THE KUWAITI MORTALITY RATES

AND SOME COMPARISONS

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1. Introduction

Governments in many countries depend heavily upon estimate of future populations. Water storage facilities and electricity generating systems, for example, need long-term planning and as the demand for these utilities depends upon the size and structure of the populations, population surveys and projections are required well into the future. Projections are also needed to estimate future demand for kindergartens, schools, hospitals, playing fields,senior citizens facilities, old age pensions,.........etc.

In order to allow the Kuwaiti social security and pensions system in the future to fulfil its role, it is very important to study the characteristics of the Kuwaiti population, how they are attained and how they are changing [1].

In this paper , two abridged kuwaiti life tables are presented and analyzed. Also , a comparison between these rates have been done.

2. Availabilty of data

Kuwait has a good deal of demographic data collected through population censuses and vital registration system. Since 1957, seven regular censuses have been taken, the last one was conducted in April 1985. A system of vital registration which provides a fairly adequate amount of information on the dynamics of population was started only in 1964 through the introduction

of legisation for the compulsory [5]. Since then, serious efforts have had been made for the improvement of the **registra-** tion system. In1969, a new law was enacted for overcoming the shortcoming of the first legislation. Thus, from 1970 onwards, the vital registration system in kuwait could be considered as more complete and reliable [4],[5].

3- Methodology

Various methods of constructing abridged life tables have been developed-among them, king's method (1914), Reed-Merrell's method (1939) and Greville's method (1943).

In this paper, the most recent method of Chiang (1961) ,is suggested to construct the kuwaiti rates [3]. The idea and procedure used in the construction of the abridged life table by this method are the same as those used in the construction of the complete life table, except for differences that result from the length of intervals . The essential element here is the the average fraction of interval lived by each person who dies at an age included in the interval. This fraction, denoted by a_i, is conceptually a logical extension of the fraction a_x, of the last year of life in the complete life table , which is often assigned a value of half on the assumption that deaths occur uniformally through out the year.

By definition[3], the fraction a_i of the interval lived by an individual who dies in the interval is .

$$a_i = \frac{\sum_{x=x_i}^{x_{i+1}-1} {}_ip_xq_x \left((x-x_i) + a'x \right)}{n_i \quad 1 - {}_ip_{i+i}}$$ (3.1)

we can rewrite equation (3.1) as follows:

$$a_in_i = \sum_{x=x_i}^{x_{i+1}-1} \frac{{}_ip_x \, q_x}{1 - {}_ip_{i+i}} \left((x - x_i) + a'x \right)$$ (3.2)

Here the coefficient

$$\frac{{}_ip_x \, q_x}{1 - {}_ip_{i+i}} , \quad x_i \leqslant x < x_{i+i}$$ (3.3)

is the proportion of those dying in the interval (x_i, x_i+_i), who will die in the year $(x, x+1)$, This shows that a_i depends neither on the values of q_x or p_x, nor on the specific death rate M_x, but rather on the trend of mortality within the interval.

When $a'_x = 1/2$ for $x_i \leqslant x < x_{i+i}$, equation (3.2) may b be rewritten as .,

$$a_i \, n_i = \sum_{x=x_i}^{x_{i+1}-1} \frac{{}_ip_x \, q}{1 - {}_ip_{+i}} \left[(x-x_i) + 1/2 \right]$$ (3.4)

Once we calculate the fractions using equation (3.4) it is easy to obtain q_i and M_i as follows .:

$$q_i = \frac{D_i}{N_i}$$ (3.5)

$$M_i = \frac{D_i}{(N_i - D_i)n_i + a_in_iD_i}$$ (3.6)

where, N_i is the number of individuals alive at exact age x_i among whom D_i deaths occur in the interval, and M_i is the ratio of D_i to the total number of years lived by the N_i individuals during the interval $(x_i., x_{i+i})$.

