qatari Sample PSU_s drawn by systematic sampling with probabilities proportional to size

Municipality	Qatari Sample			Non-Qatari Sample		
	PSU_s	Total H/Hs in Frame	HH selected in sample	PSU_s	Total H/Hs in Frame	HH selected in sample
Total	**119**	**5,441**	**2,454**	**119**	**7,380**	**2,378**
Doha	38	1597	774	72	4257	1434
Al Rayyan	52	2410	1080	31	2154	636
Al Wakra	8	355	166	8	592	145
Umm Salal	11	446	224	2	145	42
Al Khor	4	254	84	4	187	80
Al Shamal	1	71	21	1	25	21
Al Daayeen	5	308	105	1	20	20

- **Probability sampling of households**

After selecting the sample PSUs from each of the two area frames, a sample of 21 households were selected from each sample PSU. In the PSUs with less than 21 households, all the households were selected.

The sample selection has been carried out by a systematic scheme. Thus, For example there are 200 households in a PSU and we have to select 20 households using systematic sampling technique (the sampling interval will be 10 in this case), and suppose the random start is 3, then the selected sample will be households with numbers:3,13,23,33,43,53,63,73,83,93,103, 113,123,133,143,153,163,173,183 and 193. The following table shows the average number of households per PSU and the corresponding minimum and maximum in the Qatari and non-Qatari frames separately according to 2010 census.

Table (3) Minimum, maximum and average number of households per PSU

Particulars	Min.	Aver.	Max.
Qatari area frame	24	60	132
Non-Qatari area frame	20	70	877

- **Sample Collective households**

As in earlier surveys, two types of collective households have been distinguished:

(a) Small collective households with 1 to 6 persons; and

(b) Large collective households with 7 persons and more.

- **Small collective households**

For the purpose of the labor force survey, The Primary Sampling Units (PSUs) for small gatherings (having up to 6 persons) has been created from the census results, by combining the small gatherings from the adjacent census blocks so that each PSU has on average 60 households (small labor gatherings). The number of PSUs and households (gatherings) in each municipality is provided in table-4.

Table (4) : Frame of PSUs for small gatherings

Municipality	Small gatherings	
	PSUs	HH(gatherings)
Total	329	19,753
Doha	206	12,422
Al Rayyan	74	4,419
Al Wakra	13	881
Umm Salal	7	414
Al Khor	21	1,132
Al Shamal	4	233
Al Daayeen	4	252

Initially a sample of 60 PSU from 329 PSUs was selected in the first stage by using probability proportional to size and then listing operation within these PSUs was carried out. During the listing operation, we found that in 8 out of 60 PSUs, there does not exist any gathering(due to the demolition of some areas). A sample of 22 collective households from the remaining 52 PSUs was drawn by simple random sampling. In PSUs with less than 22 gatherings, all the gatherings were selected. The distribution is given in the table-5 below:

Table (5) : Distribution of sample PSUs of Small gatherings by Municipality

Municipality	Small gatherings	
	PSUs	HH(gatherings)
Total	52	848
Doha	31	452
Al Rayyan	12	208
Al Wakra	3	59
Umm Salal	1	22
Al Khor	3	63
Al Shamal	1	22
Al Daayeen	1	22

- ## Large collective households

According to the sampling frame from 2010 Census, there were 16467 large collective households (with more than 6 persons per household) in Qatar with a total of 851818 persons (detail is in table below). Large collective households vary greatly in size from a minimum of 7 persons to a few thousand persons in densely populated areas. By contrast, the geographical variation of large collective households is somewhat narrow.

