

**THE LIFE EXPECTANCY AND MORTALITY
OF KENYANS**

by

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**A Thesis submitted
in partial fulfilment of the requirements
for the Masters in Business Administration
degree at the University of Nairobi**

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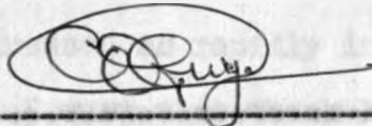
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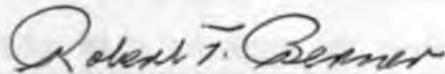
DECLARATIONS

This thesis is my original work and has not been presented for a degree in any other University.



Christopher Owiti Guya

This thesis has been submitted for examination with my approval as a University Supervisor.



Prof. R.F. Berner

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CHAPTER I	INTRODUCTION	1
CHAPTER II	THE STATE OF THE ART	5
2.1	Background and Motivation	5
2.2	Research Objectives	7
2.3	Scope and Limitations	8
2.4	Organization of the Thesis	9
2.5	Summary	10
2.6	References	11
CHAPTER III	METHODS	12
3.1	Research Methodology	12
3.2	Data Collection	13
3.3	Data Analysis	14
3.4	Validation	15
CHAPTER IV	RESULTS AND DISCUSSION	16
4.1	Introduction	16
4.2	Results	17
4.3	Discussion	18
4.4	Conclusion	19
4.5	References	20

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENT -----	i
PREFACE -----	iv
<u>CHAPTER ONE:</u> <u>INTRODUCTION</u>	1
<u>CHAPTER TWO:</u> <u>THE MAIN FACTORS CONTRIBUTING</u> <u>TO THE HIGH MORTALITY RATE IN</u> <u>KENYA</u>	6
2.1 Inadequate Medical Facilities and Personnel	6
2.2 Rural Urban Migration	15
2.3 Rapid Population Growth and Malnutrition	24
2.4 Traditions and Religion	32
2.5 The Rate of Traffic Accidents	38
2.6 Recommendations	60
2.7 Appendix	73
<u>CHAPTER THREE:</u> <u>MORTALITY TABLES</u>	78
3.1 A Review of Mortality Tables	78
3.2 The Construction of a 'Crude Mortality Tables' for Kenya	99
3.3 Conclusion and Recommendations	105
<u>CHAPTER FOUR:</u> <u>THE USE OF FOREIGN BASED</u> <u>MORTALITY TABLES IN KENYA:</u> <u>(A SURVEY)</u>	122
4.1 The Objectives	122
4.2 Methodology	123
4.3 Results	125
4.4 Recommendations	133
4.5 Appendix	140

CHAPTER FIVE: CONCLUSION 144

REFERENCES ----- 148

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LIST OF TABLES

<u>Table</u>		<u>Page</u>
2.1	The Number of Hospital Beds in Kenya Compared with the Population (1965-1973)	8
2.2	Medical Officers by Locality in Kenya 1969	10
2.3	The Distribution of Medical Facilities and the Fatality Rates by Province (Kenya, 1969)	11
2.4	Average Annual Growth of African Population in the Main Towns in Kenya (1948-1962 and 1962-1969)	17
2.5	The Reasons for Migration Among Urban Immigrants Aged 15-50 by Education Attainment and Age Group	19
2.6	The Proportion of Africans Seeking Jobs in Nairobi by Age Group	20
2.7	Annual Incomes in Nairobi, Mombasa and Kisumu (1968 and 1969)	21
2.8	The Number of People at Various Age Groups by Region	29
2.9	Kenya: Traffic Accident Statistics for 1970-1973 Including Comparative data for Population, Registered Deaths and Vehicles for the Same Period	40
2.10	Kenya: Road Traffic Fatalities Compared with Some Developing Countries - 1968	42

2.11	Number of Road Traffic Accidents Classified by Type of Vehicles in Kenya, 1970-1975	43
2.12	Causative Factors in Road Traffic Accidents in Kenya (1970-75)	45
2.13	Deaths Due to Road Traffic Accidents by Broad Age Groups in Kenya (1974-1975)	46
2.14	Nairobi Traffic Accident Statistics for 1970-1975 Including Comparative Data for Population and Registered Deaths in the Same Period	51
2.15	Distribution of Persons (Killed and Injured) in Road Traffic Accidents in Nairobi, 1970-1975	52
2.16	Annual Mean Values of Persons (Killed and Injured) in Road Traffic Accidents by Month of Year in Nairobi, 1968-1972	54
2.17	Road Traffic Fatality by Class of Persons in Nairobi (1970-1975)	53
2.18	Road Traffic Fatalities by Sex for Nairobi (1968-1972)	55
2.19	Fatalities by Age Group for Nairobi 1968-1972 (Only Recorded Deaths are Considered)	56
2.20	Road Traffic Fatalities by Occupation for Nairobi 1968-1972	58

<u>Table</u>	<u>Page</u>	
2.21	Sample Data of Females for the Year 1972 and 1973 (Registered Deaths)	75
2.22	Sample Data of Males for the Year 1972 and 1973 (Registered Deaths)	76
2.23	1972 and 1973 Registered Deaths in Kenya (A Comparison between a Sample and Population)	77
3.1	Part of the 1958 C.S.O. Table (Male)	87
3.2	Portions of Select and Ultimate Mortality Table (5 Years Select Period)	94
3.3	Kenya: Population Projections based on 1969 Census	113
3.4	Kenya: Population Projections for 1970-1973 based on 1969 Census	114
3.5	Registered Deaths by Age Groups in Kenya 1970-1973	115
3.6	Registration of Deaths in Kenya by Age Groups (1971)	116
3.7	Registration of Deaths in Kenya by Age Groups (1972)	117
3.8	Registration of Deaths in Kenya by Age Groups (1973)	118
3.9	Registration of Deaths in Kenya by Age Groups (1970)	119

3.10 Crude Mortality Rates for Kenya (1970-1973) 120

3.11 Illustrating the Calculation of Crude Mortality Table for Kenya (1973) 121

PREFACE

My reasons for conducting a study on the "Life Expectancy and Mortality of Kenyans" were threefold. First, given the high mortality rate in Kenya (about 18 persons per 1,000) according to the 1975 estimates, I wanted to investigate the main factors responsible for such a high mortality rate in this country. Several factors are actually involved, however, I only propose to discuss the major ones and this is the subject matter of chapter two of this thesis.

Second, I was interested in calculating "crude" mortality rates for Kenya, using age groupings designated by both the "Central Bureau of Statistics" and the "Office of the Registrar-General". The exercise was to be done for 1970 through 1973. Based on the mortality rates of the various age groups for 1973, I was also interested in attempting to prepare a "Crude Mortality Table" for Kenya. In my independent study field work, I learned that the officials at the Central Bureau of Statistics in this country had made population projection based on broad age groupings for 1970 and 1975 based on 1969 population census data. However, there are no such estimates for 1971, 1972

and 1973 in which I was particularly interested. Too, I had a keen interest in observing the trend (changes) in mortality rates for the above years (1970-1973), because of the linkage between mortality rates by age groups and the factors which influence mortality rates. I have left out 1974 and 1975 because the death records pertaining to the two years were not available at the time of the research. But before embarking on the calculation of the above mortality rates and the "crude" mortality table for Kenya, I thought it important to give a short review of mortality tables in general.

Last, after learning that the mortality tables used in this country are based on the mortality experience of Europeans, I was motivated to investigate their validity in the Kenyan environment. I therefore decided to conduct an actual field survey on the use of mortality tables in this country. The results of this exercise are presented in chapter four.

Given the above objectives I used various methods to obtain the necessary information and data. With regard to the main factors contributing to the high death rate, I combined both library and

field research. Published resources and data were used to obtain the relevant information for the three major factors, and actual field research was undertaken for the other two factors. In particular, the research on road traffic accidents was quite laborious and time consuming. In chapter three, the overview in the construction of mortality tables was mainly a literature review, while the construction of a "Crude Mortality Table" for Kenya entailed an actual collection of sample data as well as the calculation of mortality rates for the various broad age groups. Chapter four is a summary of the results of my field survey.

Following the introductory chapter (chapter one), the major content of the thesis is divided into three major chapters. Chapter two focuses on the main factors responsible for the high mortality rate, hence short life span in Kenya especially among Africans. For example, according to the 1969 rough estimates the life expectancy of a European was about 70 years while that of a Kenyan African was about 50 years (ref. 1). The difference is fantastic obviously. The main factors contributing to the high mortality rate in this country can be summarised under the

following headings: The inadequacy of medical facilities and personnel; Rural-urban migration; Traditions and religion, and lastly the High rate of road traffic accidents. All these will be discussed in detail in chapter two.

Chapter three includes a general discussion of mortality tables as a foundation for my subsequent attempt to construct a "Crude Mortality Table" for Kenya later in the chapter. Secondly, it also gives a description, and summary of the methodology of constructing "crude mortality rates" for the various age groups (0-4, 5-9, etc.). It was expedient and necessary to use these broad age groups because the relevant data for the construction of mortality table for each age are not available in this country. It is my hope that the responsible institutions (the Central Bureau of Statistics and the Office of the Registrar-General) will soon start to keep these vital statistics age by age (20, 21, 22, etc.), instead of the broad age groups they are currently using.

Chapter four is basically a presentation of a Survey: conducted in this country to investigate

the validity of the foreign based mortality tables in Kenya. Chapter five has been devoted to a few concluding remarks on the whole thesis.

CHAPTER ONE

INTRODUCTION

Management Science as a discipline is not yet fully developed as the other areas of Business Administration such as: Accounting, Finance, Production, Personnel and Marketing. This is true in both the developed and developing nations of the world. However, the situation in countries like Kenya is undoubtedly worse due to the deterrent influences of a prior colonial administration. Management Science as a special field of study started developing after the industrial revolution when organizations became much more complex. Thus managers were forced to employ a little more sophisticated techniques in solving their operational problems. Rational or optimal decisions could no longer be made 'off head'. In view of this, the discipline took off suddenly with the invention of the electronic computer, only a couple of decades ago. Most powerful management decision tools like Linear Programming (LP) and Simulation models are only useful when an electronic computer is available.

Management Science was therefore developed to handle complex operational problems of modern organizations, especially problems which seem to be beyond the application of simple Arithmetical models. It is not surprising that the discipline has matured very fast in the developed nations (U.S.A., Canada, U.S.S.R., and Japan). The position of the developing countries has been and still is unfortunate, in that the discipline has lagged behind significantly compared to the situation in the developed nations, especially in the area of Business application. In the case of developing nations i.e. Kenya, Uganda and Tanzania, the lag can be attributed to a large extent to the colonial rule, especially its educational system. This system was designed to prepare the colonial subjects for administrative and clerical jobs. Given this objective very few Africans (in the case of Africa) obtained technical training. The strategy was quite consistent with their development policies, for example the colonies were only developed to provide the developed nations with the various industrial raw materials, i.e. agricultural products (cotton, coffee, sisal, etc.) and minerals (gold, diamond, coal, etc.). The educational system therefore, put too much emphasis on Arts subjects instead of Science. In other words,

the colonial subjects were encouraged to study subjects like History, Bible, Geography, Sociology and English language. This was quite in order given that the educated African elite were groomed to be quasi-administrators and clerks, while the bulk of the African population serve as labourers. I consider the above practice as a drawback to the development of disciplines like Management Science in this country.

During the colonial administration, crucial business operational decisions were made abroad and the personnel in the colonies were only supposed to implement such decisions. This being the case, it was unlikely that the implementors knew anything about how these decisions were arrived at, hence, they had very little knowledge of management decision-making tools like Linear Programming and Network Analysis for example. In any case Linear Programming as a modern management operational technique can only be usefully applied to solve complex operational problems which at that time were mainly solved abroad. But even if some problems of the above nature cropped up suddenly in the colonies, the relevant technician(s) would be immediately flown in from abroad (London or New York) to solve the problems. Very often this would be

done behind the scene. In other words the local personnel in the organization concerned would not be allowed to participate in the process of solving such problems. Thus the local quasi-administrators had very remote chances of learning the techniques which were employed in finding solutions to such operational problems in the colonial days.

It is unfortunate that the above practice has tended to continue in quite a number of the newly independent countries like Kenya. For example, up to now no definite and positive steps have been taken by our government to change the current educational curriculum to suit the needs of an independent developing nation. The country is still short of students with the necessary quantitative skills and aptitudes to take up professional technical courses like Actuarial Science or Operations Research. It will be hence very difficult for me to obtain the relevant literature and information for my thesis which is focussing on one of the East Africa's most dormant areas of Management Science (Actuarial Science). Given the above facts and evidence, I believe that one can rightly attribute the under-development of Management Science in this country

to the colonial type of administration which was abolished in this country only twelve years ago.

THE CAUSE OF THE HIGH MORTALITY RATE
IN THE TROPICAL COUNTRIES
IN INDIA

The high mortality rate in this country is a function of many factors and conditions which in many ways are not mutually exclusive as we shall see later. However, only a few of these factors have been treated in this chapter. This does not mean that they are the only ones responsible for the high mortality rate in India. Their importance to the situation in this chapter is based on the fact that they are the most prominent in the list of the contributing factors to the general mortality rate. Some of these factors in the above order are treated in this chapter.

2.1. THE CAUSE OF THE HIGH MORTALITY RATE

Health conditions in this country are the cause of the high mortality rate especially when we take in to account the factors of malnutrition, lack of hygiene, the spread of malaria, etc. In the rural areas there has been a great deal of improvement but it is reported that many villages are still very poor, with no water, no electricity, no roads, etc. In the city of Bombay, the situation is somewhat better but the state

CHAPTER TWO

THE MAIN FACTORS CONTRIBUTING TO THE HIGH MORTALITY RATE IN KENYA

The high mortality rate in this country is a function of many factors and conditions which in many cases are not mutually exclusive as we shall see later. However, only a few of these factors have been treated in this chapter. This does not mean that they are the only ones responsible for the high mortality rate in Kenya. Their inclusion in the discussion in this chapter is based on the fact that they are the most significant in the list of the contributing factors to our national mortality rate. Five of these factors in the above category are discussed in this chapter.

2.1 INADEQUATE MEDICAL FACILITIES AND PERSONNEL

Health conditions in this country are far below the East African average especially when one tries to compare the Kenyan situation with Tanzania. In Tanzania people have been placed in Ujamaa Villages and it is reported that each village has adequate health centres, schools and water. In the city of Dar-es-Salaam, for example, one rarely sees the kinds

of shanties which occupy nearly half of Nairobi city, particularly in areas like Kariobangi, Mathare and Majengo.

In Kenya there is an acute shortage of medical facilities and medical personnel not to mention the poor quality of the few available. The fact that there is a need for the improvement of these facilities is obvious both to the government and the private institutions concerned. For example, the government had only 299 medical officers in 1973 (ref. 2). This meant that on average there were about 36,000 persons to one medical officer (doctor) in this country. This is rather startling given the rate of economic growth in this country (about 5-7% per annum). The inadequacy of medical facilities and personnel is again evidenced by the fact that nearly 40% of the deaths in this country are caused by parasitic and infectious diseases (see the appendix at the end of this chapter). This figure is based on a study I made using the death records from the office of the Registrar-General in this country for the years 1972 and 1973. Most of the diseases under the above categories can be easily reduced, if not eliminated in the rural areas by the improvement of medical facilities. Some of these diseases are

Malaria, Smallpox and Measles; most of which affect infants and children. Generally speaking, the national health picture is improving. In other words the government is making the necessary effort to increase the volume of medical facilities and the number of medical personnel. The above point is illustrated in table 2.1 below.

**Table 2.1: The Number of Hospital Beds in Kenya
Compared with the Population (1965 - 1973)**

Year	Government	Private	Mission	Total	Population in "000"
1964	6931	1504	2995	11430	-
1965	7434	1617	3232	12183	9365
1966	7550	1600	3288	12438	9643
1967	7980	1590	4090	1308	9928
1968	-	-	-	-	10209
1969	-	-	-	-	10942
1970*	8359	1938	4190	14537	11225
1971	9097	1310	4118	14525	11671
1972	9897	2589	6062	18055	12067
1973	9829	2589	5768	18186	12483

Source: Kenya Statistical Abstract, 1974.

* Figures for 1970 - 1973 are projections

Based on the table above we note that while between 1965 and 1973 the number of hospital beds increased by 49.3%, the figure for population growth over the same period was only 33.4%. This no doubt shows an improvement from the national point of view. However, there is one feature which tends to distort the above improvement, and that is the serious imbalance in the distribution of the available medical facilities and medical staff in the country. Before I take up this issue in the next paragraph, I would like to note here that the available health facilities and staff in this country are still inadequate and the few we have in the majority of cases are poorly maintained.

As I have mentioned earlier the imbalance in the distribution of the few medical facilities and personnel seems to be a major contributor to the high national mortality rate in this country. A few provinces are well served while most of them are very inadequately equipped. The result is a high national mortality rate due to the lack of the basic health facilities in most areas, particularly in the rural areas. Most of the diseases which kill our people as I have observed above, especially infants and children, can be significantly reduced if not elimi-

nated by practicing preventive medicines and improved health facilities particularly in the rural areas.

