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Some Demographic Measures of Libyan Population in Benghazi, Libya

Introduction

THIS study is based on four sets of data collected between Feb. 1969 and Dec. 1970 by the Economics and Business Research Division of the Faculty of Economics and Commerce, University of Benghazi, Libya. Senior students from the department of economics, research fellows and some members of the faculty helped in the drawing up of the questionnaires, construction of sampling frame and actual collection of the data. Analysis of the data was mainly done by the author.

The first set of data was collected between 1st and 15th February 1969. This covered 860 households selected randomly from 18,876 households in Benghazi City. The survey was socio-economic in nature where information on family structure, pattern of expenditure and income was of main interest. Some demographic information was also collected. This second set of data was taken from the Gynaecology Department of Gomuriah Mustaspha, Benghazi. Gomunah Mustaspha (Republic Hospital) is the biggest general hospital in the city as well as in the whole of eastern part of Libya. Pregnancy histories of all women coming for child birth between October 1969 to September 1970 were collected from individual patient cards from the records of the Hospital. The third set was collected from Mustaspha El Athwal, (Hospital for Children) Benghazi. This hospital specializes in the treatment of children's diseases and is one of

the best in the eastern region of the country. All admissions and infant deaths between March 1970 and October 1970 were compiled from the records of this hospital : earlier data were not available as the hospital had started proper record keeping from March 1970 onwards. The fourth set of data on birth and deaths was compiled from the General Statistics Section of Municipality of Benghazi, for the period of Oct. 1969 to Sept. 1970. The present study also uses the 1964 Census of Libya.

The data on fertility appear to be more accurate and much more detailed, while the data on mortality were sketchy and unreliable. For a country like Libya we could have collected parallel data from graveyard records; now, of course, it is too late and we have to be remain contented with detailed analysis of fertility only.

For studying fertility we need information on (i) female population, (ii) proportion of females in the reproductive ages, (iii) age at marriage and proportion married in the population, and (iv) record of births in the period under consideration. In Libya, family planning is not encouraged by the Government and it is probably in order to assume that the population exhibits natural fertility.

2. Fertility

Estimated citizen population of Benghazi, based on the survey conducted by Mukerji and Kataifi, on 1st April 1970 was 218,910. Assuming a sex composition of 90 females per 100 males the estimated number of females was 103,694, among them about 43,391 were in the age group 15-44 years. Table below shows the citizen female population in some of the age groups for whole of Libya and Benghazi Muhaphasa.

<i>Age Group</i>	<i>Female citizen 1964 Census</i>	<i>Female citizen Benghazi Muhaphasa 1964 Census</i>	<i>Female citizen in Benghazi on 1st April 1970</i>
15-19	58104	12648	10208
20-24	56994	10677	8617
25-29	61472	10435	8422
30-34	46244	7618	6149
35-39	38612	6733	5434
40-44	32148	5651	4561
15-44	293574	53762	43391
All ages	726844	128476	103694

The allocations in column 4 of the above table are based directly on the proportions in column 3. This may not give accurate picture as the data are not adjusted for age misreporting and it is also assumed that the structure of female population had not changed between the census date 1964 and 1st April 1970. From the high birth rate and vast improvement in health care after 1964, one may expect a change in the age structure; such changes are reflected more in the early ages and may not be pronounced in the 15-44 age-group. Perhaps a more important factor is that Benghazi Muhaphasa includes rural areas of Tocra, Elabir, Soluch, Gemminis, El Magroon etc. and age structure in these rural areas may not be the same as in Benghazi City. From column 2 of the above table proportion of females in 15-44 turned out to be .4039, from column 3 the same proportion was .4185. The difference .0146 between the two proportions may be explained by the fact that education and job facilities in Benghazi City attracts younger females. Perhaps the difference should be more as in the eastern part of Libya; Benghazi alone offers facilities for University and other technical education suitable for college age girls.

Proportion Married and Age at Marriage. In Libya, child birth out of wedlock is almost non-existent. Table 1* is based on the 1964 Census [2] tables on civil status of the population. The data refer to citizen females; for the age group 15-19 it has been assumed that all women, not included in "ever married" or "status not stated" groups were single.

The column M_x shows the proportion married in the respective age groups. In the reproductive ages 15-44, on the average about 83 percent were currently married. Using Hajnal's [3] method the mean age at marriage turned out to be:

$$\text{Mean age at marriage} = \frac{15 + \sum_{x=15}^{40} 5({}_5S_x) - 45({}_5S_{45})}{1 - S_{45}}$$

where
$$S_{45} = \frac{{}_5S_{40} + {}_5S_{45}}{2} = 18.04.$$

For Benghazi City mean age at marriage was also calculated from the survey data. In this regard, out of 860 selected households information was available for 815 households; among them 798 were Libyan nationals. In these 798 house-

*All tables are placed at the end of the article.

holds, 860 males were reported married on the date of survey. Age at marriage was not reported in every case; for 518 couples, age at marriage was available for both husband and wife. Table 2 presents some of the estimates from this data. For this table the data were first tabulated by single year age of wife marrying husbands of different ages; then frequencies were computed for 5 year age groups 15-19, 20-24, . . . etc. The Table 2 shows that as age at marriage of wife increases the difference between the ages of husband and wife decreases. There were cases in which the wives were in teens and husbands were in forties at the time of marriage. Usually such marriages are not the first marriage for the husband. In Islam, more than one marriage is allowed but contrary to general belief the survey data showed only 3 percent of married men having more than one living wife. In majority of cases husbands were, at the time of marriage, older than their partners; only in 19 cases, wives were older than their husbands. As many as 12 out of 45 men marrying before age 19 took wives older than themselves. The overall mean age at marriage for women turned out to be 18.6 years, which is slightly higher than the above estimate for whole of Libya. The survey data reflects the effect of mortality as ages for only the married women who survived to the date of survey are included. Of course, early death in married state does not imply early marriage unless early marriage led to child birth in immature age resulting in the death of the mother. General health conditions in Libya are fairly good and so the higher survey mean age at marriage is more likely due to the effect of urbanization.

