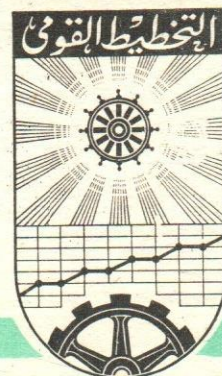


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Analysis of Data on Fertility, Mortality and Economic Activity of Urban Population in Libya Based on a Household Sample Survey

by

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The Household Sample Survey was conducted in 1969 by the Census & Statistical Department of Libya. The writer of this article, in his capacity as a United Nations Statistical Advisor in Libya, was responsible for designing and conducting the survey.

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0.1 The need for a continuous flow of comprehensive information on the demographic and economic characteristics of the population for formulating socio-economic plans needs no special emphasis. The importance of such information is far more essential in a developing country, as Libya, in which a remarkable economic and social development is being witnessed for the last ten years. The phenomenal high rate of increase in per-capita income (about 25.0 % per annum) should have a tremendous influence on the various demographic characteristics of the population, i.e. the rate of growth, economic activities, the composition of labour force, etc.

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<sup>1/</sup> The results were tabulated and published by the Census and Statistical Department in the following reports:

- a) Report on the First Phase of the Household Sample Survey (Tripoli Town).
- b) Report on the First Phase of the Household Sample Survey (Benghazi Town).
- c) Report on the First Phase of the Household Sample Survey in Tripoli and Benghazi (Economically Active Population).
- d) Report on the First Phase of the Household Sample Survey in Tripoli and Benghazi (Economically Inactive Population).



0.2 In Libya, as in most countries, vital registration records are the main source for estimating fertility and mortality rates while data on the labour force are usually obtained from the population census or other periodic inquiries. Evaluation of the vital registration records in Libya showed clear evidence of deficiency and inadequacy. The information on the economic activities of the population, on the other hand, were obtained in the 1964 population census. However, in view of the wide coverage of the census operation and with the limited technical resources at that time, no adequate control could be laid on the collection of the data on economic activities. In addition, no distinction was made in the population census between urban and rural areas despite the fact that such distinction is most bearing on demographic analysis. It was, therefore, conceived that with the use of sampling methods, more refined techniques can be applied to seek information which might be less biased than those obtained from the population census.

0.3 Therefore, one of the main purposes of the Household Sample Survey conducted in 1969 was to seek more accurate and up-to-date information on some demographic and economic characteristics of the population in urban areas namely Tripoli and Benghazi, the two main capitals in Libya. The purpose of this study is to examine the reliability of the sample results and their applicability for estimating some of the demographic and economic parameters in the urban population and to gain some knowledge of the factors which enter into the determination of these parameters. The study will cover the following:

- I. A brief outline of the methodology used in designing and conducting the Household Sample Survey.
- II. Estimation of fertility and mortality rates.
- III. Analysis of the economically active population. An assessment of the potential increase in the economically active population in the urban areas.

#### I. An outline on the Methodology used in the Household Sample Survey

##### 1.1 Coverage and scope

A plan was prepared to conduct a household survey on a sample basis covering only Libyan households in various sectors of the country; i.e. urban, semi-urban and rural areas. However, in view of the shortage in staff, it was found necessary that



the geographical coverage should be carried out gradually, starting, as a first phase, with the urban areas, i.e. the two main cities in Libya: Tripoli and Benghazi, then the other large cities and finally the rural areas. Although no objective distinction had been made in the population census between urban and rural areas, this was arbitrarily defined by the Census and Statistical Department as the total population of Tripoli and Benghazi cities, plus the urban agglomeration in the provinces of Baida and Derna. According to the definition, the population in Tripoli and Benghazi represented about 90 % of the total urban population in Libya <sup>1/</sup> and 20 % of the total Libyan population.

### 1.2 The Unit of Enumeration and the Sampling Frame

The definition of the household adopted in this survey was that used in the population census i.e. "a group of persons who are normally residents of the dwelling under study and having a common budget". The sample was drawn in clusters of 5 households by means of systematic selection with a random start. The 1964 Population Census records were used as a frame but in order to up-date the above frame another supplementary sample was selected representing dwellings built after the census. The supplementary sample was selected from the lists containing building permits issued by the Municipality until December 1967.