There is a notable imbalance in the distribution of medical facilities and staff between the rural and urban areas. This point is illustrated in table^s 2.2 and 2.3 given below.

Table 2.2: Medical Officers by Locality in Kenya

Locality	Government Medical Officers	Population	Persons per Medical Officer
Nairobi	147	509,000	3,500
Mombasa, Nakuru, Kisumu	46	327,000	7,100
Other	106	10,106,000	95,300
TOTAL	299	109,420,000	36,000

Source: Ministry of Health Manpower Review, 1971

**Table 2.3: The Distribution of Medical Facilities
and the Fatality Rates by
Province (Kenya, 1969)**

Province	Percentage of Total Population (1969)	Number of Persons		Fatality* Rate
		Per Hospital Bed	Per Medical Officer	
Rift Valley	20.4	820	1755	7.6
Nyanza	19.4	1296	2219	17.4
Eastern	17.4	834	1724	4.9
Central	15.3	766	1289	4.7
Western	12.3	1033	3569	10.0
Coast	8.6	511	707	4.1
Nairobi	4.4	152	84	7.8
North Eastern	2.2	1308	1230	-
TOTAL	100	715	871	7.7**

Source: Economic Survey of Kenya, 1971.

* The Annual Report of the Registrar-General, 1972.

** This figure is very much understated due to the fact that there were no fatality data for North Eastern Province in 1969. Similarly quite a good number of districts in Eastern Province did not forward their fatality figures to the Death Registry in the same year. For example, the estimated national fatality rate for 1975 is about 18 deaths per 1,000.

Tables 2.2 and 2.3 given above indicate that the imbalance in the distribution of medical facilities in this country is responsible for the high national mortality rate to a large extent. However, the

provision of medical facilities is not the sole solution in the sense that there are quite a number of medical preventive measures that could be used to reduce the national mortality rate i.e. vaccination for various common diseases like smallpox. Once a person becomes immune to a certain disease, it does not matter very much whether he has an access to a health centre where that disease could be cured because he is not likely to contact the disease anyway. However, a fair distribution of the available medical facilities is still necessary. The reader can note in table 2.3 that the poorly served provinces tend to have high fatality rates. Apart from the preventive medical measures, and imbalance in the distribution of medical facilities, there are many other factors that contribute to the high national mortality rate. Some of these will be discussed hereafter.

However, the fact that in 1972, 5035 people died at home in Kisumu Rural, and only 144 people died in medical institutions (hospitals, health centres, etc.), while the corresponding figures for Nairobi in the same year were 824 and 3762 respectively (ref. 3) is an evidence of the imbalance of medical facilities to some extent. It is likely that

the 5035 people who died at home in Kisumu Rural in that year had no easy and quick access to medical institutions as defined above. This point is supported by the data in table 2.3 above.

Similarly a close study of table 2.2 reveals a surprising feature, that is, while Nairobi had only 5% of the country's population in 1969, it had about 50% of the available medical officers in the country. Thus leaving only half of the personnel for the remaining 95% of the Kenyan population. Obviously this is absurd by any standards. It gives one the impression that the government is not very much concerned with health conditions in the rural areas particularly. The above point is evidenced by the fact that there were 3,500 persons to one medical officer in Nairobi while for the small towns and the rural areas the figure was alarming (95,300 persons to one doctor). The gap is quite significant and the situation is indeed regrettable. For example, during the years 1972 and 1973 about 40% of the total registered deaths in Kenya were caused by infective and parasitic diseases (see the appendix at the end of this chapter). The analysis of deaths by cause and by age groups was undertaken and completed by me, using the death records from the office of the

Registrar General. Incidentally, most of the above diseases can be cured or eliminated by the improvement of medical facilities and by preventive measures. Table 3 given in the appendix at the end of this chapter shows that the sample data which were used in the analysis compare favourably with the percentage distributions by cause of death in the population.

Summary

From the above analysis it is apparent that a good number of deaths in this country can be attributed to the imbalance in the distribution of the available medical facilities and personnel. As I have said above, parasitic and infective diseases alone contributed to about 40% of the total deaths in 1972 and 1973 (registered deaths). Nearly 80-90% of these deaths occur in the rural areas according to my own rough estimate. Even though this figure does not reflect the actual picture due to the fact that it is based on the registered deaths only, I am still convinced that it is not significantly far off from the national actual death picture. I therefore believe that the number of deaths in this country could be reduced markedly by the improvement of medical facilities and preventive measures in the rural areas of this country.

2.2 THE RURAL-URBAN MIGRATION

The current rush of people in their middle ages (20-45 years) to the urban centres in Kenya especially to Nairobi also tends to increase the mortality rate in this country. There is an alarming increase in the number of young men and women migrating to the urban centres in this country. It is a national tragedy that even the government cannot reverse overnight. This can be attributed to two main reasons. First, the present educational system which tends to prepare our young people for white collar jobs and not farming. Secondly, the above factor is enhanced by the imbalance in the location of the major industries and the provision of the basic social amenities. In other words most industries and social amenities are concentrated in the major urban centres, particularly in Nairobi. The main reason for running into towns is the urge to secure paid jobs which are obtainable mostly in the urban centres, especially white collar jobs. Of course there are many other reasons apart from this, however, the need for paid jobs comes first in the list.

Such a trend could be reversed if the government would expand and improve the industrial base, and the social amenities in close proximity to the several major rural centres. There is a clear tendency of locating most industries in Nairobi, Mombasa, Thika and Nakuru; close to energy, water and manpower resources. As long as such a practice continues, it would be very difficult to keep young job-seekers away from the major urban centres especially Nairobi as they search for jobs. There is a definite need to support the development of agricultural based industries in the rural areas, thereby creating a greater balance of paid jobs throughout the country. Unless something is done to this effect, the situation cannot easily be improved. The above point is illustrated in table 2.4

In 1963 according to the census report by the Kenya Bureau of Statistics the population of Nairobi was 240,000 compared to 120,000 in 1959. This shows a growth of 100% in four years. Nairobi's population has now risen to 400,000. Of the 400,000 people, 100,000 live in the inner city (the area bounded by the old city walls) and 300,000 live in the outer areas. This compares with 20,000 living in the area in 1959, gives an increase of 150%.

Thus the population of the

Table 2.4: Average Annual Growth of African Population in the Main Towns in Kenya (1948-62 and 1962-69)

(Figures given in %)

Town	1948-1962	1962-1969
Nairobi	6.5	15.2
Kisumu	7.2	8.7
Mombasa	7.1	7.6
Thika	10.5	5.6
Nyeri	9.1	5.2
Hakuru	6.3	4.9
Nanyuki	8.0	3.0
El Dorset	7.6	0.4

Source: Population Census 1969, Volume II

From the above table the rate of population growth in Nairobi between 1962 and 1969 is alarming. In fact according to the press release by the Mayor of Nairobi reported in "The Standard" on Friday, February 13, 1976, the population of Nairobi is currently 700,000 compared to 250,000 in 1965. Thus within a period of ten years Nairobi's population has more than doubled. Of the 700,000 people, 100,000 live in Mathare Valley (the most unhealthy residential area in the city). This compared with 20,000 living in the area in 1965, gives an increase of 400%. Thus the population of the

Valley has grown by 400% over a period of only ten years. Obviously this is fantastic. But as I have said above, the main objective is to secure jobs, which unfortunately are not obtained by the majority of the new migrants. In 1962, 45.3% of the total Nairobi population was unemployed, by 1969 this figure had risen to 67.9% (ref. 4). It is to be noted that these percentages are not comparable with the usual unemployment figures which are normally a proportion of the people in the labour market. Unlike these the above figures include also youths below 16 years and the unemployables i.e. blind street beggars. However, the marked difference in the two figures quoted above over a period of only seven years is quite significant.

One of the logical consequences of this trend is the enormous increase in the crime rate in the city and other urban centres. Over 50% of such crimes (theft, robbery) are committed in Nairobi alone. For example, between 1969 and 1973, the national crime rate went up by about 52% (ref. 4). These are only crimes known to the Police. In which case the actual figure for the country is certainly higher than this.

In a research carried out by H. Rempel in 1970 in Kenya to find out the reasons why people migrate into towns, 10 different reasons were given by people from different age-groups. The results are presented in table 2.5 below:

Table 2.5: The Reasons for Migration among Urban Immigrants Aged 15-50 by Education Attainment and Age Group (Figures given in %)

Reason	Level of Education		Age Group		Total Overall
	Pr.	Sec.	15-22	23-50	
Could not find jobs	82.8	76.1	79.9	82.6	80.9
Lack of land	3.5	2.1	1.4	3.2	3.2
Unable to go to School	2.9	8.1	7.3	4.4	4.4
Lack of schools or poor quality schools	0.5	0.7	0.7	0.6	0.6
Lack of Social amenities	-	0.7	0.4	-	0.2
Others	10.3	12.3	10.3	10.7	10.7
TOTAL	100	100	100	100	100

Source: H. Rempel: Labour Migration into Urban Centres and Urban Unemployment in Kenya. (Unpublished Ph.D. thesis of the University of Wisconsin, 1970).

From the above table based on Rempel's research it is abundantly clear that the main motive behind rushing into urban centres is the need for jobs. This was a macro-research of the entire country. Mr. Whitelaw also made a study on the unemployment in Nairobi in 1970. His results are given in table 2.6.

Table 2.6: The Proportion of Africans Seeking Jobs in Nairobi by Age Group

(Figures given in %)

Age Group	Percentage of Total Population
16-19	33
20-24	30
25-29	16
30-34	13
35-39	11
40-44	13
45-49	11
50-59	13
60+	10

Source: Whitelaw Report, 1970

The above table is self-explanatory. All the above people were unemployed as of 1970 in Nairobi. However, the majority of those who have jobs earn meagre wages, which in most cases cannot even keep them above starvation level. The above point is supported by the survey made by the Ministry of Health in 1971. The results are given in table 2.7.

Table 2.7: Annual Incomes in Nairobi, Mombasa
 and Kisumu (1968 and 1969)

Range in Kenya £ Per Year	% of Households
Less than £ 120	8.5
£ 120 - 179	16.6
£ 180 - 299	22.4
£ 300 - 559	23.4
£ 600 -1119	19.1
£1200+	9.1

Source: Kenya Statistical Abstract, 1971.

From the above table we notice that about 72% of the workers in the three towns earn a maximum of 960/- per month (£ 559). Considering the cost of living at that time this amount is quite small.

Given all the above data (tables 2.5 - 2.7) one might like to know how rural-urban migration affects the life expectancy and mortality of Kenyans. It does affect the two in the following ways:

- (1) By having most of the people in their middle ages (the economically and most productive group) roaming about in the towns looking for jobs, which most of them do not obtain, the country's output is considerably lower than it would be, especially agricultural output on which Kenyans depend. The possible outcomes of this situation are famine and malnutrition whose logical consequences over a period of time is death especially in the rural areas. There is no doubt that a starving or a poorly fed person can only live for a short time (months or years), hence his life expectancy is likely to be short.
- (2) When these people come to towns they find themselves in the "transitional settlement areas" i.e. Mathare Valley, Kariobangi and Majengo. These are the most unhealthy residential areas in the city. So that even if they come to

(3) live in such locations while in good health, their health conditions begin to deteriorate due to poor sanitation and lack of good food. Very often such areas do not have adequate health centres nearby to cater for the sick and provide preventive medical measures for the healthy. The condition of these new job seekers is worsened by the fact that they often starve. Under such conditions such people have lower life expectancy and their deaths augment the national mortality rate. At times migrant job seekers carry with them diseases like Cholera which quickly spread in the locations with poor sanitation as the ones mentioned above. A Cholera epidemic, for example, would undoubtedly cause mass death within a very short time interval. Alternatively such job seekers contact such diseases on entering such unhealthy locations. Other urban job seekers on failing to secure jobs, return to their home locations with certain communicable diseases contacted in the urban areas. This again could cause an epidemic in the rural areas where such people live.

(3) The jobless in the urban areas often resort to unlawful means of obtaining their day to day means of living thus, they engage in robbery and stealing. In quite a number of cases such practices are violent especially robberies and in certain incidences both the robbers and innocent people lose their lives, thus increase the national mortality rate. In view of all these, rural-urban migration can be considered as one of the factors contributing to the high national mortality rate hence short life expectancy.

2.3 RAPID POPULATION GROWTH AND MALNUTRITION

2.3.1 Rapid Population Growth: Kenya is basically an agricultural country but unfortunately nearly two-thirds of the total land area is arid (semi-desert) hence cannot sustain human life at an average level. Of course such areas are all the same occupied, but by nomadic tribesmen who have no permanent homes. They are ever on the move searching for water and grass. The Masai, Turkana and the Somalis are good examples of such tribes. But despite all these hardships, the rate of population growth in Kenya is still one of the highest in Africa (approximately 3.5% per annum). The national average fecundity rate

is about seven children per mother. It is also true that the rate of consumption outbids the growth in production. For example, between 1967 and 1969 the Kenyan Gross Domestic Product (G.D.P.) went up by only 17% while the increase in total consumption during the same period went up by about 24% (ref. 4).

As usual in this country the gap is normally bridged by borrowing from abroad. In the majority of cases such loan funds never reach the poor starving rural peasants in any form. The loans are often used to buy luxurious goods for the upper class who constitute slightly less than 5% of the total Kenya population. It is therefore possible that the rural peasants with large families continue to starve despite the acquisition of such loans to bridge the gap between consumption and production. At present (May 1976), there are thousands of people dying of hunger in the North Eastern and Eastern Provinces of Kenya. There is therefore no doubt that this situation contributes to the high national mortality rate. However, the Kenyan situation is not unique as similar cases exist in other nearby countries. The truth is that as long as population growth exceeds food production, there is bound to be famine and malnutrition both leading to untimely deaths. Thus the rapid growth of population

in this country contributes to a large extent to the national mortality rate and short life expectancy as compared to some developed nations.

The government should therefore launch an extensive programme of family planning and birth control in order to reduce the rate of population growth. One cannot overlook the current efforts that both the government and certain private organisations are exacting towards the two objectives. However, a brief study made in my own district revealed that very little effort is being made to introduce the illiterate rural couples to family planning and to birth control methods. This is apparently true in most rural areas especially the very remote places of this country. I consider this as an act of negligence on the part of the government, for the rural population really needs to reduce their average number of births per female.

Of course we must note that the apathy on the side of African couples in this country tends to frustrate the government efforts to achieve the above objective (reduction of population growth). In most cases African women are to blame. There are two main reasons for the apathy or reluctance to use family planning and

birth control methods. First, there is an evident misconception of the rationale of using birth control pills in order to reduce the number of children per woman. On quite a few occasions prominent African church and political leaders have opposed openly the idea of birth control or family planning in this country and even in Africa at large. Politicians argue that Africa (including Kenya) needs manpower to liberate the continent politically and economically and this can only be achieved through fighting. Obviously the poor, illiterate, rural parents take such statements just on their face value and consider them quite rational. In view of these, attempts to reduce the number of births per woman are likely to be frustrated by such speeches made by very influential members in our society.

Secondly, just as I have said above, most of our couples have not received the necessary and positive instructions and education on how to use the pill safely. The subsequent misuse of these pills has resulted into a number of complaints from our women. Most of them are health complaints which imply that the pills are dangerous for the lives of the users. This feeling has been consolidated by some of our learned leaders who go around alleging that the U.S.A. is using

African women for testing the safe use and effectiveness of the birth pills. In other words their women have not started using these pills as yet. In view of these facts the response to the call for family planning and birth control has met with a lot of hostility. The end result has been abstention from the use of these methods. For example, in 1969 there were 2,231,000 women of child-bearing age (15-49 years). Of these only about 102,640 attended family planning clinics at least once in 1969 (ref. 4). This is only about 5% of the total number of females of child-bearing ages in that year. Of course we need to note that some of these women could have been pregnant for most part of the year and hence there was no need for them to attend family planning clinics. Despite this possibility the above percentage is still alarmingly small.

In the developed nations the low rate of mortality, hence long life span, has been compensated by a low birth rate (demographic transition). It has been therefore possible to keep down the population growth to a manageable level. The reverse is the case in the developing countries. Due to the advances in medical science people in the developing countries now live longer than before. For example in 1960 the

average life expectancy of a Kenyan African was 37.5 years on average while according to 1969 estimates the figure had gone up to about 50 years within a period of 9 years. However, the birth rate is increasing very fast. This has led to a predominantly young population in this country and the developing countries in general. Table 2.8 illustrates this point.

Table 2.8: The Number of People at Various Age Groups by Region

(Figures given in %)

Region	Age-Group	1960	1980*	2000*
East Africa	0 - 14	41.7	41.3	41.7
	15 - 64	55.5	55.7	54.7
	65+	2.7	3.0	3.4
Western Europe	0 - 14	23.8	22.5	23.0
	15 - 64	65.0	63.0	63.0
	65+			

* Projections

Source: Population and Food Supply,
Freedom from Hunger Campaign,
Basic Study No. 7, U.N.O.