Fertility Data. Table 3 shows the distribution of live births by sex, fetal waste, order of pregnancy etc. from the Gomuriah Hospital records. In compiling this table, for multiple births the mother has been counted only once, without changing her order of pregnancy, but all the children born have been counted. So the total of live births and fetal wastes in given age group may be more than the corresponding number of women. Table 3(a) shows the number of births registered in Benghazi Municipality in the period Oct. 1969 to 1970. Comparing the two tables it is seen that in the 12 month period, 6404 or 69.3 percent of the 9235 registered births had occurred in Gomuriah hospital. This indicates the importance of this particular hospital as far as maternity cases are concerned. Knowledgeable opinion is that in treatment of other diseases also this hospital plays an important role in the country. Both the Tables 3 and 3(a) show the sex ratio at birth of about 104 males to 100 females. This is interesting as (he hospital record has no omission or recording error?; if the registered number of births show same sex ratio the confidence in the registration in-

creases. Like other countries registration of birth and death is compulsory in Libya, requiring that the registration must be done within seven days of the event. The reason for proper registration of birth lies elsewhere, according to the present rules, the parents of citizen babies are entitled to some fixed monthly grant for each baby from the government and further a number of other facilities do not become available if the baby is not registered.

While on sex ratio let us discuss another feature of Libyan population. The 1964 census showed for whole of Libya a population sex ratio of about 109 males per 100 females as compared to the above noted 1969-70 sex ratio at birth of 104. There is no reason to believe that sex ratio at birth prior to 1969 was very much different from 104. Then why is the population sex ratio so much higher?

Dutta and Sharif [4] tried to explain this imbalance on the hypothesis that Libyan women give birth to more male babies. Srivastava [5] criticized the conclusion as one based on insufficient evidence and suggested that the imbalance is due to higher female mortality particularly in early ages. From registration data crude male and female death rates were found to be 12 and 10 per thousand; further, in almost every age group, the number of male deaths per 100 female deaths were significantly higher. Thus, if the registration is reasonably correct the initial excess of males at birth should be wiped out, or at least not be reinforced in the direction of excess males. This can happen only if the general death rate is so low that comparative excess male deaths does not make any significant dent in the total number of males in the population. Crude death rate in Libya is not very high but near the rates enjoyed by the Scandinavian countries in Europe. Again from the El Athwal hospital records, which have no omission or recording errors, we found the death rate among male and female admitted patients as 154 and 136 per thousand in age group 0-1, the same rates were 62 and 49 per thousand for ages 1-4 and 38 and 19 for age group 5-14. Thus for the ages 0-14 the death rates for male patients were higher than those for female patients. Libyan citizens take full advantage of the generous medical facilities provided by the government. There is no reason to believe that more male sick children were brought to the Athwal hospital by the parents due to their preference for male children. Also there is no reason to believe that in the period prior to March 1970 the pattern was radically different. Thus, both the registration and hospital records show that female deaths are relatively smaller than male deaths

and general population sex ratio of 109 cannot be explained by mortality differentials alone.

From the survey study, it was, however, found that for 103 married sons only 33 daughter-in-laws were reported as members of the families; thus, about 68 percent were not reported. As adult married son, brother and other male relative are more likely to be found in joint families and joint families formed 27 percent of all families in the sample, the proportion of under-reporting would be $.68 \times .27$ or about 18 percent. Further, the same study found that 5.6 percent of married daughters were reported as members of the families. Thus, a rough measure of under-reporting among married females would be 12 percent. 1964 Census report showed 264349 married citizen females in ages 15 to 50. Adjusted for under-reporting this number should be 300396 or an additional 36047 women. So the total females should be $726884 - 36047 = 762931$, total males were 788657, giving an adjusted sex ratio of 103 males per 100 females in the population. This figure agrees with lower female mortality discussed earlier. However, the method of adjustment is not foolproof, we have ignored omissions among males and among females outside the group married in 15-50, also the adjustment factor is based on a small sample from an urban area of the country. The main purpose is to point out a possible explanation, even if based on a small sample survey, for the high sex ratio in Libyan population.

Returning to Table 3 we find that for all mothers mean age at pregnancy was 27 years; modal order of pregnancy, one and median order of pregnancy, was IV. Table 4 summarises some of the data from Table 3. It shows that about 89 percent of the pregnancies resulted in live births, the remaining 11 percent ending in either still births or abortions. As age increases proportion of fetal waste increases considerably, rising to about 31 percent in age group 45-49 from around 10 percent in ages 15-29. Incidence of multiple births was around 1 percent of live births. Fifty percent of the women had pregnancies of order IV or less and first order pregnancy was the most common.