Table (6) : Frame of Large Gatherings by Municipality

Municipality	Up to 500 persons		persons 2500-501		More than 2500 persons	
	Gatherings		Gatherings		Gatherings	
	Number	Persons	Number	Persons	Number	Persons
Total	16,272	514,575	181	173,375	14	163,868
Doha	9,492	298,169	93	77,392	3	29,313
Al Rayyan	4,225	122,327	24	24,718	1	2,985
Al Wakra	813	30,903	25	29,301	6	26,701
Umm Salal	313	9,707	6	6,004	0	0
Al khor	1,126	41,363	19	22,898	3	101,241
Al Shamal	127	2,708	0	0	0	0
Al Daayeen	176	9,398	14	13,062	1	3628

Because of the high variation of the size of large collective households, and because of their relative geographical concentration, it may not be efficient to combine blocks into homogenous PSUs as suggested in the sample design of the Qatari and non-Qatari regular households and small gatherings. In the case of large collective households, it has been decided to directly sample from the list frame with probability proportional to size, where size is measured in terms of persons in collective households according to the frame information.

Further it was decided to stratify the large gatherings into three strata based on their size. The first stratum include labor gatherings having persons up to 500, the gatherings with 501 to 2,500 persons are in stratum 2 and similarly the third stratum constitute of gathering with more than 2500 persons living in it.

Some 195 collective households with more than 500 persons per collective household were selected with certainty. The sample included in addition 1,020 large collective households having less than 500 persons selected with probability proportional to size.

The number of persons to be selected within each gathering is provided in table below.

Table (7) : Sample Distribution in Large Gatherings

Stratum	Labor gathering with number of persons	Labor gatherings to be selected	Persons to be selected from each large gathering
Total		**1,215**	
1	up to 500	1,020	5
2	501----2500	181	25
3	more than 2500	14	50

2- Field Operations

This section describes three aspects of the field operations with bearing on the final sample and weighting procedure, namely, listing; final sample; and response.

• Listing

The population and housing census was conducted in April, 2010. The field operation for the labour force survey was in May,2012, so the frame was two year old. It was decided to do the listing operation of the sample PSUs prior to the selection of households.

• Final sample

The final sample composition is shown in Table 8 below. It consists of 2,454 Qatari households, 2,378 non-Qatari regular households, 848 small collective households and 1,215 large collective households, as indicated in the summary table below.

Table (8) Final sample of Qatari and non-Qatari regular households and persons in small and large collective households

Particulars	Frame(Listing)		Sample	
	H/Hs	Persons	H/Hs	Persons
Total	15,309	72,363	6,895	37,629
Qatari households	5,441	35,509	2,454	16,410
Non-Qatari hslds.	7,380	28,081	2,378	9,261
Small collectives(1)	2,488	8,773	848	3,058
Large collectives(2)	-	-	1,215	8,900

Notes

(1) Small collective households with 6 persons or less.
(2) Large collective households with 7 persons or more.

Response

The following table shows the results of the last stage of the field operations where the sample households and persons are contacted for interviewing. The table indicates the type of responses received for each category of sample units..

Table (9) Final samples by type of response

Particulars	Qatari households	Non-Qatari regular households	Non-Qatari in small collective households	Non-Qatari in large collective households
	H/Hs	H/Hs	Persons	Persons
Total	**2,454**	**2,378**	**848**	**1,215**
Complete response	2,308	2293	-	1,121
Partial response	1	-	-	-
Refusal	-	3	-	-
Out of scope	4	-	-	-
Absence	141	82	-	94

The table distinguishes between complete responses, partial responses, refusals, out of scopes and absences. A complete response is when responses are obtained for all persons in the sample household. A partial response is when responses for some but not all persons in the sample households are obtained. Refusal is when a sample household or person has refused to participate in the survey. Out-of-scope refers to the situation where the sample household or person turns out to be outside the scope of the survey, for example, a household in the Qatari sample turns out to be non-Qatari, or an address meant to be that of a non-Qatari regular household turns out to be a commercial establishment. An absence is when a sample household or person could not be contacted due to temporary absence.

On the basis of table-9, response rates are calculated for the different categories of sample units. The response rate is the percentage of the responding households as a ratio of the total number of sample households

.

As in previous surveys, the response rates are very high in Qatar. The response rate is nevertheless slightly lower among Qatari households (94%) in comparison with non-Qatari households (96%).