Solving equation(3.6) for N_i and substituting the resulting expression in (3.5), give the basic Gormula in the construction of an abribged life table,

$$q_i = \frac{n_i M_i}{1 + (1-a_i)\ n_i M_i} \tag{3.7}$$

Further, using Greeman's simple formula[2], which assumes that $_6 P_x \doteqdot P^3 _5 P^2 _{x+5}$, over the intial quinquennial age step and through out the table, we can extract the life functions, by sex, every fifth year of age separately for the kuwaiti population.

all other quantities in the table are functions of q_i, a_i, and the radix l_o, The number d_i of deaths in (x_i, x_i+_i) and the number l_{i+i} of survivals at age x_{i+i} are computed from

$$d_i = l_i\ q_i \qquad i = 0,1,2, \ldots\ldots\ldots , w-i \tag{3.8}$$

and

$$l_{i+i}\ l_i - d_i \qquad i = 0,1,2, \ldots\ldots\ldots , w-1 \tag{3.9}$$

respectively . The number of years lived in the interval (x_i, x_{i+i}) by the l_i survivors at age x_i is

$$L_i = n_i \quad (l_i - d_i) + a_i n_i d_i \quad i = 0,1,2,\ldots\ldots\ldots\ldots, w-1 \tag{3.10}$$

The final age interval is again an open interval, and L is computed exactly as the complete life table.

$$L_w = l_w / M_w \tag{3.11}$$

where M_w is again the specific death rate for people of age x and over.

The total number T_i of years remaining to all the people obtaining age x_i is the sum of L_i for $j\ i, i+1, \ldots\ldots\ldots$, w the observed expectation of life e_i age x_i is the ratio T_i / l_i , or

$$e_i \quad (L_i + L_{i+i} + \ldots\ldots\ldots\ldots + L_w / l_i) \quad i = 0, 1.2, \ldots\ldots, w \tag{3.12}$$

4. Concluding Remarks :

The abridged life tables constructed on the basis of Chiang'S method, reffered above, are presented in four tables, see (Appendix I). According to these tables,the life expectancy at birth for 1965-1970 was 61.75 years for Kuwaiti males and 61.11 years for kuwaitifemales. During 1975-1980 , the males life expectancy at birth has been improved to 66.39 years, and the females life expectancy has gained some improvement to become 71.99 years.

The Kuwaiti curves which are presented in appendix II, showing a decline during the early childhood years as the child adapts to the new environment and gains immunity from the diseases of the outside world , then the curves take the form of J-shape. In both periods, the probabilities of dying are high in infancy, fall to minimum in the age group (10.14) ,rise slowly toward middle life and thereafter rise rapidly with increasing age, The excess infant mortality appears to be related to several reasons [5]. First, it may be partly due to artificat of data. Second,the low education level of the Kuwaiti mothers is associated with higher infant mortality. Third, there is a widispread practice among Kuwaiti families to leave their children in the care of uneducated domestic servants who are often responsible for the preparation of feed for their infants at home. The presence of servants in the household is associated with higher infant mortality may be due to the uncontrolled fertility as births born with short interval are subject to comparatively high mortality. Fifth,the kuwaiti

population consists of a large rumber Bedouin populations who
have higher than average fertility and mortality rates and this
may partly be responsible for sending the overall Kuwaiti infant mortality
rates up.

Also, four tables are presented, see(Appendix III), which
are showing that males and females mortality rates have been
improved immensely at all ages except at some old ages, It is clear
that female mortality is lower than male for almost all ages,
the reasons of that, men tend to be exposed to more hazardous
environmental factors, accidents and violence than women, and
females also appear to be genetically superior.

R E F E R E N C E S :

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Faculty of Commerce;Kuwait University,Kuwait.

[2] Benjamin, B. & Pollard, J.H. (1980);" The analysis of
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[3] Chiang, C.L. (1968);" Introduction to stochastic to stoch-
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[4] Kuwait, C.S.O. (1970-1982); The annual statistical abstracts,"
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statewise study; population and vital stistics unit;Kuwait.

A P P E N D I X (I)

Table (I.1)
Abridged Life Table For Kuwaiti Females
1965-1970

Age Group	q_i	l_i	$_n d_i$	a_i	$_n L_i$	T_i	e_i
0-	.062550	100.000	6.255	.14	95.622	6.711.321	67.11
1-	.021041	93.745	1.977	.21	369.405	6.615.699	70.57
5-	.007672	91.768	704	.23	456.906	6.246.294	68.07
10-	.005390	91.064	482	.25	454.089	5.789.388	63.58
15-	.004183	90.582	379	.33	451.970	5,335.299	58.91
20-	.006192	90.203	558	.42	449.684	4,883.329	54.14
25-	.010311	89,645	924	.42	446,520	4,433.645	49.46
30-	.010461	88.921	930	.46	442.365	3,987.125	44.84
35-	.012843	87.991	1.130	.47	437.268	3.544.760	40.29
40-	.015864	86.861	1.378	.51	430.945	3,107.492	35.78
45-	.019000	85.483	1.624	.51	423.453	2.676.547	31.31
50-	.031211	83.859	2.617	.53	413.343	2.253.094	26.87
55-	.054373	81.242	4.417	.57	395.955	1.839.751	22.65
60-	.084142	76.825	6.464	.58	368.741	1.443.796	18.79
65-	.123242	70.361	8.671	.61	331.113	1.075.055	15.27
70-	.187833	61.690	11.587	.63	280.950	743.942	12.06
75-	.295070	50.103	14.748	.55	214.577	462.992	9.24
80-	.424072	35.355	14.993	.41	138.534	138.534	7.03
85-	.555103	20.362	11.303	.32	71.549	109.881	5.40
90-	.571271	9.059	6.081	.24	28.105	38.332	4.23
95-	1.000000	2.978	2.978	.11	10.227	10.227	3.43