1.3 The sample selected from the Census records consisted of the names and addresses of: 930 householders in Tripoli and 575 in Benghazi, distributed proportionally among various districts (Mahallas). Non Libyan households were excluded and these represented 201 households. As to the supplementary sample, it consisted of 228 households representing 2 % of the newly constructed buildings. However, 140 Units from the supplementary sample could not be interviewed either because the buildings were not residential or because of the difficulty to find these buildings. The following table gives the distribution of the selected sample by type of frame and the number of households interviewed in each type:

F r a m e		Number of Households Interviewed	Number of Household not interviewed			Total Number of Households Selected
			Non-Libyans	Non-Located	Non-Residential Units	
The Census Records	Tripoli	713	167	50	-	930
	Benghazi	511	34	30	-	575
New Buildings	Tripoli	46	15	14	30	105
	Benghazi	42	12	46	23	123
<u>Total</u>	Tripoli	759	182	64	30	1,035
	Benghazi	553	46	76	23	698

<sup>1/</sup> The Statistical Abstract 1968. Table (4).  
The Census and Statistical Department, Libya.



According to the field instructions, all the dwellings selected in the sample had to be interviewed even if these dwellings were occupied by some other householders different from those reported in the sample lists.

#### 1.4 The Field Work

The field work of the first stage survey started in October 1968 in Tripoli and February 1969 in Benghazi. Three supervisors and 31 interviewers were employed in the field work after being trained for one week. The field work was preceded and accompanied by an intensive campaign, utilizing all media of information and emphasizing on the importance of the survey for planning purposes and the confidentiality of the data collected. The efficiency of the campaign was indicated by the fact that very few cases of refusals were recorded.

#### 1.5 The Limitations of the Survey

It is important to point out some of the shortcomings and defects of the survey, the knowledge of which is most relevant in evaluating the accuracy of the results obtained and in assessing their limitations. Perhaps, the most serious limitation arise from the selection of the sample. Although the sample had been selected according to laws of probability, it seemed doubtful that the sample was completely representative of the household population in the two Towns. The defection of the sample can be attributed to the following:

- a) The 1964 Population Census records were not adequate enough as a sample frame due to the noticeable population changes that took place from 1964 to 1968.
- b) The frame used for selecting the supplementary sample was defective and consequently it seemed doubtful that the supplementary sample represented accurately the households occupying dwellings built after 1964. Furthermore, owing to the difficulty of estimating the number of this type of households, it would be difficult to assess the working sampling fraction of the supplementary sample.
- c) A considerable difficulty was witnessed in locating a large number of dwellings selected in the sample and consequently these had to be replaced by other units. Although some rigid rules had been laid for the selection of replacements, the possibility of some bias in the selection could not be excluded. This may be due to the tendency on the part of interviewers to select the most accessible elements.



- d) The sample was originally selected with 2 % sampling fraction but because of the failure to reach all the units selected, the working sample fraction (W.S.F.) was less than 2 %. Using the civil registration records of the Municipalities, the Libyan households could be estimated at 51,000 households in Tripoli and 30,000 in Benghazi. This means that the (W.S.F.) was about 1.5 % and 1.8 % respectively and not 2 % as had been originally planned.

However, it is worth noting that the above limitations should not seriously hamper the use of the results obtained for analytical purposes particularly for the estimation of Population averages and ratios. On the other hand, it would be doubtful to use the sample values to estimate any population aggregates due to the lack of reliable estimate of the working sample fraction.

1.6 In addition to the above limitations connected with the efficiency of the sample, there is another limitation which is common to most household surveys. It is known that the results obtained from such surveys are usually liable to some bias due to the failure of some households to give accurate information either consciously or unconsciously as in the case of income data. Such sources of bias will be referred to when commenting on the results obtained.

## II. The Estimation of Fertility and Mortality Rates

2.1 Before deriving any estimates of the fertility and mortality rates from the information obtained from the sample, it was conceived necessary to examine first the rate of population growth in the urban areas based on the Population Census data. There are shown in the table below:

Table (1) - The Estimation of Population Growth Rate in Urban Areas

C i t y	Population (Libyan)		Estimated Rates of Population growth	
	1954 Census	1964 Census	Average Annual Rate	Constant Rate
Tripoli	99,925	182,672	8.3 %	6.2 %
Benghazi	67,188	130,618	9.4 %	7.1 %
Total	167,113	146,177	8.8 %	6.6 %







From the above computation, it can be seen that the rate of natural increase can be tentatively estimated at 2.7 % in Tripoli and 3.7 % in Benghazi and the weighted average of the total urban area is about 3.1 which is a reasonable estimate for the area.