3- Weighting procedures

The overall weights are formed by three components: the weights reflecting the sample design, the adjustment factors for non-response; and the final factors to calibrate the results to population controls obtained from external sources.

• Design weights

The design weight associated with any particular sample unit is calculated by the inverse of the probability of selection of that unit in the sample. For example, for a Qatari household, the probability of selection is the product of three probabilities: the probability of selection of the sample PSUi in which the household reside; the probability of selection of that particular household in the sample PSUi. Thus, the design weight associated with a particular Qatari household in sample PSUi is given by

$$W_i = {}^{1}/_{p_i}$$

where pi is the probability of selection of the Qatari household in sample PSUi. It is given by the expression:

$$p_i = \text{Prob}(PSU_i)({}^{m_i}/_{M_i})$$

Where

M_i= Total number of Qatari households in PSUi (according to the updated list)

mi= Number of sample Qatari households in PSUi

The probability of selection of PSUi is equal to 1 if PSUi is self-representing. Otherwise, it is given by

$$\text{Prob}(PSU_i) = {}^{nM_i}/_{M}$$

Where

n = Number of non-self-representing PSUs in the sample

M_i= Total number of Qatari households in PSUi (according to the Qatari area frame)

M = Total number of Qatari households in all non-self-representing PSUs (according to the Qatari area frame)

- **Adjustment for non-response**

The design weights w_j are adjusted for non-responding households and individuals within households. In general, the adjustment factors may be expressed as:

$$w_i = \alpha_i w_i$$

where αi is the adjustment factor for non-responding households and individuals in PSUi (or large collective household i).

If it can be assumed that responding and non-responding households and individuals in a given PSU are essentially similar with respect to the key subjects of the survey, the adjustment factor may be calculated by the inverse of the response rate in PSUi (or collective household i) given by following formula:

$$\alpha_i = {}^{m_i}/_{m_i'}$$

where mi is the number of sample households in PSUi and m_i' is the number of sample households with complete response in PSUi.

In the case of individuals, the coefficient αi takes the form:

$$\alpha i = ({}^{m_i}/_{m_i'})\,({}^{u_i'}/_{u_i''})$$

where u_i' is the number of individuals in households with complete response and u_i'' the number of individuals with complete response within a responding household.

- ## Adjustment to population aggregates

The derived weights w'i are further adjusted to population aggregates obtained from demographic projections and administrative records. The calibrated weights have been calculated to match the demographic projections.

Standard Errors of Survey Estimates

Standard Errors of Survey Estimates

• Introduction

As in every sample survey, the results of the Labor Force Survey 2012 are subject to sampling errors. Sampling errors arise due to the fact that the survey does not cover all elements of the population, but only a selected portion.

The sampling error of an estimate is the difference between an estimate based on a sample survey and the same estimate derived from a complete count under identical conditions. The sampling error may be decomposed into two components: (i) sampling bias; and (ii) sampling variance. The sampling bias reflects the systematic error that may occur due to (a) the failure of the sampling frame to represent the target population (coverage errors); (b) the failure of selecting the sample according to the scheme prescribed by the sampling design, and (c) the failure of successfully enumerating all selected units in the sample (non-response errors).

The sampling variance reflects the uncertainty associated to a sample estimate due to the particular sample used for its calculation, among all possible other samples that could have been selected from the frame under the same sampling scheme.

• Standard errors of the survey estimates

Because the selection process of the Labor Force Survey is based on a random sampling scheme with known probabilities, the sampling variance of the survey estimates may be calculated from the sample results themselves. This feature of random sampling is an essential element, which distinguishes probability samples from other sampling methods, such as quota sampling or purposive sampling.

Tables 1 below give the standard errors of the estimates of the main aggregates, namely, the size of the population, the working population (15 years and over), the economically active population (the labor force), the

number of persons employed and unemployed, and the number of persons not economically active (not-in-labor-force), for Qataris and non- Qataris separately.

Table 2 gives the standard errors for the main rates and ratios: labor force participation rate, employment-population ratio and the unemployment rate.