Birth Rate and Proportion of Women Giving Birth in a Year. Estimated population of Benghazi in April 1970 was 218910, registered number of live births in the period was 9235 giving a crude birth rate of 42 per thousand population. For the country as a whole birth rate will be higher as Benghazi has relatively unfavourable sex ratio, approximately 111 males to 100 females compared to 109 for whole of Libya. Also the proportion of married females is lower than

that of the country as a whole and mean age at marriage in the city is higher. AH these factors tend to bring down the birth rate of the city. For the period under consideration estimated number of females in the ages 15-50 was 50810 out of which 41147 were married, About 22 percent of the married women in this age group had a live birth in the 12 month period. The registration data showed 245 fetal wastes when live births totalled 9235; on the other hand hospital records show 803 fetal wastes for 6404 live births. There is obviously significant under-registration of fetal deaths. Using this correction factor the estimated number of mothers will be :

$$(1 + .1254) \times (7125/7207) \times 9235 = 10275.$$

The first factor on the left hand side adjusts for under-registration of fetal wastes and the second factor adjusts for multiple births. Thus in a year (10275/41147) or about 25 percent of married women in the reproductive ages completed a pregnancy ending either in a live birth or a fetal waste.

Fetal Waste. Nature of birth was recorded by the attending doctor. Fetal wastes were classified as still birth and abortion using the WHO specifications. In the case of still birth, sex of the fetus was also recorded. Table 5 shows the 803 fetal wastes classified by order of pregnancy, age of mother and sex of the fetus. Out of 803 fetal wastes 116 were due to still birth and 687, due to abortion. This gives a ratio of 17 still births for 100 abortions. By age or order of pregnancy, the ratio still birth/abortion (S/A) does not show any marked pattern except for the fact that after age 44 and for higher order pregnancies it goes up sharply; however, the numbers are too small for drawing any valid conclusion. For the 116 still births, sex ratio was found to be about 123 males to 100 females. It is interesting to note that in 15-19 and for pregnancies upto order III, this ratio is favourable to male fetus; this reversal from the overall pattern may have an explanation which only a gynaecologist can supply.

Last column of Table 5 shows the ratio fetal waste/live birth (FW/LB) by age of mother. For calculating this ratio we have used the number of live births from column 5 of Table 4. Thus the ratio (FW/LB) in 15-19 = 98/949 - .180722 etc. It can be seen that upto age 29 the ratio does not differ much from around 10 percent but after that age it increases sharply, In ages 40-44 and 45-49 there were respectively 26 and 44 abortions and still births per 100 live births. This may be due to the use of inefficient methods of pregnancy ter-

mination by the mothers or it may be a biological characteristic of Libyan females. In either case it merits a closer inspection by the health authorities,

Overall mean and median ages and also order of pregnancy are summarised in the table below:

	<i>Live Birth</i>		<i>Fetal Waste</i>		<i>All pregnancies</i>	
	<i>89 percent of pregnancies</i>		<i>11 percent of pregnancies</i>			
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Age	23.3 years	25.2 years	28.1 years	26.8 years	26.5 years	25.3 years
Order	V	IV	VI	V	V	IV

It can be seen from the above table that relatively older women suffered more fetal wastage.

Multiple Births. Out of 7125 mothers, 80 gave multiple births, 78 were twins and 2 were triplets. The proportion of mothers experiencing multiple births is .0112 or about 1 percent, this agrees with general experience. Table 6 shows the distribution of multiple births by age and order of pregnancy of the mothers, it also shows the sex combination of the babies born. From this table it can be seen that by and large incidence of multiple births is relatively more in higher order pregnancies. In all 162 children were born in multiple births out of which 76 were males and 86 were females, showing a sex ratio of 88 males per 100 females. It may be recalled that for all births the sex ratio was 104. If multiple births are removed the sex ratio will be slightly higher than 104.

Number of Children Surviving and not Surviving upto the Present Pregnancy. For all 7125 mothers the hospital records supplied information on the number of earlier pregnancies and number of children surviving to the present order of pregnancy. From these data Tables 7 and 8 were compiled. From Table 7 we find that the mean number of surviving children was 4. Thus we expect an average family size of six in the city. The survey study showed an average size of 6.56 persons. The sources are independent and there is a time lag of about one year between the two.

A number of authors have used the average family size of 5 for their studies. There is enough evidence to show that for short term projection this average should be raised to 6.6 or 7 and for long term projection the figure should be higher than 7 as fertility in Benghazi and whole of Libya is not decreasing.

From Table 8, we find that by the time women crossed their reproduction age they lost on the average about 3 children either due to pregnancy wastage or due to death among live born children. More than half of the women suffered no losses due to either fetal waste or deaths among their earlier births but as many as 427 out of 7125 mothers, or about 6 percent, suffered 4 or more such losses. Entries in Table 8 have the effect of recall lapse; actual losses were likely to be more than what has been reported by the mothers, this can be roughly illustrated by the following calculations. From Table 8 the mean age of mothers who have lost at least one child either due to fetal waste or deaths among live born children will be

$$\frac{[(1040-840-4)17 + (1998-1343-18)22 + \dots + (7-1-0)50]}{7125 - 3805 - 85} = \frac{93623}{3235} = 28.9 \text{ years.}$$