#### Evaluation of fertility and mortality rates

2.4 Information on the frequency of birth and death incidents were sought for the estimation of current crude birth and death rates and assessing the deficiency in the conventional civil registration records. These informations on birth and deaths in the sample were obtained by asking female members of the household about the number of children born to each woman during the last twelve months, <sup>and</sup> during her entire lifetime and also by asking the householders about the number of deaths among members of the household during the last twelve months.

#### The Deficiency in birth registration

2.5 The following figures give the computed birth rates obtained from the sample as compared with those based on the civil registration records in 1968 (i.e. the year which almostly correspond to the survey reference year).

	<u>Tripoli</u>	<u>Benghazi</u>
1. Crude Birth Rate from the Sample	49.6 %	57.9 %
2. " " " " Registration Records (1968)	39.4 %	31.6 %
3. Deficiency Ratio $\frac{1-2}{2} \times 100$	20.6 %	45.5 %

So, assuming that the rates obtained from the sample are of the correct order of magnitude for Libya, the above figures indicate the degree of deficiency in the civil registration system. Obviously the deficiency is expected to be much higher in rural areas.

2.6 The normal test of significance was applied to test the regional differences in fertility as estimated from the sample. The differences between the crude birth rates in Tripoli (49.6) and Benghazi (57.9) was not significant (the standard error of the difference  $\sigma_d = 4.8$ ). It can then be assumed that the Tripoli and Benghazi samples were drawn from the same population as to fertility level. The pooled data in the two cities gives an overall estimate of the crude birth rate at 53.2 (with standard  $\sigma_p = 2.5$ ).



2.7 Examining the applicability of the above estimates, it appears that it is exceptionally high if compared with the birth rates observed in other countries. Apart from the effect of sampling errors, the high crude rate may be due to some exaggeration in reporting the number of births during the reference year. However, the high fertility can be accepted if it is considered in the light of the exceptional economic developments witnessed in Libya in the last ten years. The most important of these is the phenomenal and continuous increase in per capita income which brought about a state of affluence. Meanwhile, the community is still retaining its conservative traditions and its negative attitude towards birth control. Such factors should induce more marriages and subsequently an increase in birth rates. This can be indicated by the fact that the crude birth rates for all Libya (based on civil registration records) has increased from 25. in 1964 to 38. in 1968. Although this increase is partly due to improvement in registration, a considerable part of it could be due to actual rise in fertility rates.

Another estimate of the crude birth rate in urban areas

2.8 In order to examine the applicability of the above estimate, another attempt was made by utilizing the information collected in the Household Survey on the number of birth to each female in the sample (15 and over) during her life-time. Assuming a hypothetical cohort of females passing through the age 15-50, the number of birth for a specific age group were estimated by simply subtracting the total number of births during life-time in the preceeding age group. The figures and calculations are shown in the following table for the pooled data in Tripoli and Benghazi :

Table (3) - The Estimation of Crude Birth Rate from Sample Data on Life-time fertility in urban areas in Libya

(1) Age group	(2) Number of Females in the Sample	(3) Number of births during life-time $Y_t$	(4) Number of births by age group of females	(5) Av. Number of births in specific age group per year
15 -	331	99	99	20
20 -	287	600	501	100
25 -	224	996	396	79
30 -	222	1,261	265	53
35 -	201	1,414	153	31
40 & 50	275	1,777	363	36
<u>Total</u>	1,540		1,777	319

(3)  $Y_t$  = Life-time births of females in age group t.

(4)  $y_t = Y_t - Y_{t-1}$



The crude birth rate in Tripoli and Benghazi can be then obtained by dividing total number of birth in one year (Column 5) by the total number of persons in the sample.

The crude birth rate in urban areas =  $\frac{319}{7,850} \times 1,000 = 40.8$

2.9 Two estimates of the crude birth are now obtained from the sample: the first based on current fertility during the reference year (53.2) and the second based on life-time fertility (40.8). The difference between the two estimates is considerably large.