From the above table it is evident that a country like Kenya with so many dependents cannot escape the problem of food shortage. In other words,

famine, starvation and malnutrition are likely to be rampant in the country and indeed it is true in this country. The reason is obvious, these dependents consume but do not produce. It is therefore possible that most of them are likely to have very little to eat and if such a situation continues over a long period of time, they are likely to be weak and die earlier. It is in this respect that I consider the rapid population growth in this country as a contributor to the national high mortality rate hence short life expectancy.

2.3.2 Malnutrition: The Kenyan economy is predominantly agricultural, and our agricultural output is above average by African standards. Grains compose the major component of our output. These are crops like maize and millet. The others are cash crops (coffee, tea and cotton). However, we produce at the same time quite a good amount of protein food crops i.e. beans and peas. Besides these, we rear large numbers of cattle which provide us with dairy products as well. In view of this, we are not all that badly off, as far as protein food items are concerned compared to other African countries like Tanzania. Of course I recognize the fact that despite this comparative advantage over many African countries we are still short

of protein food items, partly due to the level of our economic development (a function of our historical background and the geographical position of our country), and partly due to the rapid growth in population.

Many people in this country do not know the importance of protein in our bodies hence fail to see its significance in our diets. Based on a brief survey which I conducted and completed, whose results are given in the appendix at the end of this chapter, I discovered that malnutrition has its highest death toll in Nyanza Province of Kenya. Incidentally the Province has the highest annual output of beans and peas which are the cheapest protein food items that Kenyans can afford at present. The problem with these people (the Luos) is that they hate meals dominated by beans and peas. Their main argument is that such meals make them weak and inactive. Central Province presents a good contrast to Nyanza, even though we must not forget to note the imbalance in the distribution of medical facilities between the two Provinces. The majority of Kikuyus like meals dominated by beans, peas and English potatoes. As a result of this, the number of people suffering from malnutrition is likely to be much lower than in Nyanza as will be the deaths due to malnutrition.

However, it must be noted that in places like North Eastern and Eastern Provinces, protein food items are obviously scarce apart from the small quantity of dairy products i.e. milk that these people obtain from their poorly fed cows and goats. There are a few cases where malnutrition could be attributed to customs and traditions. In the survey I have cited above (see the appendix at the end of this chapter), I found that about 3.33% of the total registered deaths in 1972 and 1973 were due to malnutrition (see blood diseases). Even though the percentage is small, I believe something could still be done to reduce it to an insignificant level. I intend to elaborate on this point in my recommendations at the end of this chapter.

2.4 TRADITIONS AND RELIGION

2.4.1: Traditions: Even though I have not conducted an actual research on the various traditions and customs of all tribes in Kenya, I have a feeling based on the evidence from my own Province (Nyanza) that some of our traditions and customs tend to increase unfairly our national mortality rate. It is apparent that before our country was colonized, we had several kinds of local drugs for curing some minor diseases which were a threat to the lives of Africans at that time.

However, I need to note here that these drugs were in a number of cases incapable of curing or eliminating certain diseases, i.e. parasitic and infectious diseases.

With the advances in medical science, most of the above diseases are no longer a threat to human life in this country. On the other hand, technological advancement has tended to bring with it some new diseases that were not all that dominant in the pre-colonial epoch. For example, diseases caused by too much sugar in the body or pollution of water and air by industrial concerns. Similarly, the rate of death due to excessive drinking is today alarming mainly because such people are more exposed to various accidents especially road traffic accidents in the urban areas. All these seem to be products of technological advancements in the world today.

In any case, most of the diseases resulting from the above causes can be easily treated or cured by the use of modern drugs. The main problem at present lies with the reluctance of some Africans in this country to use modern drugs for various reasons. The situation in the rural areas is even worse. Most of the rural population especially people of the age

40 years and above still rely very much on the local traditional methods of curing certain diseases. There is no doubt that some of these local drugs used to be quite successful in curing certain diseases in the past. However, the recent technological advances have tended to complicate the curing process of some of these diseases, especially if one tries to use the traditional local drugs. In the rural areas very few people take pains to send a patient to a health centre in order to have the disease diagnosed. Very often a patient with a serious stomachache is most likely to be rushed to a village medicineman (witchdoctor) rather than to be taken to a health centre. The relatives of such a patient believe that he has been bewitched by say his step-father with whom they might have had a recent quarrel over some piece of land. They do not realize that such stomach trouble could be the result of some dirt or poisonous food items that were eaten by the patient and that such a case ought to be reported to the medical authorities i.e. medical doctor so that the patient would receive the relevant treatment. In many cases, despite the attempts of the bogus village medicinemen, the patients eventually die. Large numbers of deaths in this country fall under this category. In my view such untimely deaths which

increase our national mortality rate are attributable to some of our customs and traditions.

There are also Africans particularly in the rural areas, and even in the urban centres who believe that the modern drugs tend to shorten a person's life span and hence they try to abstain from using them. Of course this applies to some particular drugs and it is not therefore fair for one to generalize. Such practices or beliefs lead to more and more untimely deaths in this country.

A good example of the destructive effects of traditions and customs is the Nyanza case on the Western part of Kenya last year when the Cholera epidemic hit many parts of the Province. It is well known that Cholera can spread at almost the 'speed of light'. It can be immediately passed on to the next unaffected person. The government therefore ruled that people who die of the disease should not be given a formal burial ceremony as is customary in the Luo community. In fact the government wanted such dead bodies to be burned and not buried. According to the Luo traditions the two directives were in serious conflict with their tribal norms.

Given the above situation people whose relatives contacted the disease used all tactics to keep the matter secret, thus frustrating the government's directives. In many cases deaths were never reported to the medical authorities lest the relatives of the deceased are victimised. The official procedure was that once a Cholera victim had been handed over to the medical authorities, his relatives would only see him if he recovers. They were not allowed to see him even during the time of his hospitalization and if he happened to die no relative would see his body, not to mention the burial ceremony. People having learned this, kept all Cholera cases secret. The end result was that certain families were nearly wiped out by the disease as it jumped from a victim to another person in the family. This is a clear case where some of our traditions contribute significantly to the national mortality rate and short life expectancy.

2.4.2. Religion: One cannot forget the contribution made by certain religious norms to our national mortality rate. There are quite a few religious groups which tend to discourage their members from availing themselves for medical treatment when they fall sick, nor do such religions permit

such patients to take any medical drugs. Two examples of such religions are "Legio-Maria" and "Pentecoastal Assembly". The former has at times very extreme restrictions in the sense that any member found going against these norms i.e. going in for medical treatment, can be suspended from the church. The latter is moderate in its implementation of its norms. In other words, they do not go to the extent of suspending somebody found contravening their regulations. However, such people are seriously rebuked and scorned by their fellow members particularly the church leaders.

In my opinion, both practices are irrational and baseless and only encourage untimely loss of lives or at times lead to uncalled for morbidity among Africans in this country. The rationale behind these practices is the false belief that the most effective and Godly method of treating a person is by offering only prayers to the Almighty. In other words, anything made by man should not be used in the curing process. The result is the increased number of deaths and morbidity which augment the national mortality and morbidity rates. Of course I have only given two examples but in real terms there are several religions whose norms discourage the use of

modern drugs. In my opinion, the norms of such religions are detrimental to human life and as such increase unfairly the mortality rate of Kenyans. I intend to ~~come~~ back to this point in my recommendations at the end of this chapter.

2.5 ROAD TRAFFIC ACCIDENTS

2.5.1 The National Overview: Road traffic accidents represent one of the leading factors responsible for the high death rate in the world at present particularly in the developed nations. For example, in 1966 the World Health Organisation (W.H.O.) reported that for the entire world, more than 100,000 people were killed yearly in road traffic accidents, and for every person killed, 10 to 15 people were seriously injured while 30 to 40 people were slightly injured (ref. 5).

It is true to say that mortality and morbidity rates from transmissible diseases are known to be declining in Kenya. However, mortality and morbidity rates due to road traffic accidents are increasing. The complete picture of mortality and morbidity is hampered by the scarcity and unreliability of the available sources of such information. However, a partial view of the problem

can be approximated by using the available data and a careful analysis of epidemiological components. For example, the problem is clarified by studying who the victims are, the kind of vehicles involved in the accidents and the environment in which such road traffic accidents occur. Table 2.9 shows figures for population, registered vehicles, total deaths and other forms of casualties in Kenya during the period 1970 to 1973. Mortality and morbidity rates are very useful indicators of the trends from year to year in a country like Kenya. Table 2.9 offers two very important rates relating to the number of deaths from road accidents to the number of motor vehicles and to the number of persons in the country during the surveyed period. It is unfortunate that the data have not been classified according to sex and age groups. The importance of such a classification is that it facilitates attempts to identify specific groups exposed to more risk so that appropriate corrective measures can be taken. In general however, mortality rates due to road traffic accidents have tended to increase over the reviewed period and there is enough evidence to show that the trend is likely to continue unless special attempts are made to reduce road traffic accidents in this country.

**Table 2.9: KENYA: Traffic Accident Statistics for
1970-1973 Including Comparative Data for
Population, Registered Deaths, and Vehicles
for the same Period**

Descriptive Classification	1970	1971	1972	1973	Total
Population x 1000	11225	11671	12067	12483	68597
Registered Vehicles	137271	149750	15969	164222	848886
Total Deaths	42917	47325	46884	46992	235572
Total Number of Accidents	5163	6042	6613	6789	33314
Total Number of Persons Killed in Traffic Accidents	944	1046	1331	1402	6143
Total Number of People Killed and Injured in Traffic Accidents	7756	8555	10528	10997	49717
Ratio of Fatalities to Total Deaths x 100	2.2	2.2	2.8	3.0	2.6*
Ratio of Fatalities to Persons Killed and Injured x 100	10.9	12.2	12.6	12.7	12.4*
Fatalities per 1000 Vehicles	6.8	6.9	8.3	8.5	7.2*
Fatalities per 100,000 Persons	8.4	8.9	11.0	11.2	9.0*
Total Number of Accidents per 100,000 Persons	46.0	51.8	54.8	54.4	48.6*

Source: Kenya Statistical Abstract, 1974

- * These ratios are computed by the author from the above figures.

An attempt has been made in the table below (2.10) to compare road traffic fatalities in Kenya with some of the selected developing countries. These are 1968 data so one would expect that the situation could be quite different now (either worse or better). The comparison is made with respect to the ratio of vehicles per 1000 persons. Fatalities per 10,000 people and fatalities per 1000 vehicles. It is interesting to note that whereas Malawi and Uganda had only 4 and 6 vehicles per 1000 persons respectively, their fatalities per 1000 vehicles were higher than Kenya (8.9 and 10.1 respectively) which has a higher number of vehicles per 1000 persons (II). This gives one the impression that Kenyan drivers and road users are smarter than their counterparts in the two countries. It could also mean that more efforts have been made in Kenya to reduce deaths due to traffic accidents by the government than in the other two countries. Table 2.10 given below illustrates the above point.

**Table 2.10: KENYA: Road Traffic Fatalities
Compared with Some Developing
Countries - 1968**

Country	Vehicle per 1000 persons	Fatalities per 10,000 persons	Fatalities per 1000 vehicles
Barbados	73	15.5	2.1
Cyprus	11	18.8	1.7
Guyana	45	17.2	3.9
Hong Kong	28	8.8	3.2
Malawi	4	3.5	8.9
Uganda	6	6.6	10.1
Zambia	18	14.9	8.3
Kenya	11	6.6	5.9

Source: Jacobs, G.D. & Hurchinson, P.:
A Study of Accident Rates in
Developing Countries. Transport
Research Laboratory, L.R. 546 (1973),
Department of the Environment, London.

Another analysis has been made of the type of vehicles mainly responsible for road traffic accidents in which so many lives are lost in Kenya. This covers the period between 1970 and 1975. It is important to note that motor-cars alone were responsible for about 49.8% of all the road traffic deaths during the period. Lorries and taxis contributed about 16.9% towards the total deaths. All these and others have been illustrated in table 2.11 below.

Table 2.11:

Number of Road Traffic Accidents Classified
by Type of Vehicles in Kenya
1970 - 1975

Vehicles	1970	1971	1972	1973	1974	1975	TOTAL	%
Motor Cars	2334	2988	3033	3252	3205	3540	18552	49.8
Lorries, Buses, Mini-buses and Taxis	939	981	1172	1118	909	1191	6310	16.9
Motor Cycles and Pedal cyclists	645	572	628	587	431	349	3212	8.6
Others (Animals, Hardcarts, etc.)	1245	1501	1580	1832	1705	1333	9196	24.7
TOTAL	5163	6042	6613	6789	6250	6411	37270	100

Source: Traffic Headquarters (Kenya)

The Kenya Police Traffic Accident Section had classified 98 causes of road accidents. Of these 33 concerns drivers (including motor cyclists). The figures are broken down as follows: driving at excessive speed, overtaking improperly, misjudgement of clearance or distance ahead, losing control, errors of judgement or negligence and failing to keep to the proper lane. All these are illustrated in table 2.12 on the next page.

From table 2.12, drivers seem to be responsible for nearly 50% of the total road traffic accidents in this country. In trying to reduce road traffic accidents, they ought to be our first target. Similarly the percentage of pedestrians is also quite surprising and no doubt something should be done to reduce this percentage.

A brief analysis is also given below of traffic deaths by broad age groups. The reader will notice that youths (those under 16 years) constituted about 86.4% of the total deaths due to road traffic accidents during the surveyed period. The data are given in table 2.13.

Table 2.12: Causative Factors in Road Traffic Accidents in Kenya (1970-1975)

Factors of Causation	1970	1971	1972	1973	1974	1975	TOTAL	%
Drivers (including Motor cyclists)	2438	3006	3460	3081	2803	3342	18130	47.4
Pedestrians	1289	1435	1448	1851	1596	1524	9413	23.9
Pedal-cyclists	362	425	392	484	342	312	2317	6.1
Vehicle defects	276	324	365	387	331	350	2033	5.3
Road defects	113	102	121	129	54	98	618	1.6
Others (Passengers, Animals, Obstraction, Weather, etc.)	685	750	826	857	509	1356	5983	15.7
TOTAL	5763	6042	6613	6789	6635	6982	38224	100

Source: Kenya Police Traffic Headquarters.

**Table 2.13: Deaths due to Road Traffic Accidents
by Broad Age Groups in Kenya
(1974 - 1975)**

Age Group	1974	1975	Total*	%**
Under 16 years	1183	1145	2328	86.4
Over 16 years	174	193	367	13.6
TOTAL	1357	1338	2695***	100

Source: Kenya Police Headquarters

- * These are figures for the two years 1974 and 1975
- ** These figures are obtained by dividing the figure for total for each age group by the total deaths in the two years
- *** Total deaths for the two years for all age groups.

It is likely that the figure 86.4% is mainly composed of school children who know very little about how to use the roads safely especially crossing.

Discussion: The data analysed and presented above only offer a partial picture of the road traffic problem in this country. It is true that vehicle owners constitute a small percentage of the entire Kenyan population. These are in most cases the educated elite and the wealthy individuals. However,

their loss to the country is a blow that Kenya cannot withstand. In other words the country's economic development depends very much on the contributions of such people even though they are in the minority. In any case even people who do not own any vehicles lose their lives through road traffic accidents to a very large extent. For example, in table 2.13 above, out of all the road traffic deaths between 1974 and 1975, youths (non-vehicle owners) constituted about 86.4% of the total deaths. This is therefore a national problem not confined to any group of people. It is quite sad to notice from the above tables that the number of road accidents is increasing from year to year.

Drivers and Passengers: Drivers cause road traffic accidents merely due to their inability to respond timely to their environment while driving on the road. Table 2.12 shows that during the reviewed period (1970 to 1975) drivers were responsible for about 47.4% of the total road traffic accidents. The main contributing factor to the above situation seems to be the misjudgement of road clearance ahead. In general, some of the main points found from the research are:

1. **Fatigued, being asleep or sleepy while driving thus failing to give timely and relevant traffic signals or observe road traffic signs.**
2. **Inexperience with vehicle, errors of judgement or mere negligence.**
3. **Excess speeding, overtaking improperly, crossing road junctions carelessly, losing control and misjudgement of clearance ahead.**
4. **Skidding and dazzled by lights of an approaching vehicle.**
5. **Influence of drugs and strong drinks.**

With regard to passengers in most cases they are victims of circumstances. In other words, their deaths in most cases can be attributed to the errors made by the drivers. Of course in a few cases, passengers fall from moving vehicles due to overloading or trying to jump in or out of a moving vehicle without due care. Deaths arising from such practices cannot be attributed to the vehicle drivers.

Pedestrians: The major causes of road traffic accidents due to pedestrians can be attributed to their 'heedlessness' to traffic signs i.e. stepping or walking or running off footpaths or at times on the main road. Table 2.12 shows that about 23.9% of road traffic accidents during the surveyed period could be attributed to pedestrians. In most cases, such pedestrians use the road while drunk hence are incapable of heeding to the necessary road signs especially while crossing the road.