Mean age at marriage was found to be 18.6 years, so the $(1598 \times 1 + 774 \times 2 + \dots + 10 \times 3) = 6591$ losses were suffered in $(28.9 - 18.6) = 10$ years approximately. In the year under consideration 803 fetal wastes were there; so in the remaining 9 years the losses suffered were $6591 - 803 = 5788$, provided the mothers reported all losses in the preceding years correctly. This gives an annual average loss of $5788/9 = 643$, which includes pregnancy wastage and deaths among live born children. In the period under consideration, Oct. 1969 to Sept. 1970, the estimated number of mothers was 10275. If the annual average loss pattern for the 7125 mothers holds for the city as a whole then in the year under consideration total deaths among children upto age 10 including fetal waste will be $643 (10275/7125) = 927$. Now registration record for the year shows (fetal waste : 245) + (infant deaths : 1225) + (deaths among children aged 1 to 4 years : 333) + (deaths among children 5-14 : 78) = 1881. This figure itself is an underestimate; so the average loss 927 estimated on the basis of data supplied by the mothers is too low and it leads one to conclude that the data on losses have substantial error due to recall lapse.

Birth Interval. Closed birth interval is the time difference between successive orders of birth; open birth interval is the time difference between the last birth and date of observation. Usually both intervals refer to cohort type of data, for cross-section data, as in this case, if we assume that the women are homogeneous with respect to fertility performance, the only difference will be due to variations in the date of marriage. In Table 9, some birth intervals are presented, all intervals are based on at least 30 mothers. Columns 2, 3 and 4

show mean age at a particular order of birth, variance of age and birth intervals. The first interval is the difference between mean age at marriage and first order birth, while other intervals are obtained by successive subtraction. Columns 2, 3 and 4 refer to all mothers who have not lost any pregnancy due to fetal waste or deaths among earlier live births. It can be seen that between 2nd and 6th order births, the intervals show a declining trend, after 6th order there is no pattern, apparently errors in age reporting have a lot of effect on these intervals. For high fertility women we expect a reduction in the closed birth intervals for higher order births; this is because in order to reach a given high order of pregnancy, she has to conceive soon after the preceding pregnancy in order to avoid crossing the upper limit of reproductive age, this pattern is exhibited upto 6th order birth. For all orders in this category the mean birth interval is about one and a half years. Columns 5, 6 and 7 show the statistics for all women who lost at least one child. The women in this group may or may not have a surviving child. For a cohort, inter live birth interval should show an increase if there is an intervening fetal waste; on the other hand interval between successive conceptions should decrease as the period of infecundability associated with a fetal waste is smaller than *the* corresponding period in the case of a live birth. This pattern is not very clear from column 7 of Table 9. In six out of eleven intervals upto 11th order of pregnancy the intervals are smaller than those in column 4. Variance of the age in this group is larger than the variance when the women had no losses, which conforms to expectation. For all orders the mean birth interval is a little more than one and a half year. On the basis of these data, we may say that death among children or fetal waste (the latter being predominant) will increase the average birth interval between pregnancies by about 1.2 months.

Age Specific Rates. Finally we present age specific rates for the City of Benghazi for the mid-period, Oct. 1969 to Sept. 1970. For calculating these rates we used the age distribution of mothers from Table 3, births were inflated to match the registration data for the period. Number of women in each age group were based on the estimated female population from the survey data allocated according to 1964 census age distribution of Benghazi Muhaphasa. Table below shows the rates. ASFR denotes age specific fertility rate, ASMFR denotes the corresponding marital rates. TFR and GFR have their usual meaning. From this table we find that on the average a married woman will give birth to 7 children before she goes out of reproductive age.

<i>Age Group</i>	<i>ASFR</i>	<i>ASMFR</i>
15-19	151	326
20-24	295	343
25-29	268	288
30-34	206	220
35-39	157	170
40-44	43	49
45-49	9	13
50+	6	8
No. of women	50810	
No. of married women		41147
TFR	5.7	7.1
GFR	182	
Birth Rate	42	

These rates refer to Benghazi City in April 1970, for the country as a whole the rates will be higher. There is substantial increase in fertility in the recent years. Based on 1973 census the general consensus is that the crude birth rate is around 50.

3. Mortality

As has been mentioned earlier mortality statistics were collected from two sources. Table 10 shows the data from the Registration Department for the period Oct. 1969 to Sept. 1970. In this period registered number of live births were 9235, so the infant mortality rate will be $IMR = (1225/9235) 1000 = 133$ deaths per 1000 live births. This IMR is likely to be lower than its actual level because of under-registration of infant deaths. If we assume this rate to be correct, we can test some of the other registered deaths. The reported number of surviving children to the mothers is likely to have less omission errors. From Table 7 we find that 7085 mothers had in all 27830 children surviving upto Sept. 1970, taking mean age at marriage as 18.5 years instead of 18.6 years we have the total married years of exposure for the 7085 mothers equal to :

$$1038 \times 2.5 + 1990 \times 3.5 + 1907 \times 8.5 + 1146 \times 13.5 + 753 \times 18.5 \\ + 182 \times 23.5 + 35 \times 28.5 + 7 \times 33.5 = 60680 \text{ years.}$$