Table (I.2)

Abridged Life Table For Kuwaiti MAles

1965 - 1970

Age Group	q_i	l_i	$_nd_i$	a_i	$_nL_i$	T_i	e_i
0-	.071451	100.000	7.145	.11	94.998	6.174.818	61.75
1-	.017650	92.855	1.639	.17	367.159	6.079.820	65.48
5-	.009072	91.216	827	.22	453.938	5.712.661	62.63
10-	.010061	90.389	909	.31	449.733	5,258.723	58.18
15-	.011343	89.480	1.015	.33	444.877	4.808.990	53.74
20	.012040	88.465	1.065	.37	439.731	4.364.113	49.33
25-	0.14114	87.400	1.233	.37	433.981	3,924.382	44.90
30-	.016151	86.167	1.392	.42	427.405	3,490.401	40.51
35-	.018112	84.775	1.535	.42	420.154	3.062.996	36.13
40-	.022243	83.240	1.851	.48	411.756	2.642.842	31.75
45-	.032260	81.389	2.626	.48	400.829	2.231.086	27.41
50-	.050281	78.763	3.960	.53	384.325	1.830.257	23.24
55-	.082510	74.703	6.164	.53	359.064	1.445.932	19.36
60-	.129611	68.539	8.883	.56	321.649	1.086.868	15.86
65-	.198154	59.656	11.821	.61	269.728	765.219	12.83
70-	.275533	47.835	13.180	.63	206.331	495.491	10.35
75-	.356022	34.655	12.338	.52	141.677	289.160	8.34
80-	.453110	33.317	10.112	.41	83.354	147.483	6.61
85-	.583041	12.205	7.116	.35	41.797	62.129	5.09
90-	.695623	5.089	3.540	.27	15.333	20.332	3.99
95-	1.000000	1.549	1.549	.11	4.999	4.9999	3.23