2.5.2 Nairobi Area: A fair amount of statistical information about road traffic accidents in Nairobi can be easily obtained from both the Nairobi Area Police Traffic Headquarters, and the City Council of Nairobi. The information offers quite a good number of characteristics (age, sex, ethnic groups, occupation and education) of drivers; the number and types of vehicles; the number of road traffic accidents and their distribution according to place, time and specific causes; the number of characteristics of the victims (killed and injured) and their distribution; education; economic and social status.

Road traffic accidents in Nairobi have been given in table 2.14. The fatality rate of 41.4 deaths

per 100,000 persons due to road accidents during the four years is definitely alarming when compared to the national rate of about nine deaths per 100,000 persons during the same period (see table 2.9). At the same time the number of casualties due to road traffic accidents of about 370 per 100,000 persons, far exceeds the national average of about 49 per 100,000 persons during the same period. One may wonder why people continue to flow into the city given the significantly higher rate of death and casualty due to road accidents in the city. Perhaps the reason could be the fact that nobody ever knows in advance when he is going to die. In view of this all these death signals in the city seem not to scare job seekers.

The entire picture of mortality and morbidity patterns is hampered by the unreliability of the available statistical data obtainable in this country. However the statistical ratios given above throw some light on the dimension of the problem. Table 2.14 on the next page illustrates the situation of road traffic accidents in Nairobi during the period reviewed (1970-1973).

Table 2.14: Nairobi Traffic Accident Statistics for 1970-1973, Including Comparative Data for Population and Registered Deaths for the Same Period

Descriptive Classification	Y E A R S				Year Total
	1970	1971	1972	1973	
Population x 1000	534	566	597	629	2326
Total Deaths	4663	4648	4348	5290	18949
Total Number of Traffic Accidents	1825	2359	2239	2165	8588
Total Number of Persons Killed and Injured through Traffic Accidents	2113	2506	2690	2676	9985
Ratio of Fatalities to Total Deaths x 100	4.1	5.0	4.3	5.3	5.0
Ratio of Fatalities to Persons killed and Injured x 100	8.9	8.9	7.0	7.1	9.6
Fatalities per 100,000 Persons	35.4	33.4	31.7	30.0	41.4
Total Number of Traffic Accidents per 100,000 Persons	341.8	416.8	375.0	344.2	369.0
Total Number of Persons killed through Road Traffic Accidents	189	233	252	282	956

Source: Traffic Headquarters, Nairobi Area.

The next table given below shows figures for the numbers of people killed and injured in road traffic accidents according to the levels of severity in Nairobi during the period 1970-1975. The overall trend for each category is increasing from year to year. About 34.9% of all the accidents during the period were found to be fatal and serious while the remaining about 2/3 involved slight injuries which required little or no medical attention. Table 2.15 below summarises the situation.

Table 2.15: Distribution of Persons (Killed and Injured) in Road Traffic Accidents in Nairobi 1970-1975

Year	Fatal		Serious		Slight		Total
	No.	%	No.	%	No.	%	
1970	189	8.9	503	23.8	1421	67.3	2113
1971	233	9.3	626	25.0	1647	65.8	2506
1972	252	9.4	672	25.9	1766	66.0	2690
1973	282	10.2	764	28.6	1630	60.9	2676
1974	262	11.8	607	27.4	1347	60.8	2216
1975	229	8.1	626	22.1	1975	69.8	2830
TOTAL	1447	9.6	3798	25.3	9786	65.1	15031

Source: Traffic Headquarters, Nairobi Area

Similarly, an analysis of traffic accidents by month of year has been done. The monthly mean values over the five years study period of persons involved in road traffic accidents by levels of severity are given in table 2.16. (see next page).

Another analysis has been done by the author of road traffic fatalities by classes of persons in Nairobi for the surveyed period (1970-1975). As the reader will notice, pedestrians constitute about 62% of the total deaths due to road traffic accidents in Nairobi over the surveyed period, followed by passengers (15.7%) and vehicle drivers (11.1%). These are illustrated in table 2.17 given below.

Table 2.17: Road Traffic Fatality by Class of Persons in Nairobi (1970-1975)

Class of Persons	1970	1971	1972	1973	1974	1975	TOTAL	%
Pedestrians	105	132	169	159	166	159	890	62.1
Motor Cyclists	4	6	19	7	3	4	43	3.0
Pedal Cyclists	20	24	22	25	8	17	116	8.1
Passengers	21	47	29	54	44	30	225	15.7
Vehicle Drivers	15	24	13	37	41	29	159	11.1
TOTAL	140	233	252	282	262	239	1433	100

Source: Traffic Headquarters, Nairobi Area.

Table 2.16: Annual Mean Values of Persons (Killed and Injured) in Road Traffic Accidents by Month of Year in Nairobi 1968-1972

Month	<u>FATAL</u>		<u>SERIOUS</u>		<u>SLIGHT</u>		<u>TOTAL</u>	<u>GRAND</u>
	Total 1968- 1972	Monthly Mean	Total 1968- 1972	Monthly Mean	Total 1968- 1972	Monthly Mean	Total 1968-1972	1968-1972 Mean Annual
January	67	13.4	201	40.0	547	109.4	815	163.0
February	67	13.4	216	43.2	546	109.2	829	165.8
March	82	16.4	241	48.2	568	113.6	891	178.2
April	65	13.0	211	42.2	511	102.2	787	157.4
May	82	16.4	213	42.6	291	118.2	886	177.2
June	74	14.8	214	42.8	705	141.0	993	198.6
July	68	13.6	211	42.2	651	130.2	930	186.0
August	89	17.8	178	35.6	578	115.6	845	169.0
September	85	17.0	214	42.8	601	120.2	900	180.0
October	98	19.6	246	49.2	620	124.0	964	192.8
November	89	17.8	240	48.0	575	115.0	904	180.8
December	77	15.4	254	50.8	586	117.2	917	183.4
TOTAL	943	16.1	2589	43.2	7079	117.9	10611	176.9

Source: Dr. J.W.K. Duncan, Dr. L.P. Noel and Mr. S.S. Soin:
A Review of Road Traffic Accidents in Nairobi, Kenya, 1975.

The fatalities due to road traffic accidents have increased from 1970 through 1973 in Nairobi and when compared with total deaths the ratios are even more marked than for the country as a whole. Before 1970 fatal accidents were recorded by hospitals, Traffic Police Department and City Council Mortuary. This has made it a bit difficult to obtain reliable data. However, since 1971 the records of all fatal accidents at the City Mortuary have been up-dated and are now more representative of the actual situation than before.

The author has also made an analysis of traffic accident deaths by sex. The data of fatalities due to road traffic accidents for the reviewed period have been given in table 2.18 here below. A ratio of 5:1 for males to females can be noted. This tends to confirm the impression that females are less exposed to road traffic accidents than males.

Table 2.18: Road Traffic Fatalities by Sex
 for Nairobi (1968-1972)

Sex	1968	1969	1970	1971	1972	Total
Male	98	120	157	188	222	785
Female	31	20	32	45	30	158
Ratio of Male deaths to Female deaths	3:2	6:0	4:9	4:2	7:4	5:0

Source: City Mortuary Records

The author also adventured to do an analysis of fatalities in Nairobi by age groups. The distribution by age group is shown in table 2.19 below. The groups 25-30 and 40-49 years show a very high fatality rates of 35.5% and 24.2% respectively. It is apparent that the people in these groups drive vehicles most and constitute a higher percentage of the working class and educated elite in this country.

Table 2.19: Fatalities by Age Group for Nairobi
1968 - 1972
 (Only Recorded Deaths are Considered)

Age Group	1968	1969	1970	1971	1972	Total	%
0 - 4	4	4	5	6	4	23	2.4
5 - 14	12	11	21	26	23	93	9.9
15 - 24	16	20	31	31	33	131	13.9
25 - 39	47	50	72	95	109	373	39.5
40 - 59	27	37	50	46	68	228	24.2
60+	23	18	10	29	15	95	10.1
TOTAL	129	140	189	233	252	943	100.0

Source: City Mortuary Records.

During the survey the author did another analysis of fatalities by occupation. The division into occupational status of fatality figures due to road traffic accidents in Nairobi during the review

period is shown in table 2.20. It is apparent from the analysis that road traffic accidents eliminate those whose brains are mostly desired for the country's economic development. Students and children together with the civil servants comprise about 29% of all fatalities. The professional, business and administrators constitute about 17.6% of all fatalities. Table 2.20 is given on the next page.

Discussion: Five classes of persons have been defined as road users in the city. These are: pedestrians, motor-cyclists, pedal cyclists, vehicle passengers and vehicle drivers. Pedestrians have the highest death toll in road traffic accidents in the city. The situation is illustrated in table 2.17 above. It is therefore very urgent that corrective measures be aimed at first, and foremost to these road users, and secondly to the passengers so as to cut down the level of deaths due to road traffic accidents in the city. An analysis of fatalities by age group shows that deaths within the age group 15-59 years contributed to 77.6% of all recorded fatalities during the reviewed period (see table 2.19) above. The highest percentage of 39.5 involved people who are badly needed for our economic development. These are people within the age group

Table 2.20:

Road Traffic Fatalities by Occupation for Nairobi
1968 - 1972

Occupation	1968	1969	1970	1971	1972	Total	%
Professional	12	9	9	27	23	80	8.5
Business	7	13	8	20	14	62	6.6
Civil Service	11	18	29	22	39	119	12.6
Administrator	7	5	5	5	2	24	2.5
Clerical	5	5	5	8	12	35	3.7
Student and Children	19	22	32	45	37	155	16.4
Transport and Communication	10	10	29	16	28	93	9.9
Housewives	12	11	8	14	11	56	5.9
Craftsmen (including Farmers)	7	13	20	17	19	76	8.1
Manual	8	18	17	22	30	95	10.1
No Occupation	11	9	18	29	32	99	10.5
No Information	20	7	9	8	5	49	5.2
TOTAL	129	140	189	233	252	943	100

Source: City Mortuary Records.

of 25-39 years. This group is composed of mainly University graduates in various disciplines and professions. These people tend to acquire motor vehicles at a faster rate and their high death rate due to road traffic accidents could be attributed to their lack of driving experience, youthful enthusiasm for speed and adventure, rashful behaviour, impatience and immaturity. In quite a few cases some of them acquire driving licences without passing any driving test. They simply buy the licences and drive.

However, the city traffic branch with the cooperation of the City Council, have attempted to work out a definite road traffic programme to help curb the rate of road traffic accidents in the city. These include among others:

1. The establishment of traffic command unit in Nairobi in 1973 under a Commandant of Road Traffic.
2. Adherence to speed limits specific for varying types of motor vehicles.

3. The introduction of vehicle inspection centres at various points in the city to reduce and remove defective vehicles from the roads.
4. The City Council has also established as many zebra crossing points as possible and they continue to introduce others as soon as they seem appropriate.

For the above first three measures to be successful, there is a need to increase the number in the Traffic Police force. The shortage of police officers represents a bottleneck caused by the financial situation of the Kenyan government. There is a permanent shortage of developmental funds in this country. However, in order to succeed in the exercise the support of the general public is imperative.

2.6 RECOMMENDATIONS

In the major sections above five factors responsible for the high death rate and short life span among Kenyans (particularly Africans) have been discussed in detail. These sections are: 2.1, 2.2, 2.3, 2.4, and 2.5 (see table of contents). In giving my recommendations, I shall use the same order.

Based on the evidence given in section 2.1, I would like to make one recommendation:

1. Even though the government needs to increase the number of medical personnel and the volume of medical facilities, I feel that the imbalance in the distribution of the available medical facilities and personnel ought to be corrected as soon as possible. I have already pointed out and proved statistically in section 2.1 that there is an evident imbalance in the distribution of medical resources in this country. I therefore recommend that the government should take the necessary steps to rectify the situation.

Similarly, on the basis of my discussion in section 2.2, I wish to make the following recommendations:

2. There is evidently an urgent need for the government to reverse the unfortunate trend of the massive rural-urban migration in this country. There is no doubt that the above practice is the root of many social ills in our society i.e. robbery with or without violence, theft and prostitution, especially

in the urban centres. In an attempt to solve this problem, there is a need for the government to change, first and foremost, the present educational system. The current educational system tends to orientate our youths for white-collar jobs i.e. clerical as opposed to farming or agriculture in general. It is therefore high time these young people were given the relevant educational foundation for the country's sustained economic development. In my view, there seems to be no option to this, apart from intensive agricultural education and training. The teaching of agricultural subjects should start at primary school level (standard one). Secondly, the government should launch extensive programmes of rural development. It should increase the supply of agricultural equipment and encourage the establishment of cooperatives. It is also necessary for the government to guarantee reasonable earnings or wages for youths working in the farms. This will act as an incentive to stay back in the rural areas and reap these benefits. There is no doubt that if these can be done effectively,

the number of young people running into towns would go down to a manageable level. However, I wish to re-emphasize the urgent need to change the current educational system to suit the manpower requirements of a developing economy.

Based on the evidence given in section 2.3 above, I would like to make two recommendations:

3. The rate of population growth in this country is alarmingly high by world standards. There is hence a need for both the government and the voluntary private organizations to take the appropriate steps to reduce the rate of population growth. Massive family planning and birth control programmes should be intensified all over the country and not only in the urban centres as the current practice seems to be. My brief survey in my own home district (Siaya) has shown that the rural couples are not given adequate education on family planning and birth control methods. This is quite unfortunate because it is these people who need these services most. There is enough evidence to prove that rural

couples tend to have more children than their economically well placed urban counterparts. I have also talked about the misconception about birth control and family planning. It is only an intensive campaign in the rural areas that could reduce if not eliminate these false beliefs from the minds of the rural couples.

4. I would also like to suggest that the government and any other willing organizations take some steps to educate our people on the need for a good balanced diet. In the exercise, special emphasis should be put on the use of proteins in our bodies. Thousands of people, especially children, die because of malnutrition in this country. The diseases are caused basically by the lack of proteins in the body of a person. In some cases, it is not that such people cannot afford protein food items, but it is their ignorance of food values. In other words, such people have no idea about the composition of a balanced diet nor do they know the use of proteins, starch and vitamins in food items. It is my feeling that such

people need some elementary knowledge of a balanced diet. Sometimes people suffer from malnutrition due to some misleading tribal beliefs. I have already cited the Luos of Nyanza Province as an example in this respect.

In response to my investigations whose results are discussed in section 2.4 above, I would like to make two tentative recommendations:

5. It is my feeling that the time is long overdue for most of the tribes in this country to review, if not abandon, some of their traditions and customs. I believe that the government has again a special role to play in this exercise given that it is the most powerful and effective change agent in our society. I would hence suggest some kind of campaign sponsored by the government to discourage people who still adhere to certain unhealthy traditional practices and customs. Most Kenyans would not tolerate a situation like the one I did narrate about the situation in Nyanza Province in 1974 when Cholera invaded the Province. The government

should not allow some of these unhealthy customary practices to go unquestioned under the umbrella of "African Culture". It ought to isolate them and eliminate them as soon as possible. There should be no compromise where human life is involved.

6. With regard to the religions whose practices are detrimental to human life, hence the life of the entire nation, I would suggest that their leaders be given a stern warning to abandon such unhealthy norms. Of course this should happen after all measures to educate such people have failed. But definitely something must be done to stop such religions from discouraging their members from going in for medical treatment or from using prescribed medical drugs.

In response to the detailed research I conducted on road traffic accidents in this country, whose results are discussed in section 2.5 above, I feel it is necessary for me to give two recommendations

that if adopted, could significantly reduce the rate or number of deaths due to road traffic accidents in this country. These are:

7. From table 2.12 it is clear that drivers (vehicle drivers) were responsible for about 47.4% of all the total deaths due to road traffic accidents in Kenya over the reviewed period. My own conclusion (after conducting interviews with both the Police officers in charge of road traffic accidents for the entire country, and his counterpart in charge of Nairobi area) is that drivers cause road accidents for two main reasons. First, is driving while under the influence of drinks. Of course I do not have the relevant data to support the point, but it is as I have said my own conclusion I reached after my discussions with the two traffic police executives. The present system of establishing whether a person has enough alcohol to render him incapable of driving safely leaves a lot to be desired. Admittedly, it is very difficult to calculate drunkenness manually or otherwise. I would therefore suggest that certain definite amount of alcoholic content

in the blood of a driver be defined as a minimum and beyond that such a driver should be considered incapable of safe driving. Suspected drivers would then be ordered to blow some air into a special type of elastic tube. The air would then be tested in order to determine the amount of alcohol in the blood. I must note that this is not a simple procedure. It will involve a lot of work especially for the traffic police. However, it has been successful in other countries i.e. U.S.A., ~~it~~ it is perhaps a good idea to try it in Kenya and see the results.

The second reason for irresponsible driving is the lack of valid driving licences or driving experience. It is today public knowledge that driving licences can easily be bought without taking any driving lessons, not to mention passing a driving test. The practice is rampant in the country and it is certainly a difficult problem to handle. Both the buyer and the traffic police (the sellers) are to blame, particularly the sellers (traffic police officers). I would hence

suggest that the traffic police authorities review their licencing system with a view to reduce if not eliminate the corruptive element in the system.