According to previous experience, it seems that the first method tends to overestimate the crude birth rate due to overreporting of births as householders may tend inadvertently to report some birth events which happened before the reference year. The second method, on the other hand, seems to underestimate the crude birth rate due to the underreporting of birth as a result of normal lapses of memory.<sup>1/</sup> Therefore, a mid value of the above two estimates seems to be a reasonable estimate of the crude birth rate in urban population of Libya, i.e. 47.0. It is striking to note that this estimate <sup>2/</sup> agrees closely with another estimate obtained for the year 1965 based on the Reverse Survival Method.

#### The Computation of Gross and Net Reproduction Rates from Sample Data on Life-time Fertility

2.10 The figures contained in Table (3) Column (4) were utilized to estimate the gross reproduction rate (G.R.R.) and the net reproduction rate (N.R.R.).

<sup>1/</sup> The experience gained in the Indian National Sample Survey showed that the number of births reported failed off systematically as the events recede in time:

Das Gupta Ajit "Determination of Fertility Levels at trends in Defective Registration Areas" Bulletin de L'Institut International de Statistique 1957

<sup>2/</sup> In a previous attempt the crude birth rate for all Libya was estimated at 46.9 in 1965 by applying the Reverse Survival Method.  
S. Zaghloul "Demographic Parameters in Libya" - The Demographic Centre 1971.



Table (4) - The Computation of the Gross and Net Reproduction Rates for Urban Population, Libya

(1)	(2)	(3)	(4)	(5)
	Specific Fertility Rates	Specific Fertility Rates (Females) <sup>1/</sup>	Survival Function $\frac{L_x}{x}$	Net Specific Fertility Rates (3) x (4)
15 -	299.09	146.55	7,672	112.4
20 -	1,745.64	855.36	7,539	644.8
25 -	1,622.95	795.25	7,370	586.1
30 -	1,193.69	584.91	7,188	420.4
35 -	761.19	372.98	6,999	261.0
40 & 50	1,320.00	646.80	6,797	439.6
		3,401.85		2,464.3

As can be seen from the above table, Column (3), the Gross Reproduction Rate = 3.4.

It is interesting to note that in a previous attempt <sup>2/</sup> the G.R.R. in Libya in 1965 was estimated at 3.32, a result which agrees closely with that obtained in the present study.

In deriving the N.R.R. the survival function  $\frac{L_x}{x}$  of (the Southern Region level 13.5) was applied and the N.R.R. is estimated at 2.46 which seems to be a reasonable estimate for the area.

From the above analysis, it can be seen that the sampling surveys, if adequately designed and controlled, can provide reasonably accurate information for estimating fertility measures in defective registration areas.

#### Variations in Fertility by Income Groups

2.11 The crude birth rates were calculated for broad income groups in Tripoli and Benghazi samples as shown in the table (4).

<sup>1/</sup> The specific fertility rates of females was estimated on the assumption that the sex ratio of births was 105.

<sup>2/</sup> S. Zaghloul "Demographic Parameters in Libya" - The Demographic Centre, Cairo, 1971.



Table (4) - The Crude Birth Rates for Different Income Groups in Urban Population, Libya

Monthly Income of Household L.L. Area	Less than 50	50 -	100 and over	Total sample
Tripoli	62.8	42.8	29.6	49.6
Benghazi	60.8	66.4	51.0	57.9
<u>Total</u>	62.1	60.9	42.2	53.2

As expected, the fertility tends to be lower for higher income groups and the relationship seems to be more clearly indicated in Tripoli than in Benghazi. Accordingly, one should expect a higher rate of fertility for all Libya than that for urban areas on account that the per capita income in the rural areas is lower than in urban areas.

#### The Deficiency in Death Registration

2.12 The crude death rates were computed from the information collected from the sample on death incidents in the households during the reference year. The computed rates are shown below along with those based on civil registration records:

	<u>Tripoli</u>	<u>Benghazi</u>
1. Crude Death Rate from the sample	12.2 %	14.0 %
2. " " " " Reg. Records (1968)	4.6	7.3
3. Deficiency ratio $\frac{1-2}{2} \times 100$	62	48

The above comparison shows that the deficiency in death registration records is considerably far more serious than the deficiency in birth registration.

#### A pooled estimate of Crude Death Rate for urban areas

2.13 The difference between the mortality rates in Tripoli and Benghazi did not show to be significantly different (the standard error of the difference  $\sigma_d = 0.8$ ). This could permit the estimation of an overall crude death rate from the data obtained in Tripoli and Benghazi pooled together. This gave an estimate of crude death rate at 13.1 (the standard error  $\sigma_p = 1.27$ ).