Table (I.3)
Abridged Life Table For Kuwaiti Females
1975 - 1980

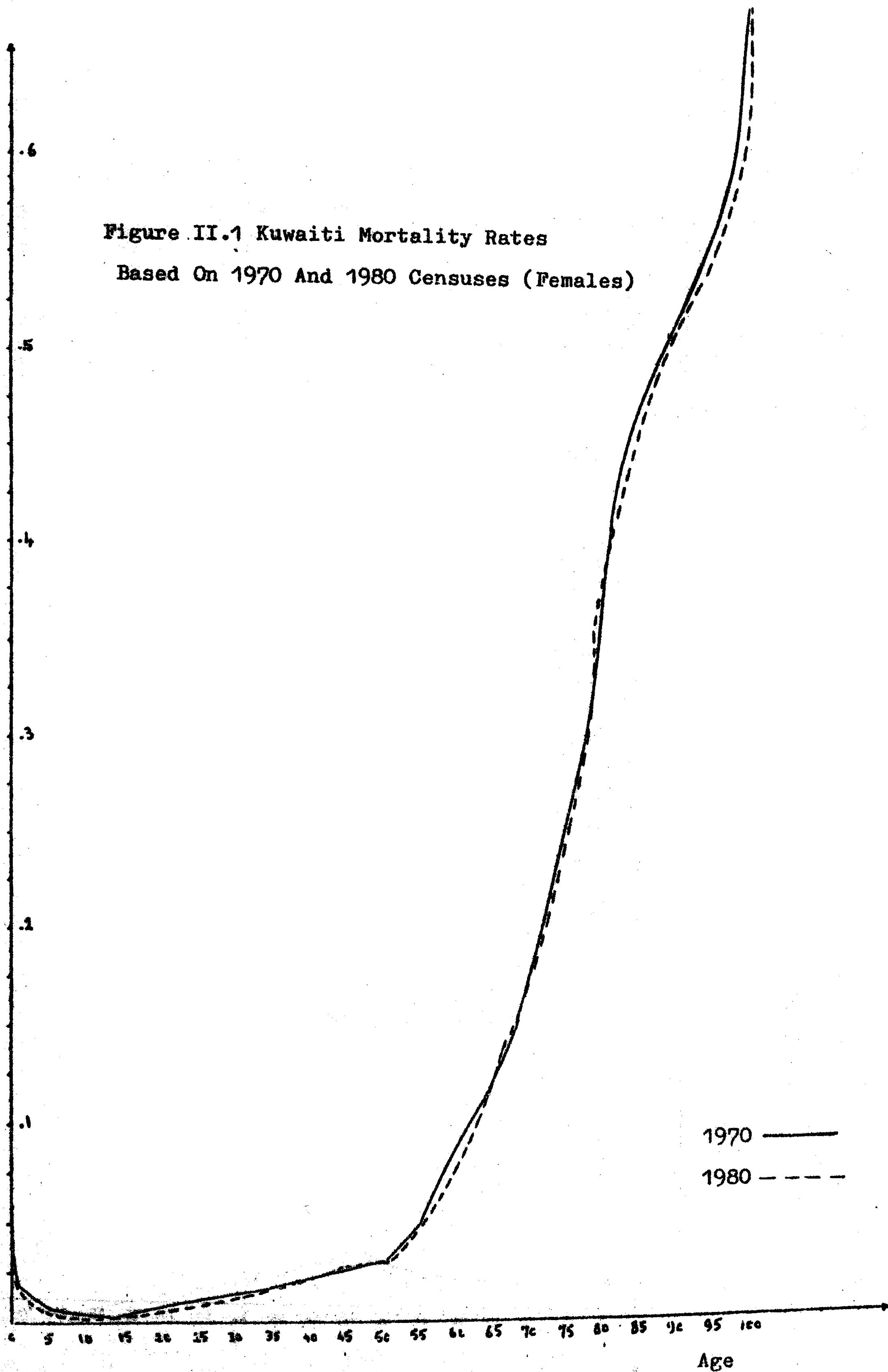| Age Group	$_n q_i$	l_i	$_n d_i$	a_i	$_n L_i$	T_i	e_i
0-	.036700	100.000	3.670	.12	96.917	7.198.818	71.99
1-	.008896	96.330	857	.34	386.912	7,061.336	73.30
5-	.002799	95.473	267	.36	476.697	6.674.424	69.91
10-	.001606	95.206	153	.38	475.647	6.197.727	65.10
15-	.002136	95.053	203	.42	474.757	5.722.080	60.20
20-	.003113	94.850	295	.46	473.512	5.247.323	55.32
25-	.004478	94.555	423	.46	471.717	4.773.811	50.49
30-	.005982	94.132	563	.48	469.252	4.302.094	45.70
35-	.008186	93.569	766	.51	465.930	3.832.842	40.96
40-	.011535	92.803	1.070	.52	461.340	3.366.912	36.28
45-	.020394	91.733	1.871	.54	453.987	2.905.572	31.67
50-	.029084	89.862	2.613	.58	442.777	2.451.585	27.28
55-	.050168	87.249	4.377	.62	425.302	2.008.808	23.02
60-	.073558	82.872	6.096	.63	399.120	1.583.506	19.11
65-	.128246	76.776	9.846	.58	359.265	1.184.386	15.43
70-	.189987	66.930	12.716	.51	302.860	825.121	12.33
75-	.294502	54.214	15.966	.48	231.155	522.261	9.63
80-	.465858	38.248	15.525	.48	152.433	291.106	7.61
85-	.532550	22.725	12.102	.48	83.370	138.673	6.10
90-	.561371	10.623	5.963	.32	38.208	55.303	5.21
95-	1.000000	4.660	4.660	.13	17.095	17.095	3.67