Pedestrians are the second group of people responsible for road traffic accidents (see table 2.12). Their problem is the most difficult to handle. However, I would like to suggest the development of a social education programme aimed at pedestrians so that they can improve their knowledge of how to walk on the roads safely, especially while crossing.

8. Pedal cyclists come third in the list of poor road users. For them I would recommend that they be given some kind of cycling test more or less as that given to motor vehicle drivers. This should be in terms of the basic knowledge required for safe road use. There is no significant difference between a pedal cyclist and a motor vehicle driver especially in terms of their chances of causing a road accident. I therefore suggest that pedal cyclists be given a light cycling test on the basic elements of safe cycling i.e. keeping to the right lane and giving timely signals

to other road users. They should also know the meaning of all road signs and signals. This is particularly necessary in the urban areas, especially Nairobi where road signs and traffic signals are numerous. Following the right lanes at various points especially roundabouts is also important. Pedal cyclists tend to make basic road traffic blunders on the above two areas (keeping to the right lane and observing road signs and signals). It is in view of this that I recommend a mini-cycling test for them. I believe that this would reduce to an extent the number of road traffic accidents caused by pedal cyclists in this country.

It is my hope that if some of the above recommendations are accepted and implemented, our national mortality rate would go down to some extent, hence the national average life span which was 50 years according to 1969 estimates (ref. 1) would go up.

A summary of the various causes of deaths (diseases) in this country has been given in the appendix at the end of this chapter. The analysis is

based on the sample survey I conducted at the office of the Registrar General here in Nairobi using the death records for the entire country for 1972 and 1973. In the exercise I used "Area Sampling". The analysis was made of all causes of deaths for all age groups. Separate tables have been prepared for females and males. A third table tries to compare my sample results and the population results. Population in the above context refers to the actual total number of registered deaths for the two years. Even though I have not conducted a chi-square test to determine the close of fitness of my sample and the actual population as defined above, the table shows that my sample was a good approximation of the population. It is however surprising to note that while parasitic and infectious diseases were responsible for about 39.5% of all deaths at all ages, they were responsible for about 50% of all infant deaths. The two figures above are obtained as follows: $(38.3 + 41)/2 \cong 39.5\%$ (see row 1-44 for both table 2.21 and 2.22) and $2614/5466 \cong 50\%$ (where 2614 is the total infant deaths caused by parasitic and infectious diseases and 5466 is the total death figure for all infants caused by all the diseases). All these figures are given in the appendix at the end of this chapter. Infants in this context refer to those within the age group (0 - 4). It is also

interesting to note that while accidents as defined in the last two codes are responsible for about 9% of the total male deaths the corresponding figure for females is only 3.8% (see the two tables in the appendix). This can be explained by the fact that women tend to stay at home while men go out for various reasons hence are more exposed to accidents especially road traffic accidents. In general we can observe that infectious and parasitic diseases have the highest death toll followed by diseases of the respiratory system. I have ignored symptoms, senility and ill-defined conditions (12%) because the causes of such deaths are not definite.

11-01	Diseases of the circulatory system
11-02	Diseases of the digestive system
11-03	Diseases of the genitourinary system
11-04	Diseases of the respiratory system
11-05	Diseases of the skin, subcutaneous tissue and hair
11-06	Diseases of the sense organs and special sense
11-07	Diseases of the musculoskeletal system
11-08	Diseases of the nervous system
11-09	Diseases of the endocrine system
11-10	Diseases of the immune system
11-11	Diseases of the eye
11-12	Diseases of the ear, nose and throat
11-13	Diseases of the mouth and salivary glands
11-14	Diseases of the skin, subcutaneous tissue and hair
11-15	Diseases of the sense organs and special sense
11-16	Diseases of the musculoskeletal system
11-17	Diseases of the nervous system
11-18	Diseases of the endocrine system
11-19	Diseases of the immune system
11-20	Diseases of the eye
11-21	Diseases of the ear, nose and throat
11-22	Diseases of the mouth and salivary glands
11-23	Diseases of the skin, subcutaneous tissue and hair
11-24	Diseases of the sense organs and special sense
11-25	Diseases of the musculoskeletal system
11-26	Diseases of the nervous system
11-27	Diseases of the endocrine system
11-28	Diseases of the immune system
11-29	Diseases of the eye
11-30	Diseases of the ear, nose and throat
11-31	Diseases of the mouth and salivary glands
11-32	Diseases of the skin, subcutaneous tissue and hair
11-33	Diseases of the sense organs and special sense
11-34	Diseases of the musculoskeletal system
11-35	Diseases of the nervous system
11-36	Diseases of the endocrine system
11-37	Diseases of the immune system
11-38	Diseases of the eye
11-39	Diseases of the ear, nose and throat
11-40	Diseases of the mouth and salivary glands
11-41	Diseases of the skin, subcutaneous tissue and hair
11-42	Diseases of the sense organs and special sense
11-43	Diseases of the musculoskeletal system
11-44	Diseases of the nervous system
11-45	Diseases of the endocrine system
11-46	Diseases of the immune system
11-47	Diseases of the eye
11-48	Diseases of the ear, nose and throat
11-49	Diseases of the mouth and salivary glands
11-50	Diseases of the skin, subcutaneous tissue and hair
11-51	Diseases of the sense organs and special sense
11-52	Diseases of the musculoskeletal system
11-53	Diseases of the nervous system
11-54	Diseases of the endocrine system
11-55	Diseases of the immune system
11-56	Diseases of the eye
11-57	Diseases of the ear, nose and throat
11-58	Diseases of the mouth and salivary glands
11-59	Diseases of the skin, subcutaneous tissue and hair
11-60	Diseases of the sense organs and special sense
11-61	Diseases of the musculoskeletal system
11-62	Diseases of the nervous system
11-63	Diseases of the endocrine system
11-64	Diseases of the immune system
11-65	Diseases of the eye
11-66	Diseases of the ear, nose and throat
11-67	Diseases of the mouth and salivary glands
11-68	Diseases of the skin, subcutaneous tissue and hair
11-69	Diseases of the sense organs and special sense
11-70	Diseases of the musculoskeletal system
11-71	Diseases of the nervous system
11-72	Diseases of the endocrine system
11-73	Diseases of the immune system
11-74	Diseases of the eye
11-75	Diseases of the ear, nose and throat
11-76	Diseases of the mouth and salivary glands
11-77	Diseases of the skin, subcutaneous tissue and hair
11-78	Diseases of the sense organs and special sense
11-79	Diseases of the musculoskeletal system
11-80	Diseases of the nervous system
11-81	Diseases of the endocrine system
11-82	Diseases of the immune system
11-83	Diseases of the eye
11-84	Diseases of the ear, nose and throat
11-85	Diseases of the mouth and salivary glands
11-86	Diseases of the skin, subcutaneous tissue and hair
11-87	Diseases of the sense organs and special sense
11-88	Diseases of the musculoskeletal system
11-89	Diseases of the nervous system
11-90	Diseases of the endocrine system
11-91	Diseases of the immune system
11-92	Diseases of the eye
11-93	Diseases of the ear, nose and throat
11-94	Diseases of the mouth and salivary glands
11-95	Diseases of the skin, subcutaneous tissue and hair
11-96	Diseases of the sense organs and special sense
11-97	Diseases of the musculoskeletal system
11-98	Diseases of the nervous system
11-99	Diseases of the endocrine system
12-00	Diseases of the immune system

2.7 APPENDIX

The contingency tables attached hereafter have been prepared using the United Nations codes of causes of death. These have been decoded here below:

- 1-44 Infective and Parasitic Diseases
- 45-61 Neoplasms
- 62-68 Blood Diseases
- 69-79 Diseases of the Nervous System
- 80-88 Circulatory Diseases
- 89-96 Diseases of the Respiratory System
- 97-104 Diseases of the Digestive System
- 105-111 Diseases of Gento-Urinary System
- 112-118 Diseases of Pregnancy, Child Birth and
 Puerperium
- 119-120 Skin and Musculo-Skeletal Diseases
- 121-125 Diseases of Musculo-Skeletal System
 and Connective Tissue
- 126-130 Congenital Anomalies
- 131-135 Diseases of the Newborn

Registered Deaths of Females Classified by Age Group and Cause of Death
for the years 1972 and 1973

Table 2.21:

(sample data*)

Causes of Death (Codes)	0	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85+	Unknown	Total	% of Total
	to 1	to 4	to 9	to 14	to 19	to 24	to 29	to 34	to 39	to 44	to 49	to 54	to 59	to 64	to 69	to 74	to 79	to 84				
1 1 - 44	579	589	82	43	35	27	34	40	38	34	27	32	21	40	24	28	17	20	42	27	1779	4.1
2 45 - 61	6	7	5	4	3	3	5	5	8	7	1	12	6	14	9	4	2	3	1	8	113	2.6
3 62 - 68	46	79	8	3	-	-	3	2	-	1	1	2	4	4	1	3	1	2	3	8	171	4
4 69 - 79	31	15	6	6	2	2	1	1	1	1	3	-	1	1	-	2	-	-	1	6	80	1.8
5 80 - 88	79	39	18	13	12	15	17	11	16	8	7	7	17	16	9	10	3	6	14	9	326	7.5
6 89 - 96	263	136	20	9	7	9	6	4	4	5	10	4	2	7	2	6	2	1	2	12	511	11.7
7 97 - 104	56	42	17	12	4	9	8	9	12	14	11	5	6	7	3	6	1	3	3	5	233	5.4
8 105 - 111	19	8	3	6	3	7	5	5	9	1	7	3	2	1	3	1	1	-	2	7	93	2.1
9 112 - 118	-	-	-	-	3	16	16	18	9	6	-	-	-	-	-	-	-	-	-	4	72	1.7
10 119 - 120	30	29	5	1	2	1	-	1	1	1	1	1	-	-	2	-	-	-	1	1	77	1.8
11 121 - 125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
12 126 - 130	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.1
13 131 - 135	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	179	4.1
14 136 - 137	138	83	21	14	8	12	25	20	20	22	11	18	15	20	6	21	12	15	52	26	559	12.9
15 138E-150E	7	2	6	6	1	9	11	4	4	4	5	-	4	2	1	1	1	-	-	1	69	1.6
16 138N-150N	22	14	3	5	2	4	9	1	3	1	2	1	2	4	2	1	2	3	-	4	85	2
TOTALS	1438	1043	194	122	82	114	140	121	125	105	86	85	80	116	62	83	42	53	121	137	4349	100.3

* Sample data collected by the author from the death registry.

Table 2.22:

Registered Deaths of Males Classified by Age Group and Cause of Death
for the years 1972 and 1973
(sample data*)

Causes of Death (Codes)	0	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85+	Unknown	Total	% of Total
	to 1	to 4	to 9	to 14	to 19	to 24	to 29	to 34	to 39	to 44	to 49	to 54	to 59	to 64	to 69	to 74	to 79	to 84				
1 1 - 44	719	727	124	47	42	41	41	53	40	47	56	52	46	57	54	54	24	21	25	42	2312	38.3
2 45 - 61	3	7	10	7	5	4	4	4	14	7	8	16	17	10	7	6	2	5	1	13	150	2.5
3 62 - 68	55	69	10	5	5	3	1	5	-	4	3	6	3	5	2	5	1	-	2	6	188	3.1
4 69 - 79	35	17	2	4	5	4	2	2	2	2	4	2	2	1	3	-	-	-	-	3	90	1.5
5 80 - 88	88	62	25	5	25	12	19	13	26	19	24	22	19	20	15	17	10	12	9	18	460	7.6
6 89 - 96	297	209	12	10	6	6	9	10	13	15	18	9	12	14	8	13	9	10	5	32	717	11.9
7 97 - 104	51	42	15	15	7	9	15	15	20	27	22	11	9	14	9	10	5	6	17	28	347	5.8
8 105 - 111	25	9	5	10	5	3	7	2	11	11	11	5	5	17	9	8	2	2	7	7	161	2.7
9 112 - 118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
10 119 - 120	30	35	7	6	6	1	2	1	3	4	1	2	1	6	6	3	2	1	4	1	122	2
11 121 - 125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
12 126 - 130	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6	0.1
13 131 - 135	189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	213	3.5
14 136 - 137	150	106	20	19	16	11	25	21	24	32	30	26	29	18	26	33	21	23	51	39	720	1.2
15 138E - 150E	3	6	17	9	8	30	40	33	42	25	13	17	10	11	6	5	1	2	2	13	293	4.9
16 138N - 150N	25	23	5	6	8	16	17	28	33	15	17	7	7	10	2	6	-	-	1	24	250	4.1
TOTALS	1673	1312	252	143	138	140	182	187	228	208	207	175	160	183	147	160	77	83	124	173	6030	100

* Sample data collected by the author from the death registry.

Table 2.23:

1972 and 1973 Registered Deaths in Kenya (A Comparison Between
A Sample and Population)

Causes of Deaths (Coded)	S A M P L E				P O P U L A T I O N*			
	Males		Females		Males		Females	
	Number of Deaths	% of Total	Number of Deaths	% of Total	Number of Deaths	% of Total	Number of Deaths	% of Total
1 - 44	2312	38.3	1779	40.9	22220	42.0	16423	42.8
45 - 61	150	2.5	113	2.6	1027	1.9	678	1.8
62 - 68	188	3.1	171	3.9	1587	3.0	1446	3.8
69 - 79	90	1.5	80	1.8	707	1.3	580	1.5
80 - 88	460	7.6	326	7.5	3610	6.8	2574	6.7
89 - 96	717	11.9	511	11.7	5481	10.3	4360	11.4
97 - 104	346	5.7	233	5.4	2976	5.6	1999	5.2
105 - 111	161	2.7	93	2.1	1732	3.3	758	2.0
112 - 118	0	0	92	2.1	0	0	722	1.9
119 - 120	122	2.0	77	1.8	1204	2.3	928	2.4
121 - 125	0	0	0	0	11	0	9	0
126 - 130	6	0	2	0	35	0	31	0
131 - 135	213	3.5	179	4.1	1577	3.0	1272	3.3
136 - 137	720	11.9	559	12.9	7565	14.3	5529	14.4
138E-150E	293	4.9	69	1.5	1426	2.7	422	1.1
138E-150N	250	4.1	85	2.0	1633	3.1	601	1.6
TOTAL	6030	100	4349	100	52792	100	38333	100

* The actual total registered deaths for 1972 and 1973.

NB. Figures used to construct the above table were obtained from the office of the Registrar General (Births and Deaths Department)

CHAPTER THREE

MORTALITY TABLES

3.1 A REVIEW OF MORTALITY TABLES

3.1.1 The Development of Mortality Tables: The construction of mortality tables rests on the statistical theory of probability. Since this is a special topic in statistics, it will not be taken up in this chapter, nor will it be discussed as an independent topic in this thesis. The author therefore assumes that the reader has a good background on the theory of probability.

Mortality tables have been in use for centuries especially in the western developed countries. The first mortality table for example, was constructed by John Graunt in England in the 17th Century (ref. 6). However, it was the development of Life Insurance which created the real need for upto date and modern mortality tables, which could be used by Life Insurance firms in their computation of Life insurance premiums for their various customers. It was, hence, Dr. William Farr who prepared the first English "Official Mortality Table" based on the 1841 population census returns. The second mortality table to be prepared in U.K. was the "Annuity Table of 1949".

This was meant to serve as a pricing table for life annuity contracts, hence it is usually referred to as a "pricing table".

Another mortality table was prepared in 1958 in U.S.A. It is officially known as the "1958 C.S.O. (Commissioner Standard Ordinary) Table". It was prepared on the basis of the mortality experience of both males and females. Unlike the "Annuity Table" of 1949, the C.S.O. table was meant to be used for regulatory purposes; hence it is known as a "Statutory Table". A third mortality table was prepared in U.S.A. in 1960 (ref. 7). It was intended for pricing life insurance policies and the determination of life insurance premiums.

These tables normally provide two very useful sets of information. In the first place, they give a mortality experience of a hypothetical population all of the same age, which will survive to any given year. Usually such tables are prepared either from the population statistics or the data obtained from a selected group i.e. the insured population. Of course, the exercise is too demanding in the sense that it requires special skills in statistics, particularly in Actuarial Science. It is in view of

this that the job is normally left to actuaries. Incidentally, such people are still found mainly in the developed countries where there are institutions for training them. For example, there are no such institutions in Africa and hence there are very few actuaries on the continent.