and average number of married years per mother will be $(60680/7085) = 8.56$ or approximately 9 years. Now from Table 9 average birth interval was about 1.5 years; hence in 9 years of exposure the women would have approximately 7 live births. From Table 3 we find that 7125 mothers gave 6322 live births in a year. If this pattern held in the earlier 9 years, the number of live births would be $7085 \times 7 (6322/7125) = 44006$. Now if I.M.R. is equal to 133 per 1000 live births held in the earlier 9 years, then out of 44006 live births $44006 \times .133 = 5853$ children will die before reaching age one. If there were no further deaths then the number of children between ages 1 and 8 in Sept. 1970 would be $44006 - 5853 = 38153$ but the reported number was 27830; so $38153 - 27830 = 10323$ died between ages 1 and 8 and the annual average number of deaths among 1 to 8 year olds would be about $10323/7 = 1475$. From Table 10, the registered deaths among children aged 1 and 14 years was only $333 \div 78 = 411$. Thus more than 72 percent of deaths were not registered. Above calculations assume no change in I.M.R. and in fertility pattern in the decade prior to Sept. 1970 but it does roughly indicate a substantial under-registration of deaths. From Table 10 we find sex ratio among deaths always favourable for females. It may be partially due to lower mortality among females but it is more likely due to relatively lower registration of females deaths. There appears to be no reason why in 30-44 years of age there were 229 male deaths for 100 female deaths and the same drop down to 131 in the age group 60+. Crude death rate was found to be 11 per 1000 population in the period, which again is an underestimate. Calculations show that in the period under consideration the crude death rate was around 20 per thousand.

Mortality Data from El Athnal Hospital Records. Table 11 presents admission and deaths over the 8 month period from March 1970 to Oct. 1970. In this period 2538 patients were admitted in the hospital. Sex of the patient was reported in 2534 cases and all further calculations are based on these 2534 cases. Age was not reported in 53 cases of which 24 were male and 29 were female. Except for March 1970, monthly admissions were between 300 and 400 patients, mean admission per month was 317 with a variance of about 34. If we assume that the eight month data formed a random sample from the population of hospital admissions, 99 percent confidence interval for mean number admitted per month will be :

$$215 < \text{population mean admissions} < 419.$$

As far as load of work is concerned one should keep in mind that this hospital

like other hospitals has an out-patient department. Number of patients served per month by the out-patient department is much bigger than the figures given above. From Table 11 the morbidity rate in age 0-1 was found to be $100(3/2 \times 1247 - T - 9235) = 203$. This is an under-estimate as only one hospital in the city has been considered. All that we can say is that more than one quarter of the new born babies contract diseases serious enough to require hospitalization in the first year of life. Morbidity rate among children aged 1 to 14 years was found to be about 23 per 1000, this figure too is an underestimate. Table 11 also shows the death rate among admitted patients, showing that deaths among male patients were more frequent. Overall figures show that nearly 15 percent of patients in age 0—1 and 5 percent of patients in ages 1 to 14 died, this gives an overall death rate of about 10 percent of admitted cases.

Interval Between Admission and Death. Some of the senior doctors in the El Athwal hospital gave us the impression that a number of patients could have survived if the parents brought the children to the hospital early enough. In particular" they wanted us to examine if deaths within 24 hours of admission were more than those dying after at least 24 hours of treatment in the hospital. With this in view we collected the data presented below.

INTERVAL BETWEEN ADMISSION AND DEATH

	<i>Deaths between 1 and 6 hours after admission</i>	<i>Deaths between 6 and 24 hours after admission</i>	<i>Deaths after 24 hours from admission</i>	<i>Total deaths</i>
	1	4	7	12
	8	8	21	37
	12	13	18	43
	6	5	3	14
	9	5	17	31
	12	7	8	27
	5	11	20	36
	8	4	9	21
Total	61	57	103	221
Proportion	.276	.258	.466	1.000

From this table we see that the proportion dying within 1 to 6 and 6 to 12 hours from admission does not differ much, and the proportion dying within 24 hours from admission is .534 compared to .466 who died after 24 hours from admission. Even though the former proportion is little more than .5 it is not statistically significant as

$$t = \frac{p - .5}{\left(\frac{.5 \times .5}{n}\right)^{1/2}} = \frac{(.534 - .5) \sqrt{221}}{.5} = 1.011.$$

From normal distribution table it can be seen that the probability of exceeding this value of t due to random fluctuations alone is around 16 percent. Thus on the basis of these data we cannot say that more patients died within 24 hours from admission. The negative conclusion does not mean that the doctors were wrong in their conjecture. We have analysed data only for a small period of time; longer period of observation can easily reverse the conclusion. The fact that proportion dying within 24 hours from admission is more than .5 is itself important.

4. Some General Observations

More than 90 percent of the Gross National Income of Libya is derived from petroleum. In recent years income from the other important source of agriculture has been declining. The government, particularly after Sept. 1969 revolution, has done remarkable work in improving agriculture and diversifying the industry. In housing the country has achieved fantastic progress, to-day almost every Libyan national has a decent house. Till recently most of the vegetables and dairy products were imported. The picture now is much better, even if the output per unit of investment is not high, a start has been made and future seems to be bright. Government has set up cement, steel, leather, cloth and other industries. Government of India and other friendly countries are fully cooperating with the Government of Libya. What the country lacks is not capital but trained manpower. Recently the Planning Commission asked the University of Benghazi to estimate the training requirements so that by 1985 a fair share of technical positions could be manned by Libyan nationals. We were given the occupation distribution in about 58 sectors as observed in 1973 census. We took the 64-73 growth rate in the employment sector to project upto 1985 without any change in the occupation matrix and with a drop out rate of about 10 percent per annum. Calculations showed that available citizen

manpower will not be able to cope up with the demand unless the government restrict itself to only a few sectors. In some sectors, at present, more than 50 percent of the workers are non-Libyan. What impressed us was that female labour was not being exploited properly. Even for such jobs as typist, stenographer, hospital nurse where normally females should be more, the males had a fairly high share. Education in Libya is developing fast, school education is compulsory, students in colleges and Universities receive generous help from the government; also every year selected students and other workers are sent abroad for higher training. With these in view, one feels that the attitude of the general public will change and more females will enter the labour force.