- Table (I.4)
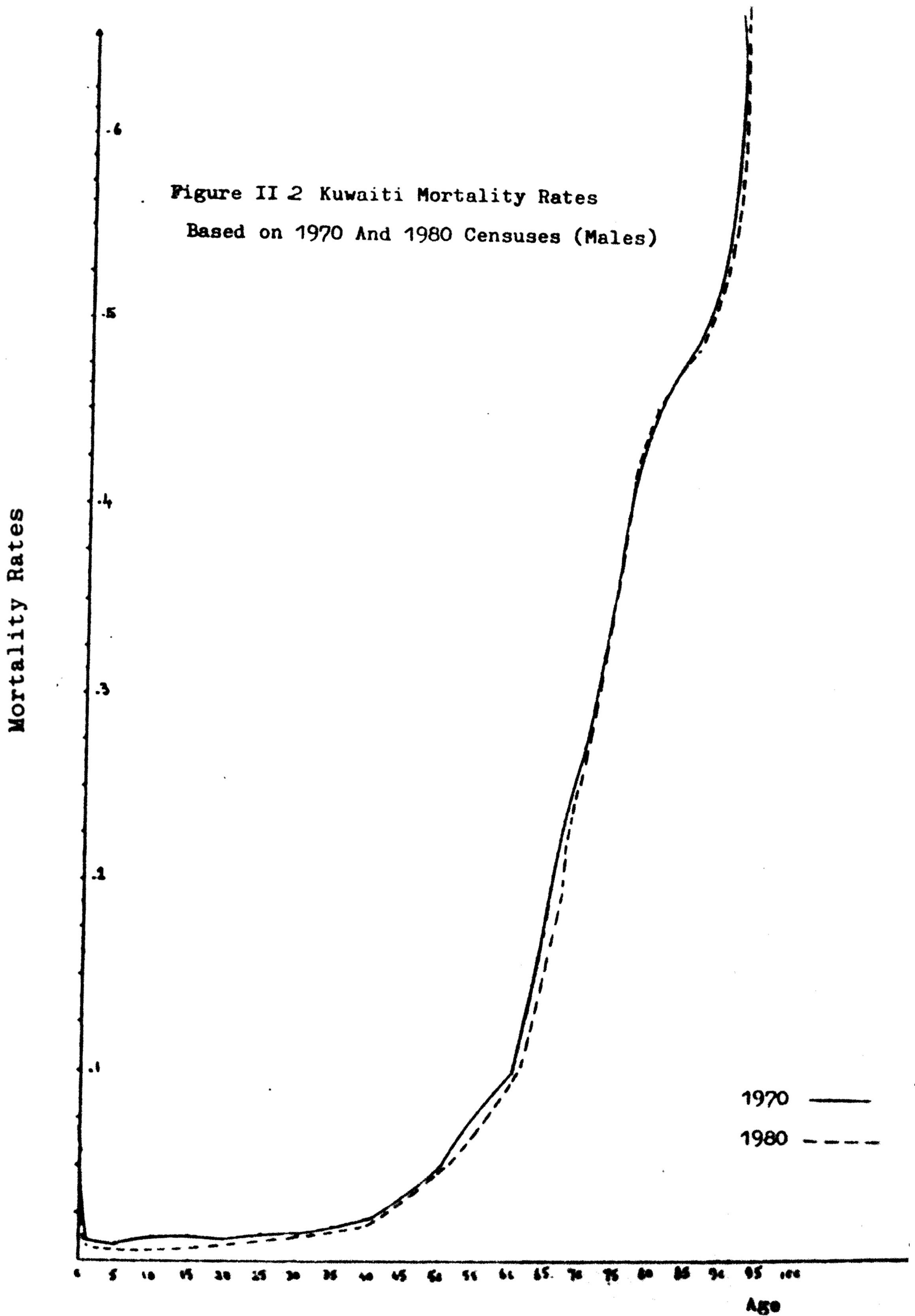Abridged Life Table For Kuwaiti Males
1975 - 1980