Apart from giving the probabilities of survival the tables also give the probabilities of dying within one year at each age. In population statistics this is called "Mortality Rate" (q_x), (ref. 7). This figure is the same as the ratio of the number of people dying at a certain age (where the number of such people include those who die within the year starting at the exact age and before their next birthday). The mortality rate for a certain given age can be calculated by dividing the number of people dying at that age by the number of people so exposed (people of the same age living during the same period). To give an example, if 500 people all of age 30 years are under observation and 10 of them die during the year of observation, then the probability that a person aged 30 will die within that year can be calculated as follows:

$$\frac{10}{500} \text{ or } .02 \text{ (ref. 7)}$$

3.1.2 Types of Mortality Tables*: As I have shown above, a mortality table is simply a tabulation of the probabilities of dying during the year at each age. The probability that a person aged 40 years will die within one year for example, is usually defined as d_{40}/L_{40} (where d and L stand for dying and surviving respectively). Depending on the source of data used, two types of such tables can be identified:

1. Tables Prepared from Population Data: Such tables are prepared in many cases by the National Office of "Vital Statistics". In the case of Kenya, this is the responsibility of the Central Bureau of Statistics. The data used in the preparation of such tables are collected on a regular population census and death registration basis. A good example of such tables is the "1958 C.S.O. Table" (ref. 7).
2. Tables Derived from the Insured Population: These are used in pricing life insurance and annuity policies - hence they are popularly known as "Pricing Tables". These can be divided into two sub-groups:

* See ref. 7.

(a) Annuity tables for the use with life annuity contracts (where the benefits are only payable when the contract holder is still alive). A good example here is the "1949 Annuity Table" prepared in U.K.

(b) Insurance mortality tables for the use with Life Insurance contracts (where the benefits can only be paid when the contract holder dies). Incidentally, the majority of insurance policies in this country are of the above type. Such tables are usually prepared by insurance firms using their pooled data. A good example is the 1960 U.S.A. pricing mortality table cited above.

Apart from the purely pricing tables which are normally prepared by Life Insurance firms, governments (especially in the developed nations like U.S.A.), do prepare similar tables based on the national mortality experience. Such tables are used for regulatory purposes. An example to quote is the "1958 C.S.O. Table", I have cited above. This particular table was prepared in U.S.A. in 1958 (ref. 7). Experience has shown that rates of mortality (q_x) for people buying annuity policies are lower, age by age, than

those buying life insurance policies. This is true even in this country. The apparent reason is that there is a silent process of "self-selection" whereby the more healthy people with lower mortality rates tend to go in for annuity policies, while the reverse takes place for the unhealthy people. In other words, such people buy life insurance policies instead. In view of this, life insurance firms use different mortality tables in the pricing of the two types of policies especially in the determination of premiums.

However, in both cases, it is important that the rates used be conservative. For example, for Life Insurance policies the tables used should show a higher mortality rate than probably will be experienced. The reason behind this strategy is to avoid, if possible, the receipt of more claims than were originally anticipated. The reverse should be the case in the selection of tables to be used with annuity contracts. In other words, the rates of mortality applied to such contracts should be lower than the expected rates so that companies will not continue to pay annuities for a longer period than was originally estimated.

Generally it has been observed over a period of many years that the world mortality rates are on the decline. In view of this, conservative life tables have become even more conservative, while the reverse has happened to annuity tables. In fact, given this new evidence there is a need to make the appropriate adjustments on these tables to reflect the improvement in world mortality rates.

Very often separate probabilities of dying are derived for each sex. Experience has shown that the rates of mortality for females are lower age by age than for males. A close study of the contingency tables given in the Appendix at the end of the chapter two does confirm this tendency even in this country. At many ages the difference is quite significant (compare the death figures in tables 2.21 and 2.22 in the Appendix). The "1949" English Annuity table referred to above gives two separate tables, one for males and another for females. It is on the basis of this that the "1958 C.S.O. table" was developed. It is a combination of the mortality experience of both sexes. However, under normal circumstances the table is deemed to represent the life experience of males.

Given this, whenever one is using the C.S.O. table for females, three years is normally deducted from the actual age of the female. In actuarial science this is known as "using three years set back". For example, a female 40 years old would be subjected to the mortality rate applicable to a man, 37 years old. Of course, when any number of years is added we refer to the practice as either loading the premiums or forward rating of the mortality table. The term loading is also used when the actual premium as determined by the life table is adjusted upwards to incorporate any special high risk of death such as in the case of an aircraft pilot or to cover the administrative expenses associated with the handling of the policy. For example, the actual premium as determined by the mortality table could be 100/- per month. Then an extra 10/- could be added to reflect the high risk of death of the insured, on top of these some 5/- could be added to take care of the administrative expenses. The payable monthly premium would then be $100+10+5 = 115/-$. This is called the "gross premium" payable monthly by the insured. The above is only a brief review of the major types of mortality tables and how they are used.

3.1.3 The Structure of Mortality Tables*: Generally a good mortality table has four basic columns. Table 3.1 given on the next page shows all the four columns of the "1958 C.S.O. Table". This illustrative table goes only upto 20 years, while the actual "1958 C.S.O. Table" goes upto 99 years.

In table 3.1 L_x represents the number of people living at age x , d_x represents the number of people dying between age x and age $(x + 1)$, and q_x represents the rate of mortality or the probability of dying. Ages are in most cases shown on such tables starting with zero indicating the first year of life (ref. 7). In the above table symbols L , d and q represent living, dying and the chance of dying respectively, while x s show the ages. For example, L_{30} , d_{30} and q_{30} means the number of people living at age 30, people dying at age 30 and the probability of a person dying at the age of 30 respectively.

* See reference 7.

Table 3.1: Part of the 1958 C.S.O. Table (Male)

Age	L_x	d_x	q_x
0	10,000,000	70,800	.00708
1	9,929,200	17,475	.00176
2	9,911,725	15,066	.00152
3	9,896,659	14,449	.00146
4	9,882,210	13,835	.00140
5	9,868,375	13,322	.00135
6	9,855,035	12,812	.00130
7	9,842,241	12,401	.00126
8	9,829,840	12,091	.00123
9	9,817,749	11,879	.00121
10	9,805,870	11,865	.00121
11	9,794,870	12,325	.00123
12	9,781,958	12,325	.00126
13	9,769,633	12,896	.00132
14	9,756,737	13,562	.00139
15	9,743,175	14,225	.00146
16	9,928,950	14,983	.00154
17	9,713,867	15,737	.00162
18	9,698,230	16,390	.00169
19	9,681,840	16,846	.00174
20	9,664,994	17,300	.00179

Source: Fundamental Mathematics of Life Insurance, by Harper and Workman, 1970.

3.1.4 The Construction of a Mortality Table*: Once the rate of mortality (q_x) has been computed for each age, the other columns can be easily constructed. Normally the youngest age in the table ought to be the youngest age for which the table is expected to be used. In the majority of cases as I have said above, the tables start with zero as the youngest age. The entire mortality table can then be constructed by the following steps:

1. Assume an initial value for L_x (at the youngest age in the table). This is normally some large number i.e. 1,000,000.
2. Calculate the number of deaths between the above age and the next age ($x + 1$). The appropriate equation is $d_x = L_x q_x$.
3. Calculate the number of people living at the second age ($x + 1$), using the equation $L_{x+1} = L_x - d_x$.
4. The two steps 2 and 3 are repeated successively for each higher age.

* See reference 7.

For example, it can be seen how columns for the "1958 C.S.O. Table" were constructed using the above procedure after the rate of mortality had been established. Table 3.1 above indicates that the initial value of L_x was chosen to be 10,000,000 at age zero. In other words:

$$L_0 = 10,000,000$$

The number of deaths between zero and age one was calculated by applying the basic equation:

$$d_x = L_x q_x$$

substituting 10,000,000 for L_0 and the value of q_0 from the table (table 3,1)

$$\begin{aligned} d_0 &= (10,000,000)(.00708) \\ &= 70,800 \text{ (rounded up)} \end{aligned}$$

Next, the number of people living at age one was calculated as follows:

Basic equation:

$$L_{x+1} = L_x - d_x$$

substituting 0 for x

$$L_1 = L_0 - d_0$$

substituting 10,000,000 for L_0 and the value of d_0 calculated above,

$$\begin{aligned} L_1 &= 10,000,000 - 70,800 \\ &= 9,929,200 \end{aligned}$$

Repeating this process, the number of deaths at age one (between age one and two) was calculated as follows:

Basic equation:

$$d_x = L_x q_x$$

substituting the values of L_1 calculated above and the value of q_1

$$\begin{aligned} q_1 &= (9,929,200)(00176) \\ &= 17,475 \end{aligned}$$

The number of people living at age two can therefore be calculated as follows:

Basic equation:

$$L_{x+1} = L_x - d_x$$

substituting 1 for x

$$L_2 = L_1 - d_1$$

putting the values for L_1 and d_1 in the equation above:

$$L_2 = 99,292,200 - 17,475$$

All these values agree with those in the "1958 C.S.O. Table" given in table 3.1 above. The above process was repeated successively until the entire 1958 C.S.O. table was constructed. As I said earlier, this table is used by the U.S.A. government for regulatory purposes

and is based on the mortality experience of both males and females.

3.1.5 Select and Ultimate Mortality Table*: Under normal circumstances the length of time which has elapsed since a person was insured does affect his chances of dying. The usual practice is that at the time a person takes up a life insurance policy, it is established through medical examination whether he or she is in good health condition. Consequently, people whose health conditions are unsatisfactory normally pay higher premiums. The additional amount on top of the actual premium as determined by the mortality table reflects the high risk of death of such people. Mortality tables used for pricing insurance policies are usually based on the life experience arising from those people whose health condition was found to be sound at the time they were insured.

It has been observed that rates of mortality for people whose health has just been established as satisfactory, are lower than for others of the same age whose good health condition was ascertained in the past. In any case, as the years go by, differences in

* See ref. 7.

rates in mortality between the two groups gradually disappear. The period of years during which there is a significant difference in the two rates of mortality is known as the "Select Period". A mortality table which therefore records the values of basic mortality functions during the select period is normally known as a "Select Mortality Table". To indicate that a group is composed of people whose good health has just been established, it is customary to enclose the age in square brackets. Thus instead of writing L_x , to represent the number of people living at age x when all of them have just been established as being in good health, the above is written as $L_{[x]}$. That is, L with a subscript $[x]$. The x placed in the brackets is part of the entire symbol, and does not mean " L multiplied with x ". An example would be $L_{[33]}$.

This means the assumed number of persons in a group, all of whom are 33 years old and all of whom their health condition has just been established as satisfactory. The number of survivors of the $L_{[x]}$ group at the end of one, two and three years can be expressed as:

$$L_{[x]} + 1$$

$$L_{[x]} + 2$$

$$L_{[x]} + 3 \text{ respectively.}$$

Thus the age at which good health was established remains a part of the symbol, enclosed in brackets. An example would be $L_{[20]} + 4$ which means the number of people still living four years after their good health was established when they were 20 years old. Thus $L_{[20]} + 4$ represents the number of people still living out of the $L_{[20]}$ group and that these people are now 24 years old.

Beyond the select period, when the effects of the selection have been worn off, the number of survivors of the original select group constitute the "Ultimate Mortality Table". The combination of these two tables is called a "Select and Ultimate Mortality Table". An example is given in table 3.2 on the next page.

Table 3.2: Portions of Select and Ultimate Mortality Table(5 Years Select Period)

Age	L_x	L_{x+1}	L_{x+2}	L_{x+3}	L_{x+4}	L_{x+5}	Age $x+5$
30	950875	949734	948471	947039	945439	943624	35
31	949221	948044	946717	945212	943501	941576	36
32	947447	946215	944434	943237	941435	939354	37
33	945589	944303	942830	941142	939194	936959	38
34	943623	942255	940700	938875	936781	934373	39
35	941488	940048	938375	936423	934176	931570	40
36	939211	937661	935870	933774	931346	928477	41
37	936729	935071	933145	930887	928225	925088	42
38	934023	932248	930178	927704	924800	921341	43
39	931088	929170	924215	924215	921017	917195	44

Source: Harper and Workman: Fundamental Mathematics of Life Insurance, 1970.

The first column in the above table records the various ages at which it may be assumed good health conditions was established. The second column records the number of people assumed to be living in such groups age by age ($L_{[x]}$). Starting at any age recorded in the first column, the number of survivors at successive ages is found by reading the table "horizontally" to the right." It will be seen that these columns to the right are labelled $L_{[x] + 1}$, $L_{[x] + 2}$, $L_{[x] + 5}$. There are no brackets on the x in the $x + 5$ column. That is because persons still living five years after their health condition was established to be good are considered to be subject to the same mortality rates as any other person of the same age at that time. That is, the select period only lasts five years (in this particular table), hence the $L_{[x] + 5}$ column may be considered by itself to be the ultimate mortality table. Accordingly, the ages represented by $L_{[x] + 5}$ are recorded (in the right hand column) besides the respective values of $L_x + 5$.

For example, $L_{[x]}$ column records 947,447 persons at age 32 whose good health has just been established. That is:

$$L_{[32]} = 947447$$

Reading across the table horizontally to the right from there, the table records that 946215 of them are still living one year later (at age 33). That is:

$$L_{[32]+1} = 946215.$$

Similarly, 944834 of them are still alive two years later, 943237 three years later and 941435 four years later. Finally, the $L_x + 5$ column records that there are 939354 of the original group still living five years later (at age 37). At this point as I said earlier it makes no difference at what age good health was established. It is only the current age which is used and therefore the survivors in succeeding years are found by reading down the column $L_x + 5$. The number still living at age 38 is in this case 936959.

A select and ultimate mortality table may be used to calculate certain probabilities of living or dying.

Example 1:

Calculate the probability that a person aged 35 will be living at the end of the first year (one year), using the above table. First assume that good health was established at the age of 35.

Solution: The equation $P_x = \frac{L_x + 1}{L_x}$ may be

used. The age expressed [35] is the age at which good health was established.

Assume good health was established at the age of 35

Basic equation:

$$P_x = \frac{L_x + 1}{L_x}$$

Substituting 35 for x (a person is aged 35 and good health has been established)

$$P_{[35]} = \frac{L_{[35]} + 1}{L_{[35]}}$$

Substituting the values for $L_{[35]} + 1$ in the table:

$$\begin{aligned} P_{[35]} &= \frac{940048}{941488} \\ &= .99847 \end{aligned}$$

Example 2:

Calculate the probability that a person aged 35 whose good health was established at the age of 32 will be living at the end of the next five years (age 40 years).

Solution: Probability of Living

Basic equation:

$$npx = \frac{L_x + n}{L_x}$$

Substituting $L_{[32] + 3}$ for x (a person is aged 35 and good health was established at the age of 32)

Substituting 5 for n , in the numerator

L_{40} is shown instead of $L_{[32] + 8}$ since 8 years puts it into the ultimate portion of the table.

$$\therefore 5P_{[32] + 3} = \frac{L_{40} + 3}{L_{[32]}}$$

Substituting values for L_{40} and $L_{[32] + 3}$

$$\text{from the table, we get } \frac{931570}{943237}$$

$$= .98763$$

$$\therefore 5P_{[32] + 3} = .98763$$

Probability of Dying is simply $1 - .98763$

$$\therefore 5P_{[32] + 3} = .01237$$

The total probabilities above must add upto 1. This is the expected result since the person is certainly either going to survive or die during the next five years.

3.2 THE CONSTRUCTION OF A "CRUDE" MORTALITY TABLE FOR KENYA

3.2.1 The Objective: After a theoretical treatment of the construction of Life tables in the above section (3.1), I was in a position to construct a "crude" mortality table for Kenya based on the 1973 population projections and death records. The main motive for the exercise were two-fold. First, I wanted to apply the theory in the above section to a practical situation, and secondly, I wanted to throw some light on the trend of mortality rate over the period 1970-1973 in this country, and to compute the approximate probabilities of survival for Kenyans during the year 1973 at all ages. Unfortunately, the figures are given according to broad age groups because this is the format in which both population and death records are kept in this country. These age groups are for example, 0-4, 5-9, 10-14 years etc.

3.2.2 The Methodology: In my attempt to construct a mortality table for Kenya based on the 1973 population and death records, I made use of the death figures from the Death Registry and population figures from the Central Bureau of Statistics. The entire task was done in stages:

1. I obtained the population projection figures based on 1969 population census from the Central Bureau of Statistics (see table 3.3 at the end of the chapter). Since I was only interested in the projected figures between 1970 and 1975, I extracted only the projections for the two years (1970 and 1975).
2. The figures given in table 3.4 were projected by the author using the formula given here below:

$P_{LO} (1 + r)^n$, where P_{LO} = Beginning population (at the time zero)

r = Rate of population growth per year
 n = the number of years between the year of the beginning population (P_{LO}) and the next year of population projection.

tended to encourage the registration of births. With regard to deaths, there seem to be no such indirect compulsion. It is in view of this that I feel the government ought to be particularly insistent on death registration. Unless this is done it is likely to take Kenya many years before she can construct a reasonable and reliable mortality table based on the life experience of Africans in this country.

With regard to the reliability of such data there should be launched a massive adult education programme in all parts of the country as has been done in Tanzania. The exercise should be mainly to teach people (adults) how to read and write. A person who is illiterate is unlikely to remember his exact age. Similarly an illiterate parent is incapable of recording the date and year in which his or her baby is born. In other words, illiteracy is another enemy to fight in an attempt to compile reliable vital population statistics necessary for the construction of mortality tables, and other tables which are important

In my case these were 1970 and 1975 respectively.
 For example, the first figure 2275 for 1971 was
 obtained in the following way:

Basic formula :

$$P_{10} (1 + r)^n$$

Substituting 2181 the actual figure for 1970
 for P_{10} and 5 for n in the above formula

$$I \text{ obtained } 2181 (1 + r)^5 = 2688$$

$$(1 + r)^5 = 2688/2181$$

$$5 \log (1 + r) = \log (2688/2181)$$

$$\log (1 + r) = \log \left(\frac{2688}{2181} \right) / 5$$

$$1 + r = \text{Antilog of } \log \left(\frac{2688}{2181} \right) / 5$$

$$r = \text{Antilog of } \log \left(\frac{2688}{2181} \right) / 5 - 1$$

$$\therefore r = .043$$

The population growth per year is approximately .043.