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TABLE 1—LIBYAN CITIZEN FEMALES

<i>Age group</i>	<i>Single</i>	<i>Married</i>	<i>Others*</i>	<i>nPa</i>	<i>nSa</i>	<i>nMā</i>
15—19	29010	27065	2029	58104	.49928	.46580
20—24	5058	49037	2899	56994	.08875	.86039
25—29	1698	57031	2743	61472	.02762	.92776
30—34	640	43269	2335	46244	.01384	.93567
35—39	327	35685	2600	38612	.00847	.92419
40—44	221	28186	3741	32148	.00687	.87676
45—49	163	18385	6549	25097	.00649	.73256

*Others include divorced, widowed and civil status not stated.

TABLE 2—518 CITIZEN COUPLES FROM BENGHAZI

<i>Age group</i>	<i>10-14</i>	<i>15-19</i>	<i>20-24</i>	<i>25-29</i>	<i>30-34</i>	<i>35-39</i>	<i>40-44</i>	<i>45-49</i>	<i>50-54</i>	<i>All ages</i>
No.	62	306	106	31	8	3	1	—	1	518
Mean age of wife	13.3	17.1	21.8	26.2	31.6	36.7	42	—	51	18.6
Mean age of husband	23.5	26.0	29.5	32.9	37.6	48.0	45	—	55	27.2
Median age of wife	14.1	17.6	22.1	26.2	31.0	36.0	42	—	51	18.2
Median age of husband	22.0	25.5	28.4	31.8	46.0	38.0	45	—	55	27.8
Mean difference in age	10.2	8.9	7.7	6.7	6.0	11.3	3	—	4	8.6

TABLE 3—BIRTHS IN GOMURIAH HOSPITAL, BENGHAZI, IN THE PERIOD OCTOBER 1969 TO SEPTEMBER 1970

Ages	Number of women	Nature of birth	Order of Pregnancy and Sex of the Baby											
			I		II		III		IV		V		VI	
			M	F	M	F	M	F	M	F	M	F	M	F
15-19	1040	L	251	272	138	135	48	52	23	20	5	2	—	1
		FW	50		25		7		6		1		1	
		T	573		298		107		49		8		2	
20-24	1998	L	155	132	195	204	219	203	178	155	97	84	66	46
		FW	27		40		39		22		21		15	
		T	314		439		461		355		202		127	
25-29	1916	L	21	26	65	56	91	121	136	153	178	158	165	151
		FW	3		12		22		25		24		16	
		T	50		133		234		315		360		332	
30+	2144	L	12	4	17	16	34	22	68	50	88	86	111	116
		FW	7		4		14		12		21		34	
		T	23		37		70		130		195		261	
All ages including age not reported	7152	L	442	435	416	413	394	398	405	382	368	331	342	314
		FW	88		81		82		68		68		66	
		T	965		910		874		855		767		722	
FW Ratio			.1003		.0977		.1035		.0864		.0973		.1006	

Table 3 (contd. on page 94)

Table 3 (contd. from page 93)

Ages	Number of women	Nature of birth	Order of Pregnancy and Sex of the Baby								All order including sex of baby not reported	
			VII		VIII		IX		X or more		M	F
			M	F	M	F	M	F	M	F		
15-19	1040	L FW T			1	1					466	483
					—						98	
					2						1047	
20-24	1998	L FW T	26	29	7	6	1	3	3	1	947	864
				11		8		1		1	202	
				66		21		5		5	2013	
25-29	1916	L FW T	122	112	56	58	30	34	12	20	879	891
				21		20		10		6	173	
				255		134		74		38	1943	
30 +	2144	L FW T	154	143	146	135	119	109	219	199	972	882
				38		41		40		80	323	
				335		322		268		498	2177	
All ages including age not reported	7152	L FW T	302	285	210	202	151	147	234	221	3217	3133
				71		70		52		87	803	
				658		482		350		542	7207	
FW Ratio				.1210		.1699		.1745		.1912	.1254	

TABLE 3(a)—BIRTHS REGISTERED IN BENGHAZI MUNICIPALITY BETWEEN
OCT. 1969 AND SEPT. 1970

<i>Month and Year</i>	<i>Live birth</i>		<i>Total</i>	<i>Fetal waste</i>
	<i>Male</i>	<i>Female</i>		
Oct. 1969	440	400	840	
Nov. „	382	378	760	
Dec. „	455	393	848	
Jan. 1970	448	470	918	
Feb. „	370	320	690	
Mar. „	403	412	815	
Apr. „	310	361	671	
May „	368	352	720	
June „	362	346	708	
July „	403	343	746	
Aug. „	415	409	824	
Sept. „	358	337	695	
Total	4714	4521	9235	245