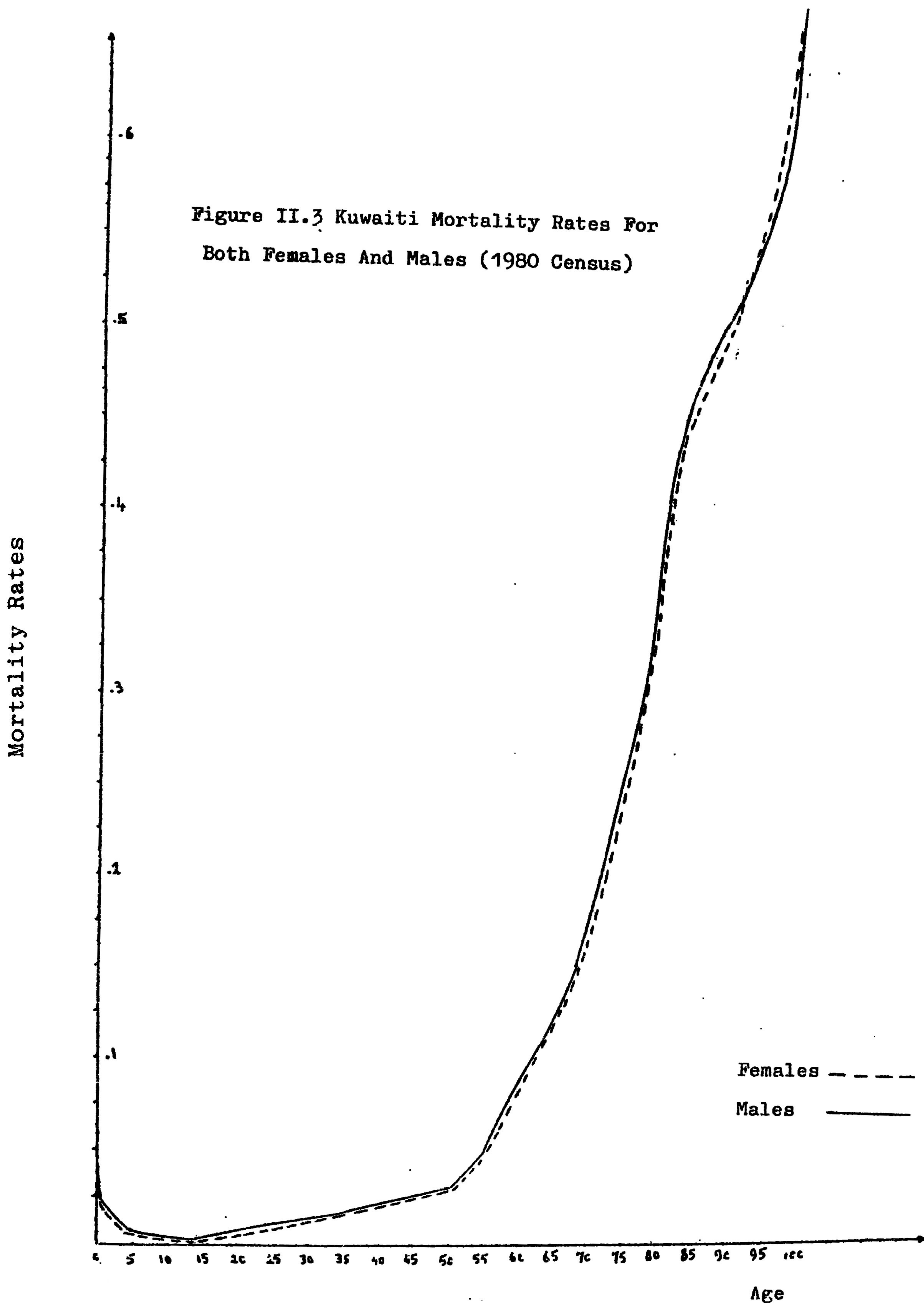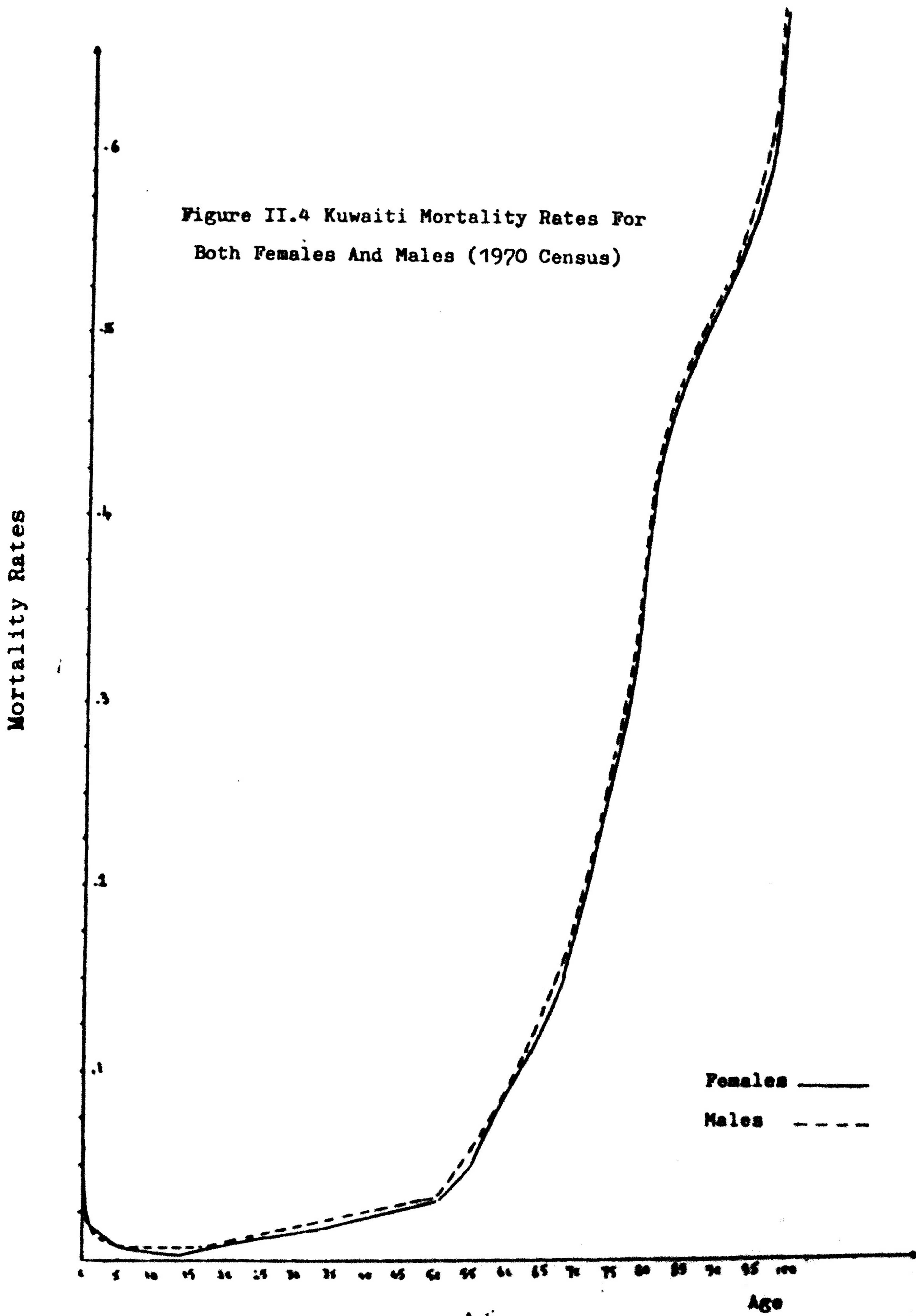| Age Group	$_nq_i$	l_i	$_nd_i$	a_i	$_nL_i$	T_i	e_i
0-	.040500	100.000	4.050	.14	96.593	6.638.986	66.39
1-	.009531	95.950	914	.23	3385.740	6.542.393	68.19
5-	.004590	95.036	436	.32	474.090	6.156.653	64.78
10-	.004201	94.600	397	.42	472.007	5.692.563	60.06
15-	.005752	94.203	542	.42	469.660	5.210.556	55.31
20-	.007490	93.661	702	.48	466.550	4.740.896	50.61
25-	.009279	92.959	863	.48	462.637	4.274.346	45.98
30-	.011592	92.096	1.068	.51	457.810	3.811.709	41.39
35-	.014495	91.028	1.319	.53	451.842	3.333.899	36.84
40-	.019859	89.709	1.781	.53	444.092	2.902.057	32.35
45-	.031244	87.928	2.747	.58	432.773	2.457.965	27.95
50-	.049074	85.181	4.180	.61	415.455	2.025.192	23.78
55-	.079523	81.001	6.441	.63	388,902	1.609.737	19.87
60-	.116875	74.560	8.714	.52	351.015	1.220.835	16.37
65-	.184961	65.846	12.179	.43	298.782	869.820	13.21
70-	.258762	53.667	13.887	.36	233.617	571.038	10.64
75-	.362332	39.780	14.414	.32	162.865	337.421	8.48
80-	.488247	25.366	12.385	.32	95.867	174.556	6.88
85-	.535200	12.981	6.947	.31	47.538	78.689	6.06
90-	.551240	6.034	3.326	.24	21.855	31.151	5.16
95-	1.000000	2.708	2.708	.14	9.296	9.296	3.43