Hence the population figure for 1971:

$$= 2181 \times 1.043$$

$$= 2274.7$$

$$= 2275 \text{ to the nearest unit}$$

All the figures given in table 3.4 were obtained using
 the above formula.

Table 3.5 was prepared after some manipulations of the actual death figures for 1971, 1972 and 1973 which are given in table 3.6, 3.7 and 3.8 respectively. The adjustment was only necessary for the death figures of babies who died at latest 7 days after birth. This exercise was imperative because unlike the classification of deaths in 1970 (see table 3.9), infant deaths under 7 days of age for 1971, 1972 and 1973 included deaths of people whose ages were unknown. It was hence necessary to use a rational and consistent basis of removing the figures for deaths of unknown age so that I would remain with the actual figure for infants who died at latest 7 days from the time of their birth. The reader can notice that in table 3.9 the figures of deaths of unknown age are kept separate from deaths of infants dying at latest 7 days after birth. In the subsequent years, the two are dumped together.

The method I used in extracting the figures of deaths of unknown age from the 1971, 1972 and 1973 death figures was simple and clear. I computed the percentage of combined deaths (unknown age and infants under seven days) which were of unknown age by dividing the total number of deaths of unknown age

in 1970 by the combined figure (unknown age and infants under 7 days) in the same year, e.g.

$$\frac{2672 + 2117}{2672 + 2117 + 967 + 786} = 73.2\%$$

After obtaining the above percentage 73.2% I used it to remove deaths of unknown age from the death figures shown under 7 days of age for 1971, 1972, and 1973. I assumed that this figure would remain constant for three years which in actual practice may not be necessarily true. However, that was the best I could do under the circumstances. The remaining figure was then added to the total deaths of infants between 7 days of age and one month of age, one month of age and six months of age and finally one year of age and four years of age. The total of these groups is shown in table 3.5 on the row of 0-4 for the years 1971, 1972 and 1973.

Secondly, since the projected population figures which I obtained from the Central Bureau of Statistics grouped together all deaths of age 70 years and above (70+), see table 3.3, I had to do likewise with the death figures. In other words, all people who died at the age of 70 years and above

were put together and placed along the last row (70+) for the years 1971, 1972, and 1973 (see table 3.5). Using the two tables (3.4 and 3.5), I calculated crude mortality rates for Kenya during the period 1970-1973. The results are presented in table 3.10. The value of Q_{xs} (the probability of dying at age x) was calculated as follows: Take for example the age group 0-4 for 1973, then

$$\begin{aligned}
 Q_x &= \frac{\text{Registered deaths (1973)}}{\text{Population proportion (1973)}} \\
 &= 21324/2475000 = 0.0086
 \end{aligned}$$

where 21324 is taken from table 3.5 and the figure 2475000 is obtained from table 3.4. The result .0086 is shown in table 3.10. The same procedure was repeated for all the age groups for the four years (1970-1973).

On the basis of the mortality rates for the various age groups in 1973, I continued to illustrate (practically) how a "Crude mortality" table for Kenya can be constructed. This is presented in table 3.11. I should have liked to illustrate how to construct a "Select and Ultimate table" for Kenya, but given the format in which the necessary data are kept in this country (by broad age groups),

I was unable to do so. Such a table is quite useful particularly for life insurance firms, in that they are used to calculate the probabilities of dying or surviving after a certain number of given years from the time the person insured was declared to be in good health through medical examination. Usually this is done before a person is insured so as to help the insurance firm determine the appropriate premiums. This bit has been treated in the review above even though, only at theoretical level.

3.3 CONCLUSIONS AND RECOMMENDATIONS

3.3.1 Conclusion: From my personal observation it seems as if the government is putting a lot of effort on the improvement of medical facilities and personnel in this country. Surprisingly, according to the figures in table 3.10 (the last column) there is only a slight improvement in the mortality rate of infants (children within the age 0-4). Infact, this is a negligible improvement. In all other age groups the mortality rates are on the upward trend with a few cases where they are more or less constant. It can be noticed that people of 65 years and above have the highest mortality rate. In other words over the surveyed period the above group has the highest increase of mortality rate (.0039) see table 3.10.

This unexpected result could be attributed first, to the small domain that the death registry covers (hardly more than 50% of the total deaths per year in this country). This is my own estimate based on the study I conducted at the death registry. Second, the above situation could also be attributed to the unreliability of the data I used. Third, the broad age groups used in this country for recording the data I used is likely to falsify the results. In other words, there is likely to be a distortion of the mortality rates. All these points are important and they must be kept in mind when one tries to draw conclusions based on the results in table 3.10.

The first column in table 3.11 gives the ages. The second column gives the number of people living at various age-groups. The first beginning figure 10,000,000 is hypothetical. It is assumed that there are 10,000,000 children living at the ages 0-4 years. This could be any figure, hence it is not unique. Column three gives the number of people who die at the various age groups, while column four gives the mortality rates for the various age groups. These are actually the probabilities of dying at the various age groups as of 1973 (see table 3.10).

The basic formula used in obtaining the numbers of deaths within a given age group is

$$d_x = L_x q_x$$

In the case of infants dying between 0-4 years, we substitute 10,000,000 for L_x and .0036 for d_x hence we have:

$$\begin{aligned} d_x &= (10,000,000)(.0036) \\ &= 36,000 \end{aligned}$$

This figure is then subtracted from 10,000,000 in order to obtain the number of people who will go into the next age group (5-9) and we have:

$$\begin{aligned} 10,000,000 &- 36,000 \\ &= 9,914,000 \end{aligned}$$

The above process is repeated for the other age groups (see table 3.11).

3.3.2 Recommendations: Based on the evidence given in this chapter, I wish to make three recommendations:

1. Even though the government is trying its best to improve the quantity and quality of the vital population statistics, there is still room for further improvements. In other words, there is a need to step up efforts in the compilation of the relevant population data in order to facilitate the construction of meaningful tables such as "Mortality tables" in the future. It is my feeling that the law relating to the registration of births and deaths should be strictly enforced and those found violating it should be prosecuted or have certain sanctions imposed on them. During my discussion with the executive in charge of the registration of births and deaths in the Office of the Registrar General, I learned that as from 1972 no dead body can be buried without a burial permit in this country. This is actually an 'Act of Parliament' hence it is a law. In view of this one is tempted to believe that the death records which the registry have compiled over the last few years (since 1972) would cover nearly 80% of the total deaths in this country per year. But my own survey in my home area revealed

that burial permits are given all right but nobody takes pains to record the age of the diseased nor the cause of his death, which I feel are very vital. It is hence my belief that the records at the death registry do not include 80% of the total deaths in this country per year. An attempt should therefore be made to record all the deaths and the vital details of any person who dies (age and cause of death particularly). Such a step is likely to improve the quantity and quality of death records. The registration of deaths has been quite slow compared to birth registration. For example, in 1963, the number of deaths already registered was 18,896 and by 1971 the figure had gone up to 23,867 thus an increase of only 26%. On the other hand, during the same period registered births had increased from 10,225 in 1963 to 47,325 in 1971, thus an increase of 363% (ref. 4). The marked difference between the two can be explained by the fact that in order to register a child in class one, a birth certificate is usually needed. In fact in the urban areas it is compulsory to have a birth certificate. This has

tended to encourage the registration of births. With regard to deaths, there seem to be no such indirect compulsion. It is in view of this that I feel the government ought to be particularly insistent on death registration. Unless this is done it is likely to take Kenya many years before she can construct a reasonable and reliable mortality table based on the life experience of Africans in this country.

With regard to the reliability of such data there should be launched a massive adult education programme in all parts of the country as has been done in Tanzania. The exercise should be mainly to teach people (adults) how to read and write. A person who is illiterate is unlikely to remember his exact age. Similarly an illiterate parent is incapable of recording the date and year in which his or her baby is born. In other words, illiteracy is another enemy to fight in an attempt to compile reliable vital population statistics necessary for the construction of mortality tables, and other tables which are important

for planning and development.

2. Besides the above recommendation, I would also urge the relevant governmental agencies (Central Bureau of Statistics and the Death Registry) to take some pains in improving their records, using for example one year age interval, instead of the five year interval currently in use. This should apply particularly to population census returns, to projections and to the registration of deaths. If the above can be done it will be very easy for a statistician or an actuary to prepare a more meaningful mortality table in the future. The reader will notice that I was unable to prepare a "crude" select and ultimate mortality table for Kenya due to the fact that the necessary records are kept according to broad age groups instead of age by age as is done in countries like U.S.A. I therefore recommend that both death and population records should be kept age by age, and that the ages should go up to 100 years, instead of dumping all deaths over 85 years in an open ended age group of 85+ (85 and above). Both the above recommendations if adopted will enable statis-

ticians to determine more accurately the actual mortality rate for each age. In my view this would give Life Insurance firms a more realistic picture and basis of fixing their premiums. It would further enable any governmental evaluating and control agency to guard customers against unfair premium charges.

3. The figures of people whose ages are unknown should be kept separate and not be mixed up with deaths of infants of known ages. This is the superiority of table 3.9 compared to 3.6, 3.7 and 3.8. It is due to the above practice, that I was forced to engage in uncalled for interpolations to arrive at an approximate figure for infants dying within a period of under seven days of age (see table 3.4). I hence recommend that the death registry go back to the 1970 format (see table 3.9). All the tables cited in this section (3.2) are given hereafter.

**Table 3.3: KENYA: Population Projections Based on
1969 Census**

Figures given in Thousands

Age	1970	1975
0 - 4**	2181	2688
5 - 9	1724	2055
10 - 14	1424	1687
15 - 19	1187	1401
20 - 24	975	1158
25 - 29	798	949
30 - 34	658	775
35 - 39	533	637
40 - 44	437	514
45 - 49	350	418
50 - 54	278	330
55 - 59	226	257
60 - 64	166	197
65 - 69	121	142
70+*	186	205
TOTAL	11247	13413

Source: Kenya Statistical Digest,
June 1971, Vol. I, IX-No.2

- * 70+ is a condensed figure for all people who die at 70 or more years.
- ** 0-4 shows a condensed figure for all children and infants who die at latest 5 years after their births.

**Table 3.4: KENYA: Population Projections for
1970-1973 Based on 1969 Census
Figures given in Thousands**

Age	1970	1971	1972	1973
0 - 4**	2181	2275	2373	2475
5 - 9	1724	1788	1854	1922
10 - 14	1424	1480	1539	1600
15 - 19	1187	1227	1267	1308
20 - 24	976	1010	1045	1082
25 - 29	798	829	862	896
30 - 34	658	679	701	724
35 - 39	533	552	571	591
40 - 44	437	451	465	450
45 - 49	350	364	378	393
50 - 54	278	287	298	309
55 - 59	226	233	241	249
60 - 64	166	171	176	182
65 - 69	121	124	128	132
70+*	186	190	194	198
TOTAL	11247	11660	12092	12541

Projections made by author

* 70+ is a condensed figure of all people who die at 70 or more years

** 0-4 shows a condensed figure for all children and infants who die at latest 5 years after their birth.

**Table 3.5: Registered Deaths by Age Groups in Kenya
1970 - 1973**

Age	1970	1971	1972	1973
0 - 4**	21004	21918	22606	21324
5 - 9	2091	2550	2348	2288
10 - 14	955	1188	1160	1194
15 - 19	823	979	896	969
20 - 24	840	953	974	1014
25 - 29	900	1254	1292	1196
30 - 34	952	1066	1165	1323
35 - 39	1004	1241	1250	1320
40 - 44	963	1187	1135	1220
45 - 49	989	1320	1217	1274
50 - 54	1041	1206	1168	1189
55 - 59	838	1028	894	970
60 - 64	1197	2411	1401	1431
65 - 69	795	1023	1042	1074
70+*	3644	4311	3718	4327
TOTAL	38036	42607	42266	42113

Source: Annual Report of the Registrar-General, 1972

* 70+ is a condensed figure of all deaths of people of 70 and more years

** 0-4 shows a condensed figure of all children and infants who die at latest 5 years after the time of birth following an adjustment to remove the number of persons of unknown age who died.

Table 3.6: Registration of Deaths in Kenya by Age Groups (1971)

Age	Males	Females	Total
Under 7 days	3677*	2768*	6445*
7 days and under 1 month	965	744	1709
1 month and under 6 months	1912	1705	3617
6 months and under 1 year	2030	1887	3917
1 year - 4 years	5744	5196	10940
5 years - 9 years	1404	1146	2550
10 years -14 years	628	560	1188
15 years -19 years	526	453	979
20 years -24 years	499	454	953
25 years -29 years	703	551	1254
30 years -34 years	598	468	1066
35 years -39 years	744	497	1241
40 years -44 years	756	431	1187
45 years -49 years	880	440	1320
50 years -54 years	795	411	1206
55 years -59 years	702	326	1028
60 years -64 years	880	503	1383
65 years -69 years	686	337	1023
70 years -74 years	740	445	1185
75 years -79 years	505	233	738
80 years -84 years	481	355	836
85 years and over	901	651	1552
TOTAL	26764	20561	47325

Source: The office of the Registrar General

* Not adjusted to remove deaths of unknown age.

Table 3.7: Registration of Deaths in Kenya by Age Group (1972)

Age	Males	Females	Total
Under 7 days	3610*	2699*	6309*
7 days and under 1 month	932	769	1701
1 month and under 6 months	1886	1648	3534
6 months and under 1 year	2164	1944	4108
1 year - 4 years	6105	5467	11572
5 years - 9 years	1286	1062	2348
10 years - 14 years	639	521	1160
15 years - 19 years	507	389	896
20 years - 24 years	535	439	969
25 years - 29 years	714	578	1292
30 years - 34 years	661	504	1165
35 years - 39 years	766	484	1250
40 years - 44 years	716	419	1135
45 years - 49 years	810	407	1217
50 years - 54 years	781	387	1168
55 years - 59 years	598	296	894
60 years - 64 years	868	533	1401
65 years - 69 years	670	372	1042
70 years - 74 years	679	436	1115
75 years - 79 years	390	239	629
80 years - 84 years	451	337	768
85 years and over	633	573	1206
TOTAL	26381	20803	46384

Source: Annual Report of the Registrar-General
1972

* Not adjusted to remove deaths of unknown age.

**Table 3.8: Registration of Deaths in Kenya by
Age Group (1973)**

Age	Males	Females	Total
Under 7 days	3862*	2802*	6664*
7 days and under 1 month	995	784	1797
1 month and under 6 months	1890	1633	3523
6 months and under 1 year	2068	1915	3983
1 year - 4 years	5357	4897	10254
5 years- 9 years	1229	1059	2285
10 years-14 years	665	529	1194
15 years-19 years	594	375	969
20 years-24 years	531	483	1014
25 years-29 years	677	519	1196
30 years-34 years	729	594	1323
35 years-39 years	854	466	1320
40 years-44 years	764	456	1220
45 years-49 years	823	451	1274
50 years-54 years	751	438	1189
55 years-59 years	662	308	970
60 years-64 years	891	540	1431
65 years-69 years	684	390	1074
70 years-74 years	835	428	1263
75 years-79 years	421	229	650
80 years-84 years	512	336	848
85 years and over	895	671	1566
TOTAL	26689	20303	46992

Source: The Office of the Registrar General

* Not adjusted to remove deaths of unknown age.

Table 3.9: Registration of Deaths in Kenya by Age Group (1970)

Age	Males	Females	Total
Age not stated (unknown)	2672	2117	4789
Under 7 days	967	786	1753
7 days and under 1 month	851	708	1559
1 month and under 6 months	1855	1662	3517
6 months and under 1 year	1966	1845	3811
1 year - 4 years	5301	5063	10364
5 years - 9 years	1141	950	2091
10 years - 14 years	549	406	955
15 years - 19 years	478	345	823
20 years - 24 years	434	406	840
25 years - 29 years	485	415	900
30 years - 34 years	572	380	952
35 years - 39 years	593	411	1004
40 years - 44 years	616	347	963
45 years - 49 years	655	334	989
50 years - 54 years	646	395	1041
55 years - 59 years	583	255	838
60 years - 64 years	741	456	1197
65 years - 69 years	468	327	795
70 years - 74 years	711	431	1142
75 years - 79 years	338	219	557
80 years - 84 years	424	341	765
85 years and over	671	509	1180
TOTAL	23810	19107	42825

Source: Annual Report of the Registrar General
1972

Table 3.10: Crude Mortality Rates for Kenya (1970-1973)

Age	1970	1971	1972	1973	Q _{x0} -Q _{x3}
	Q _{x0}	Q _{x1}	Q _{x2}	Q _{x3}	
0 - 4**	.0096	.0096	.0095	.0086	-.0010
5 - 9	.0012	.0014	.0013	.0012	.0000
10 - 14	.0007	.0008	.0008	.0007	.0000
15 - 19	.0007	.0008	.0007	.0007	.0000
20 - 24	.0009	.0009	.0009	.0009	.0000
25 - 29	.0011	.0015	.0015	.0013	.0002
30 - 34	.0014	.0016	.0017	.0018	.0004
35 - 39	.0019	.0022	.0022	.0022	.0003
40 - 44	.0022	.0026	.0024	.0025	.0003
45 - 49	.0028	.0036	.0032	.0032	.0004
50 - 54	.0037	.0042	.0039	.0038	.0001
55 - 59	.0037	.0044	.0037	.0039	.0002
60 - 64	.0072	.0141	.0080	.0079	.0007
65 - 69	.0066	.0083	.0081	.0081	.0015
70+*	.0195	.0227	.0192	.0219	.0024

NB: The above table is constructed by the author, using tables 3.4 and 3.5.