Table (1) Standard error and confidence interval of estimates of main aggregates, May 2012

Particulars	Survey estimate	Standard error	Confidence interval	
			Lower bound	Upper bound
Total population	1,791,518	65,118	1,663,887	1,919,149
▪ Qatari	264,066	10,567	243,354	284,778
- Male	130,896	5,228	120,650	141,142
- Female	133,170	5,759	121,883	144,457
▪ Non-Qatari	1,527,452	63,571	1,402,853	1,652,051
- Male	1,220,788	58,419	1,106,287	1,335,289
- Female	306,664	15,146	276,977	336,351
Population 15 +	1,556,539	59,972	1,438,993	1,674,085
▪ Qatari	166,013	6,458	153,355	178,671
- Male	82,783	3,367	76,184	89,382
- Female	83,230	3,386	76,593	89,867
▪ Non-Qatari	1,390,526	59,353	1,274,194	1,506,858
- Male	1,145,023	57,106	1,033,096	1,256,950

Particulars	Survey estimate	Standard error	Confidence interval	
			Lower bound	Upper bound
- Female	245,503	10,789	224,357	266,649
Economically active population (Labor force)	1,347,060	57,794	1,233,784	1,460,336
▪ Qatari	85,187	3,559	78,211	92,163
- Male	56,356	2,387	51,678	61,034
- Female	28,831	1,509	25,874	31,788
▪ Non-Qatari	1,261,873	57,567	1,149,041	1,374,705
- Male	1,118,455	56,841	1,007,046	1,229,864
- Female	143,418	7,338	129,036	157,800
Employed	1,340,582	57,793	1,227,307	1,453,857
▪ Qatari	82,601	3,473	75,793	89,409
- Male	55,609	2,342	51,018	60,200
- Female	26,992	1,462	24,126	29,858
▪ Non-Qatari	1,257,981	57,571	1,145,141	1,370,821
- Male	1,117,577	56,842	1,006,166	1,228,988
- Female	140,404	7,333	126,031	154,777
Unemployed	6,478	718	5,071	7,885
▪ Qatari	2,586	275	2,048	3,124
- Male	747	134	484	1,010

Particulars	Survey estimate	Standard error	Confidence interval	
			Lower bound	Upper bound
- Female	1,839	240	1,369	2,309
▪ Non-Qatari	3,892	653	2,613	5,171
- Male	878	256	376	1,380
- Female	3,014	523	1,988	4,040
Not economically active population (Not in labor force)	209,479	9,523	190,813	228,145
▪ Qatari	80,826	3,583	73,803	87,849
- Male	26,427	1,415	23,653	29,201
- Female	54,399	2,451	49,595	59,203
▪ Non-Qatari	128,653	8,775	111,454	145,852
- Male	26,568	2,487	21,694	31,442
- Female	102,085	6,718	88,919	115,251

Table (2) Standard error and confidence interval of estimated & ratios, May 2012

Particulars	Survey estimate	Standard error	Confidence interval	
			Lower bound	Upper bound
Labor force participation rate	86.542%	0.700%	85.2%	87.9%
▪ Qatari	51.314%	0.900%	49.5%	53.1%
- Male	68.077%	1.000%	66.1%	70.0%
- Female	34.640%	1.200%	32.3%	37.0%
▪ Non-Qatari	90.748%	0.600%	89.6%	91.9%
- Male	97.680%	0.200%	97.3%	98.1%
- Female	58.418%	1.800%	54.9%	61.9%
Employment / population ratio	86.126%	0.700%	84.8%	87.5%
▪ Qatari	49.756%	0.900%	48.0%	51.5%
- Male	67.174%	1.000%	65.2%	69.1%
- Female	32.431%	1.200%	30.1%	34.8%
▪ Non-Qatari	90.468%	0.700%	89.1%	91.8%
- Male	97.603%	0.236%	97.1%	98.1%
- Female	57.190%	1.800%	53.7%	60.7%
Unemployment rate	0.481%	0.057%	0.4%	0.6%
▪ Qatari	3.036%	0.303%	2.4%	3.6%
- Male	1.326%	0.224%	0.9%	1.8%