APENDIX (II)

Figure II.1 Kuwaiti Mortality Rates
Based On 1970 And 1980 Censuses (Females)

Mortality Rates

1970 ——————
1980 — — — —

Age

Figure II 2 Kuwaiti Mortality Rates
Based on 1970 And 1980 Censuses (Males)

Figure II.3 Kuwaiti Mortality Rates For
Both Females And Males (1980 Census)

Figure II.4 Kuwaiti Mortality Rates For Both Females And Males (1970 Census)

A P P E N D I X (I I I)

Table (III.1)
Comparison Between Mortality Rates (Females)
1970 - 1980

| Age Group | $n q_i$ | | Ratio (2/1) |
	1970 (1)	1980 (2)	%
0-	0.062550	0.036700	58.67
1-	0.021041	0.008896	42.28
15-	0.007672	0.002799	36.49
10-	0.005390	0.001606	29.80
15-	0.004183	0.002136	51.10
20-	0.006192	0.003113	50.29
25-	0.010311	0.004478	43.43
30-	0.010461	0.005982	57.19
35-	0.012843	0.008186	63.75
40-	0.015864	0.011535	72.73
45-	0.019000	0.020394	107.33
50-	0.031211	0.029084	93.19
55-	0.054373	0.050168	92.27
60-	0.084142	0.073558	87.42
65-	0.123242	0.128246	104.06
70-	0.187833	0.189907	101.15
75-	0.295070	0.294502	99.81
80-	0.424072	0.465858	109.85
85-	0.555103	0.532550	95.94
90-	0.571271	0.561371	98.27
95+	1.000000	1.000000	100.00

Table (III.2)
Comparison Between Mortality Rates (Males)
1970 - 1980

Age Group	$n q_i$ 1970 (1)	$n q_i$ 1980 (2)	Ratio (2/1) %
0-	0.071451	0.040500	56.68
1-	0.017650	0.009531	54.00
5-	0.009072	0.004590	50.61
10-	0.010061	0.004201	41.76
15-	0.011343	0.005752	50.71
20-	0.012040	0.007490	62.21
25-	0.014114	0.011592	71.74
30-	0.016151	0.011592	71.78
35-	0.018112	0.014495	80.04
40-	0.022243	0.019859	89.28
45-	0.032260	0.031244	96.85
50-	0.050281	0.049074	97.60
55-	0.082510	0.079523	96.38
60-	0.129611	0.116875	90.17
65-	0.198154	0.184961	93.34
70-	0.275533	0.258762	93.91
75-	0.356022	0.362332	101.77
80-	0.453110	0.488247	107.75
85-	0.583041	0.535200	91.79
90-	0.695623	0.551240	79.24
95+	1.000000	1.000000	100.00

Table (III.3)
Comparison Between Famales and Males Mortality Rates
1970

Age Group	$n q_i$		Ratio (1.2)
	1970 (F) (1)	1970 (M) (2)	%
0-	0.062550	0.071451	87.54
1-	0.021041	0.017650	119.21
5-	0.007672	0.009072	84.57
10-	0.005390	0.010061	53.57
15-	0.004183	0.011343	36.88
20-	0.006192	0.012040	51.43
25	0.010311	0.014114	73.06
30	0.010461	0.116151	64.77
35-	0.012843	0.018112	70.90
40-	0.015864	0.022243	71.32
50-	0.031211	0.050281	62.07
55-	0.054373	0.082510	65.90
60-	0.084142	0.129611	64.92
65-	0.123242	0.198154	62.20
70-	0.187833	0.275533	68.17
75-	0.245070	0.356022	68.84
80-	0.424072	0.453110	93.59
85-	0.555103	0.583041	95.21
90-	0.571271	0.695623	82.12
95+	1.000000	1.000000	100.00

Table (III.4)

Comparison Between Females and Males Mortality Rates
1980

Age Group	$n q_i$ 1980(F) (1)	$n q_i$ 1980(M) (2)	Retio (1/2) %
0-	0.036700	0.040500	90.62
1-	0.008896	0.009531	93.34
5-	0.002799	0.004590	60.94
10-	0.001606	0.004201	38.23
15-	0.002136	0.005752	37.13
20-	0.003113	0.007490	41.56
25-	0.004478	0.009279	48.26
30-	0.005982	0.011592	51.60
35-	0.008186	0.014495	56.47
40-	0.011535	0.019859	58.08
45-	0.020394	0.031244	65.27
50-	0.029084	0.049074	59.27
55-	0.050168	0.079523	63.09
60-	0.073558	0.116875	62.94
65-	0.128246	0.184961	69.34
70-	0.189987	0.258762	73.42
75-	0.294502	0.362332	81.28
80-	0.465858	0.488247	95.41
85-	0.532550	0.535200	99.00
90-	0.561370	0.551240	101.00
95+	1.000000	1.000000	100.00