TABLE 4—GOMURIAH HOSPITAL, BENGHAZI, BIRTHS BETWEEN OCT. 1969
AND SEPT. 1970

<i>Age group</i>	<i>No. of mothers</i>	<i>No. having live birth</i>	<i>No. having fetal waste</i>	<i>No. of children born</i>	<i>Average no. of children</i>	<i>Modal order of birth</i>	<i>Median order of birth</i>
15—19	1040	942	98	949	1.007	I	I
	(.14597)*	(.91)	(.09)				
20—24	1998	1796	202	1811	1.008	III	III
	(.28043)	(.90)	(.10)				
25—29	1916	1743	173	1770	1.015	V	V
	(.26892)	(.91)	(.09)				
30—34	1153	1006	147	1025	1.019	VII	VII
	(.16182)	(.87)	(.13)				
35—39	764	640	124	651	1.017	IX	IX
	(.10723)	(.84)	(.16)				
40—44	185	146	39	148	1.014	XI	X
	(.02596)	(.79)	(.21)				
45—49	35	24	11	26	1.083	XI	X
	(.00491)	(.69)	(.31)				
50	7	5	2	5	1.000	—	IX
	(.00098)	(.71)	(.29)				
NR	27	20	7	20	1.000	IV	IV
	(.00378)	(.74)	(.26)				
All ages	7125	6322	803	6404	1.013	I	IV
	(1.00000)	(.89)	(.11)				

* Figures in brackets indicate proportions

TABLE 5—DISTRIBUTION SHOWING FETAL WASTE BY ORDER OF PREGNANCY AND AGE OF MOTHER

Ages	Nature of birth	Order of Pregnancy											
		I		II		III		IV		V		VI	
		M	F	M	F	M	F	M	F	M	F	M	F
15—19	S	2	7	3	2	—	1	—	—	—	—	—	—
	A	41		20		6		6		1		1	
	T	50		25		7		6		1		1	
20—24	S	3	2	—	4	2	1	1	1	2	—	2	1
	A	22		36		36		20		19		12	
	T	27		40		39		22		21		15	
25—29	S	—	—	—	2	2	—	6	3	1	—	1	1
	A		3		10	20		17		23		14	
	T		3		12	22		26		24		16	
30+	S	—	2	1	—	3	—	—	1	4	2	3	1
	A		5		3	11		11		15		30	
	T		7		4	14		12		21		34	
All ages including NR	S	5	11	4	8	7	2	9	5	7	2	6	3
	A	72		69		73		54		59		57	
	T	88		81		82		68		68		66	
Ratio S/A			.2222		.1739		.1233		.2592		.1525		.1579

Table 5 (contd. on page 98)

Table 5 (contd. from page 97)

		Order of Pregnancy								All order including NR	Ratio S/A	Fetal Waste Ratio FW/LB	
		VII		VIII		IX		or more					
		M	F	M	F	M	F	M	F				
		M		F		M		F					
15-19	S									5	10	.1807	.1033
	A									83			
	T									98			
20-24	S	—	1	1	1	—	—	1	—	13	11	.1348	.1115
	A	10		6		1		—		178			
	T	11		8		1		1		202			
25-29	S	—	2	1	—	1	2	1	—	14	10	.1611	.0977
	A	19		19		7		5		149			
	T	21		20		10		6		173			
30+	S	2	1	2	2	3	2	12	9	30	20	.1832	.1742
	A	35		37		35		60		273			
	T	38		41		40		81		323			
All ages including NR	S	2	5	4	3	4	4	14	9	64	52	.1688	.1254
	A	64		63		44		64		687			
	NR	71		70		52		87		803			
Ratio /A			.1094		.1111		.1818		.3594		.1688		

TABLE 6—GOMURIAH HOSPITAL RECORDS SHOWING MULTIPLE BIRTHS BETWEEN OCT. 1969 TO SEPT. 1970

Age	Order of Pregnancy																				
	I		II		III			IV			V			VI			VII				
	M	F	M	F	M	M	F	M	M	F	M	M	F	M	F	M	M	F			
	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×			
	M	F	F	M	F	M	F	F	M	F	F	M	F	F	M	F	M	F			
15—19	1	—	2	2	—	2															
20—24	2	2	2	—	1	2						1	1	—	2	—	1				
25—29	1	—	—	—	1	—	1	1	1	—	—	4	1	—	2	1	2	2	1	3	1
30—34							2	—	—				1	—	—	—	3	1	—	1	1
35—39									1	—	—	—	1	—					—	3	1
40—44																					
45—49																					
50+																					
Total	4	2	4	2	2	4	3	1	1	1	—	4	3	2	2	3	5	4	1	7	3

Table 6 (contd. on page 100)

Table 6 (contd. from page 99)

Age	Order of Pregnancy											All Orders	Prop. of mothers in the age	Triplets						
	VIII	IX	X	XI										Age	Order of pregnancy	Sex of babies				
15—19												3	—	4	.006731	25—29	VI	m×m×f		
20—24	—	1	—									5	5	5	.007508	35—39	XI	m×f×f		
25—29	1	1	1									6	8	11	.013570					
30—34	2	1	2	—	1	—	—	—	1	1	1	1	1	6	7	6	.016479			
35—39	1	—	—						—	1	—	—	1	—	2	6	1	.013089		
40—44				—	1	—	—	1	—					—	2	—	—	.010811		
45—49										—	1	—	—	1	—	—	—	.028571		
50+																				
Total	4	3	3	—	2	—	—	2	1	1	3	1	22	29	27	.011228				

TABLE 7—NUMBER OF SURVIVING CHILDREN TO MOTHERS—FROM GOMURIAH HOSPITAL RECORD BETWEEN OCT. 1969 TO SEPT. 1970.