Particulars	Survey estimate	Standard error	Confidence interval	
			Lower bound	Upper bound
- Female	6.379%	0.808%	4.8%	8.0%
▪ Non-Qatari	0.308%	0.054%	0.2%	0.4%
- Male	0.079%	0.023%	0.0%	0.1%
- Female	2.102%	0.376%	1.4%	2.8%

- **Uses of the standard error**

One use of the standard error is to assess the level of precision of the survey estimates. A low relative standard error indicates a high precision of the estimate. In general, the lower the relative standard error of an estimate, the higher is the precision of the estimate. The relative standard error of an estimate is the ratio of the standard error to the size of the estimate. For example, from Table 1 it can be deduced that the estimate of economically active Qatari (85,187) is more precise than the estimate of economically active Non-Qatari (1,261,873) because the relative standard error of the first estimate is 4.2% i.e. lower than the relative standard error of the second estimate which is 4.6%. This result is in line with the survey design according to which Qatari households have been sampled at a higher rate than non-Qatari households for reasons explained in the methodology.

Another use of the standard error is for the calculation of confidence intervals. Under certain broad assumptions, it can be stated that the true value of the variable of interest lies in between the survey estimate and a multiple of the standard error. Thus, if y represents the survey estimate of a variable of interest, the true value of the variable represented say by θ lies with 95% confidence in the following interval,

$$y - 1.96 \text{ standard error} \leq \theta \leq y + 1.96 \text{ standard error}$$

Thus, with respect to the results shown in Table 1, it can be stated, for example, that the true value of the total number of employed Qataris is within the following interval,

$$82{,}601 - 1.96 \times 3{,}473 \leq \theta \leq 82{,}601 + 1.96 \times 3{,}473$$

$$75{,}788 \leq \theta \leq 89{,}414$$

Similarly, it can be calculated that the total number of employed non-Qataris lies with 95% confidence within the following interval,

$$1{,}257{,}981 - 1.96 \times 57{,}571 \leq \theta \leq 1{,}257{,}981 + 1.96 \times 57{,}571$$

$$1{,}145{,}046 \leq \theta \leq 1{,}370{,}916$$

These results indicate that the estimate of Qatari total employment is precise within a margin of error of about 6,900, and the non-Qatari estimate within a much higher margin of error, about 115,000

- **Calculation of the standard errors**

The standard error of an estimate is obtained by computing the square root of the corresponding variance. The variance calculation will use the method of ultimate clusters. The random groups method will also be used. Within any domain of estimation, for a subpopulation A, and for a characteristic Y, the formulas are:

$$v(\hat{Y}_A) = \sum_h \left[\frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} \left\{ \hat{Y}_{Ahi} - \frac{\hat{Y}_{Ah}}{n_h} \right\}^2 \right]$$

where:

$$\hat{Y}_{Ahi} = \sum_i \sum_{j \in A} w'_{hij} y_{hij}$$

$$\hat{Y}_{Ah} = \sum_{j \in A} w'_{hij} y_{hij}$$

And for ratios

$$v(\hat{R}_A) = \frac{1}{\hat{X}_A^2} \left[v(\hat{Y}_A) + \hat{R}_A^2 v(\hat{X}_A) - 2\hat{R}_A \operatorname{cov}(\hat{X}_A, \hat{Y}_A) \right]$$

where:

$$\hat{R}_A = \frac{\hat{Y}_A}{\hat{X}_A}$$

$v(\hat{X}_A)$ *and* $v(\hat{Y}_A)$ are calculated using formula of variance above

and

$$\text{cov}(\hat{X}_A, \hat{Y}_A) = \sum_{h}^{DOM}\left[\frac{n_h}{n_h - 1}\sum_{i=1}^{n_h}\left(\hat{X}_{Ahi} - \frac{\hat{X}_{Ah}}{n_h}\right)\left(\hat{Y}_{Ahi} - \frac{\hat{Y}_{Ah}}{n_h}\right)\right]$$