Comparing the estimated crude birth rate with those prevailing in the neighbouring countries, which are socially more developed,<sup>1/</sup> it seems that the above estimate is lower than should be expected. This may be partly due to errors resulting from underreporting of death incidents in the reference year of the survey and partly due to sampling errors.<sup>2/</sup>

The Crude death rate as the difference between the crude birth rate and the natural rate of increase

2.14 On the assumption that the estimate of crude birth rate is reasonably acceptable, another estimate of the crude death rate can be arrived at by utilizing the estimate of natural rate of increase which was obtained in item ( ) of this study, i.e.

$$\begin{aligned}\text{The crude death rate} &= (\text{The crude birth rate}) - (\text{The rate of natural increase}) \\ &= 47.0 - 31.0 = 16.0\end{aligned}$$

Evaluating the above estimate, it can be noted that in a previous attempt<sup>3/</sup> the crude death rate in all Libya was estimated at 18.1 in 1965. Taking into account the better living conditions in urban areas and the improvement in medical services since 1965, the above estimate of 16.0 can be conceived as a reasonable estimate of the crude death rate in urban areas in Libya.

III Analysis of Data on the Economically Active Persons in the Sample

3.1 The economically active population, or, the total number of persons in the labour force, is defined as those persons who are engaged in productive or remunerative work for pay or profit, whether employed or unemployed during the survey's reference period.

The past experience in the field of labour force surveys, has always shown that there are some difficulties in estimating, with precision, the size of the labour force because of the ambiguity involved in identifying some classes of the population. On one hand, some persons particularly those reporting as own account workers or unpaid family workers, might be classified as economically active while they are not actually engaged in any work connected with the production of goods and services. On the other hand, it is also likely that some persons reporting that they are not seeking work may be classified accordingly as economically inactive while they are actually wanting

<sup>1/</sup> Crude death rates prevailing at present in some Arab countries are of the following order: Algeria = 19.0, UAR = 18.1, Tunisia = 17.8, Sudan = 21.0. UN and UAR Cairo Demographic Centre "Demographic Measures for Arab countries of North Africa and South West Asia", April 1969.

<sup>2/</sup> When p is small, a larger sample is needed for precise estimate of the number possessing any attribute.

<sup>3/</sup> S. Zaghloul "Demographic Parameters of Libya" - The Demographic Centre, Cairo, 1971.



work though not seeking it for temporary reasons. Therefore, such persons should be considered as unemployed i.e. economically active, persons not at work.

#### Assessment of errors in measuring labour force

3.2 To eliminate such misclassifications, the questionnaire had to be carefully drafted so as to make possible a precise measurement of the labour force. Therefore, the household questionnaire included some questions on individual characteristics such as occupation, income from and hours of work to ensure that no person who was out of the labour force was misclassified as economically active. In addition, another individual form was utilized to collect detailed information on those persons who reported in the household that they were either unemployed or economically inactive. The informations were sought, not only to examine the causes, of unemployment, but more importantly to correct any misclassification of those persons reported as economically inactive.

By applying this technique, it was possible to reclassify some members of the households as unemployed while they had been originally reported as inactive. These cases represented mainly persons who were wanting work but not seeking it for temporary reasons. The reclassified cases represented about 26 % of the total unemployed. This can indicate the amount of bias which may occur in measuring the volume of unemployment or the size of labour force.

#### The change in the relative size of labour force

3.3 The following figures show the crude activity rates by sex based on the 1954 and 1964 population census in Libya as compared with the rates obtained from the sample in 1969.

Table (5) - The Crude Activity rates in Libya and the average rate in Africa

	1954 (Population Census)	1964 (Population Census)	1969 (Sample Survey)	Average in <sup>1/</sup> Africa
Males	51.0 %	47.0 %	38.1 %	56.8 %
Females	7.0 %	3.1 %	2.6 %	14.5 %
<u>Total</u>	29.2 %	25.7 %	20.9 %	35.8 %

It can be seen that the activity rates in Libya based on data from successive censuses and surveys were far below the average activity rate for African countries.

<sup>1/</sup> Demographic Aspects of Manpower; Sex and Age Patterns of Participation in Economic Activities Population Commission, United Nations.