No. of Surviving Children	Age of Mother									Not reported	Over-all	Percentage
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+				
0	46	51	12	11	0	1	3	0	0	0	124	1.7
1	592	368	84	27	7	4	0	0	4	4	1036	15.2
2	280	525	222	55	23	4	2	0	5	5	1116	15.7
3	94	469	346	106	36	4	3	0	3	3	1061	14.9
4	21	326	397	184	87	20	2	2	4	4	1043	14.6
5	4	155	354	215	80	26	4	0	1	1	839	11.8
6	1	74	292	211	147	25	5	1	3	3	759	10.7
7		15	129	172	141	33	4	3	4	4	501	7.0
8		6	51	108	100	24	0	1	0	0	290	4.1
9		0	15	36	77	13	8	0	0	0	149	2.1
10		1	3	15	29	15	2	0	0	0	65	0.9
11			1	4	20	10	2	0	3	3	40	0.6
12			1	1	6	2					10	0.1
15				1	0	1					2	0
NR	2	8	9	7	11	3	0	0	0	0	40	0.6
Total	1040	1998	1916	1153	764	185	35	7	27	27	7125	100.0
Mean No. Surviving	1.5	2.8	4.3	5.4	6.4	6.7	6.1	6.1	4.6	4.6	3.9	
Median No. Surviving	1.2	2.5	4.1	5.3	6.4	6.8	6.2	6.6	3.8	3.8	3.5	
Modal No. Surviving	1	2	4	5	6	7	9	7	2	2	2	

TABLE 8—NUMBER OF CHILDREN LOST BY MOTHERS—FROM GOMURIAH HOSPITAL
RECORD OCT. 1969 TO SEPT. 1970

No. of Children Lost	Age of Mother								Not reported	All ages	Percentage
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+			
0	840	1343	948	409	198	47	7	1	12	3805	53.4
1	160	439	480	308	168	27	8	2	6	1598	22.4
2	31	130	257	176	144	27	5	—	4	774	10.9
3	3	43	129	124	105	24	3	2	3	436	6.1
4	1	12	49	64	58	17	4	1	2	208	2.9
5	1	7	21	25	36	21	1			112	1.6
6		5	5	15	15	4	5			49	0.7
7		1			10	7				28	0.4
8			2	7	6	2	1			18	0.3
9				4	1	2	1	1		9	0.1
10			1			2				3	—
NR	4	18	22	13	23	5				85	1.2
Total	1040	1998	1916	1153	764	185	35	7	27	7125	100.5
Mean No. lost	0.2	0.5	0.9	1.4	1.9	2.5	2.7	3.0	1.1	0.9	
Median No. lost	0	0	0	0.9	1.4	2.0	1.9	3.2	0.8	0	
Modal No. lost	0	0	0	0	0	0	1	2	0	0	

TABLE — MEAN AGE AT BIRTH AND BIRTH INTERVAL FOR MOTHERS IN BENGHAZI BASED ON GOMURIAH HOSPITAL RECORD OCT. 1969 TO SEPT. 1970

Order	<i>Mothers with all surviving children</i>			<i>Mother with atleast one loss including fetal waste</i>			<i>Overall</i>		
	<i>Mean age</i>	<i>Var. of age</i>	<i>Birth interval</i>	<i>Mean age</i>	<i>Var. of age</i>	<i>Birth interval</i>	<i>Mean age</i>	<i>Var. of age</i>	<i>Birth interval</i>
1	19.25	0.41	.75	19.88	23.06	1.38	19.39	10.41	0.89
2	21.19	12.70	1.94	21.03	13.43	1.15	21.16	12.84	1.77
3	23.02	13.27	1.83	23.12	15.14	2.09	23.05	13.92	1.89
4	24.78	17.83	1.76	24.39	18.12	1.27	24.63	17.98	1.58
5	26.45	18.20	1.67	26.68	20.04	2.29	26.57	19.14	1.94
6	26.67	17.07	0.22	27.73	20.43	1.05	27.70	18.93	1.13
7	29.95	19.04	3.28	29.09	23.32	1.36	29.36	22.13	1.66
8	31.67	18.96	1.72	30.57	19.55	1.48	30.87	19.63	1.51
9	33.70	19.65	2.03	31.96	19.38	1.39	32.26	19.86	1.39
10	33.20	14.03	-0.50	33.79	22.42	1.83	33.70	21.30	1.44
1	36.52	23.69	3.32	35.40	21.00	1.61	35.50	21.34	1.80
All order	23.70	14.61	1.49	28.19	19.74	1.55	25.81	16.86	1.54

TABLE 10—DEATHS BY AGE AND SEX FROM REGISTRATION DEPARTMENT
OF BENGHAZI CITY IN THE PERIOD OCT. 1969 TO SEPT. 1970

<i>Age</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>	<i>Sex ratio 100(M/F)</i>
0—1	669	556	1225	120
1—4	168	165	333	102
5—14	50	28	78	179
15—29	47	32	79	147
30—44	78	34	112	229
45—59	80	47	127	170
60+	264	202	466	131
Total	1356	1064	2420	127

Crude death rate 11 per 1000 persons.