* 70+ is a condensed figure for all people who die at 70 or more years

** 0-4 shows a condensed figure for all infants and children who die at latest 5 years after their birth.

Table 3.11: Illustrating the Calculation of
Crude Mortality Table for Kenya
(1973)

Age	L_x	d_x	q_x
0 - 4**	10,000,000	86,000	.0086
5 - 9	9,914,000	11,897	.0012
10 - 14	9,902,103	6,931	.0007
15 - 19	9,895,172	6,927	.0007
20 - 24	9,888,245	8,899	.0009
25 - 29	9,879,346	12,843	.0013
30 - 34	9,866,503	17,760	.0018
35 - 39	9,848,743	21,667	.0022
40 - 44	9,827,076	24,568	.0025
45 - 49	9,802,508	31,368	.0032
50 - 54	9,771,140	37,130	.0038
55 - 59	9,734,010	37,963	.0039
60 - 64	9,696,047	76,599	.0079
65 - 69	9,619,448	77,918	.0081
70+*	9,541,530	208,960	.0219

NB. This table is based on the authors calculations using the 1973 mortality rates for the various age groups in Kenya

* 70+ is a condensed figure of all adults who die at the age of 70 years or above.

** 0-4 row shows a condensed figure for all infants and children who die at latest 5 years after their birth.

CHAPTER FOURTHE USE OF
FOREIGN BASED MORTALITY TABLES
IN KENYA (A SURVEY)4.1 THE OBJECTIVE

Based on my research conclusions given in chapter two and my statistical results given in chapter three, especially the life expectancy of Africans as reflected by the level of mortality rates in Kenya, I felt it would be a contribution to conduct a survey on the use of foreign based mortality tables in this country.

The motives which sparked off this survey were three-fold. In the first place I wanted to establish the extent to which studies have been conducted in Kenya on the life expectancy and mortality. Secondly, I thought it timely to sound the opinions of the various Life Insurance executives on the validity and the rationale behind the use of foreign based mortality (life) tables in the African environment. In other words, I wanted to know the reasons for employing these tables in the determination of premiums for life insurance and for annuities in this country. Lastly, I was also interested in hearing their views

on the need or lack thereof, for mortality tables based on the African mortality experience in establishing their pricing policy.

4.2 THE METHODOLOGY

In my interviews with the various Life Insurance executives (particularly Life Managers), I made use of questionnaires. A copy of the above questionnaire is given in appendix at the end of this chapter. At the time of my survey there were seven Insurance firms transacting Life Insurance business in this country. The actual number of the existing firms were actually ten, but three of these had stopped selling new Life Insurance policies. Actually they were still in the Life Insurance business given that they still handled their old policies. In view of this, I decided to interview executives in all the ten firms.)

Due to reasons beyond my control, I was able to conduct my interviews in eight of the ten firms. My results are therefore based on my interviews with only eight Life Insurance executives. The majority of these people were quite open minded thus they responded to my questions responsibly and effectively.

The procedure I adopted was that either the respondent filled the questionnaire in my presence or I did it personally as he gave me his responses. It was only in one case that this method failed to work due to the inaccessibility of the Life Manager in that particular firm. He suggested that I could either handover the questionnaire to his Secretary who would subsequently relay it to him or go back and interview him after one month. Given my time constraint I chose the former. I left the questionnaire with his Secretary who handed it over to him. After one week I went back to collect the already filled questionnaire from the Secretary. Thus I did not have a face to face interview with this particular Life Manager as I did with the other seven. I chose questionnaire interview approach to avoid loss of questionnaires. At the same time there were certain questions which needed some kind of explanation which could also lead to brief discussions between me and the respondents. In view of all these I felt that my presence was vital at the time of filling the questionnaires. On the whole the method worked out quite successfully despite the fact that one or two executives gave me audience for only five minutes or less while others gave me as much as two hours.

4.3 RESULTS

Since most, if not all, the Life Insurance executives are in Nairobi, the above survey did not call for any trips outside Nairobi. In my questionnaires I only included those questions which I thought were basic for my survey. In reporting my finds in this section therefore, I shall run down the questions as they appear on the questionnaire.

Based on my survey there was at the time of the survey no Life Insurance firm which had an actuary in its Kenya office. Part of the explanation was the fact that all these firms except Kenya National Assurance Limited, represent small branches or subsidiaries of big multinational Life Insurance firms with their head offices abroad (most of them in U.K. with just two in the U.S.A.). In view of this, all firms apart from the Kenya National Assurance, use the services of their head office actuaries abroad whenever there is a need. Kenya National Assurance makes use of the services of a British based consulting firm of actuaries which has just opened up a small office in Nairobi. The main reason given by all these firms was that the Insurance industry in Kenya is still too small to warrant the engagement of a full-time actuary locally. Indeed the industry seems

to be small at present. Its growth has been rather slow, despite the fact that the first Life Insurance firm started operating here in 1928. The slow growth is evidenced by the fact that up to now (1976) the insured population in this country is estimated to be only 2% of the total Kenya population. This figure is quite insignificant especially when compared to the insured population in the U.S.A. which is well over 60% of the total population according to 1976 rough estimates.

It is therefore apparent that the relatively small size of operations, and that home offices are external to Kenya, are the main reasons why we had only two actuaries in this country at the time of the survey (early 1976). However nearly all the Life Insurance executives I met had "Chartered Institute of Insurance" certificates, but these do not qualify them to serve as actuaries. As I have stated above the first Life Insurance firm started operating here in 1928, while the youngest firm started in 1968. Incidentally this firm now has the largest number of insured Africans in this country.

All these firms use mortality tables (Life tables) when determining life insurance premiums for their customers. Up to 1964, separate life tables were used for Europeans, for Asians and for Africans. The main reason behind this practice was and I think still is, that the three races had different life expectancies, hence different mortality tables seemed to be appropriate. Despite all this, the government forced all the Life Insurance firms to abandon the above practice on the grounds that it had a connotation of racial discrimination to which the government was vehemently opposed. My own view is that even if it was an aspect of racial discrimination, narrowly defined, the procedure rested on a sound rational business practice. For example, according to a study made by a United Nations team in 1960 (ref. 5), it was found that the life expectancy of an average European was 71 years, while the corresponding figure for an average African was only 37.5 years. In fact this figure was calculated using data in Kenya. Incidentally, a life expectancy of 37.5 years was one of the highest in black Africa during that time. Given the above evidence, most people educated in business and economics would see the need for using different life tables when working out life insurance premiums for the distinctively different populations

or ethnic groups. In my view, this is what one would consider a sound and rational business practice.

The politically motivated decision, to force all firms to use a single mortality table for all races has led to an arbitrary forward rating of the current tables and to a loading of premiums. The premium rate therefore were pegged at a high level for each age to cover the relatively low life expectancy of Africans. It can, hence, be fairly concluded that Europeans were the major victims of this exercise. But even the Africans have not been fairly treated in the exercise because nobody knows the life expectancy of Africans, which means that even the mortality experience of the insured Africans (the domain which ought to be used as a base for premium calculations) is unknown. In view of this, I fail to see the criteria or criterion which was used or is used in adjusting the present foreign based mortality tables to reflect the mortality experience of Kenyan Africans. It is in view of this that I term the attempt to load the premiums or forward rate the foreign based mortality tables "arbitrary".

My survey revealed that some firms forward rate these tables by three years, others by five years while one firm makes no adjustment to these tables.

It is likely that the executive of this particular firm was unaware of the loading factor, since the information I received from the Association of all Insurance firms in Kenya, was that all the premiums are loaded for life insurance. In other words, the tables are forward rated for all ages. In any case one needs to explain to the public, particularly the insured African population, the rationale behind all these differences in the loadings and forward ratings. As a result of the above politically motivated decision to maintain a common mortality table in calculating premiums regardless of race, the number of Europeans residing in Kenya who purchase new or additional life insurance policies from the local firms has gone down considerably, according to my survey. They argue rightly that their premiums are inflated unnecessarily. If a European knows very well that his life expectancy is not as short as his African counterpart, surely it is not rational for him to pay the same life insurance premiums as his African counterpart. In view of this their refusal to buy life insurance policies from the local firms is well grounded.

All the mortality tables used by the local Life Insurance firms are based on the mortality experience

of Europeans, basically in U.K. It is therefore my belief that these tables have very little relevance to Kenya Africans. They present a doubtful and questionable picture of the actual life expectancy and mortality of Africans in this country. But despite these doubts, which most of the executives I interviewed also share, I was amazed to note that during my survey, six out of the eight executives I interviewed expressed confidence in the currently used foreign based mortality tables. At the same time, they recommended that a special attempt should be made to prepare mortality tables based on the life experience of Africans to be used instead of the current life tables. This seems to me as a clear dichotomy. I tried to question these executives about the above inconsistency in their answers but none of them gave me what I would call a satisfactory answer or a convincing reason. In view of this I suspect that the apparent vacillation reflects the significantly large profits which accrue to these firms as a result of overloading of the life insurance premiums. On the negative side, however is the apparent loss of profits accruing to the Kenya branches because of the shift on the part of Europeans and some Asians to buying life insurance policies through external companies. The fact that there is an urgent need to construct different

mortality tables to be used for pricing life insurance policies for the insured African population is obvious.

Similarly my survey revealed that no attempt has been made in this country or even in East Africa to prepare life tables based on the African mortality experience. The main reason for the delay seems to be the lack of the relevant data (population data and proper and accurate death records). A second reason is the lack of competent personnel to undertake the exercise (actuaries and statisticians) in this country. It was hence, the consensus of my respondents that the government ought to play a leading role in the attempt to prepare mortality tables based on the mortality experience of Africans in this country. I concur with them on this point because it is only the government that can set things rolling in this direction. It is the responsibility of the government to conduct a periodic population census and at the same time administer the registration of births and deaths. These are crucial data for the construction of a mortality table in any country. The Kenya government is therefore in a much stronger position to pave the way for the future construction of life tables for Africans in this country.

In response to my final question in connection with the existence of enough demand in this country to warrant the setting up of an institution or programme to train Kenyans in "Actuarial Science", six of my respondents thought that there is adequate demand to do so while two held an opposite view. The main argument of the latter two was that the Kenyan insurance market is still too small to justify the setting up of such institutions or beginning programmes in actuarial science at present. I tend to disagree with their minority opinion on the grounds that even though the insurance market is limited as of now, the current rate of development in this country assures, I believe, a significant growth in the insurance industry in the next decade. Actuaries will then be required in designing and preparing the basic life tables for calculating appropriate premiums. Training a person to qualify as an actuary can take a minimum of seven years, provided that such a person has a good first degree in mathematics and statistics. In view of this, there appears to be a need to set up an institution for training actuaries or alternatively to start such programmes in any of the existing institutions of higher learning i.e. a college or university in this country. Undoubtedly such programmes could be introduced in our existing institutions at a lower

cost than that required in setting up a new institution.

4.4 RECOMMENDATIONS

Based on the above survey, I wish to make four recommendations to the Kenya government and to the private organisations concerned:

1. The fact that Kenya has a real shortage of actuaries is evident from the survey presented above. As I have said, the situation as of now seems to be under control because of the small size of the insurance industry. At the same time, it is an observable fact that our economy is growing at a significant rate by general African standards. Given this trend and believing that it will continue for the next couple of years, I am confident that there is likely to be a significant expansion in most sectors of the economy including the insurance industry. It is hence necessary that the government in collaboration with the insurance firms operating in this country, and with the education institutions, plan ahead. It is in response to these observations that I recommend that the training of actuaries in this country should begin with a minimum

delay. As I have said earlier, a special institution could be set up to conduct programmes in actuarial science, or the existing institutions of higher learning could be provided with the necessary resources to undertake the exercise. It does not matter very much where the programme is conducted as long as it is in this country and is available to Kenya citizens. We will need Kenyan African actuaries in the future and we shall not rely on foreign experts in this field indefinitely. In order to facilitate the running of these programmes, I would also recommend that statistics be introduced as a separate and compulsory subject in all our secondary schools. The strategy behind this recommendation is to guarantee the supply of students with the necessary aptitudes and skill to take up studies in advanced quantitative technology. As we know the poorer the background of a student, especially in mathematics and statistics, the longer it is likely to take him to qualify as an actuary or a statistician. Given our limited economic resources we need to guard against the wastage of our scarce resources.

2. After my brief interviews with the various Life Managers in the Life Insurance firms operating in this country, I came to a conclusion that there is a need for the government to investigate the practice of premium loading and of forward rating of the foreign based life tables used in computing premiums in this country. This suggestion is based on the fact that there seems to be too much arbitrariness in the above two processes, to the disadvantage of the insured population in this country. As I have said earlier, some firms forward rate the current tables by three years, others by five years and some do not load or forward rate the premiums and tables respectively. In other words, there is no single criterion or a uniform set of criteria adopted in this process. This kind of arbitrariness in pricing the life policies and determining premiums could easily lead to the exploitation of the insured population in this country.

I therefore recommend that insurance firms in Kenya iron out their differences and adopt a uniform procedure in pricing life policies.

It may be that as the active competition intensifies due to the expansion of the insurance industry these differences would eventually disappear. However, it is possible that the current injustice imposed on the insured population in this country through poor pricing practices will be projected for too long a period in the future. It is quite apparent that the insurance firms can do very little to improve the situation. Under such circumstances, I would recommend government intervention as described in (3) below.

3. There is a need for the government to take a keen interest in the insurance industry in this country. In my field survey of one life insurance firm, I noticed that several claims were outstanding as unpaid for up to two or more years. Of course there could be many possible reasons for such delays in the payment of these claims. However, it could be that the firm (and other firms as well) did not have adequate "policy reserves" at the time. Policy reserves are funds set aside to meet the payment of claims as they come in. I also noticed that some claims were being paid

off in very small amounts, such that the total claim was likely to take a couple of years to be paid off. Again one of the possible causes of this situation could be the lack of enough reserves to pay off these claims within the shortest period possible. In response to this situation I would recommend that the government set up a special regulatory body composed of competent actuaries to "audit" the records of these firms especially their policy reserves. In fact this ought to be the yardstick for measuring the liquidity and solvency of these firms. The usual practice is that if any business organization is unable to meet its financial obligations (debts) as they mature, it can be declared bankrupt. The same procedure should be followed with Insurance companies, especially those that do not pay some significant fractions of their claims within a reasonable time limit.

I believe that government regulation of the insurance firms, particularly to "audit" their records, is desired. Such audits will expose whether the firms maintain adequate "policy reserves" to meet some average level of claims as they come in. It is to be noted

that such regulatory bodies are found in other countries, especially the developed nations like U.S.A. In view of this there seems to be nothing unique in setting up a similar body in Kenya to provide protection to the insured policy holders and to ensure the maintenance of adequate "policy reserves". Of course in such activities the government would seek the cooperation of the insurance firms. However, if this cooperation is not forthcoming, then the government has no alternative but to impose regulations on its own.

4. I would also recommend that the government review and revise its ruling that uniform mortality tables be used for all insured people in Kenya, regardless of race. As I pointed out earlier significant differences in life expectancy among different racial groups has a marked effect on premiums which should be charged to cover costs, claims, and reasonable profits. By imposing a uniform mortality table, thus common premiums per age classification, the government really imposes injustice on some policy purchasers. Regulatory bodies in the government, therefore have a responsibility

to evaluate the effects of their audits, regulations and practices on a regular basis and to make changes in policy where appropriate.

4.5 APPENDIXQuestionnaire

(For Life Insurance Executives)

I am interested in a study about life expectancy for Kenyans (Africans) and the way in which insurance companies (those conducting life insurance business in this country) determine life insurance premiums for their insured Africans in Kenya.

The following guiding questions are intended to obtain answers which will help me in the study.

Q.1 Do you have an actuary or a statistician equivalent to such a person in your Nairobi office?

Ans. (a) Yes (b) No (If No to Q.1 ask Q.2)

Q.2 Do you use an outside firm of actuaries for consultations (whether the firm is in Nairobi or outside the country).

Ans. (a) Yes (b) No

Q.3 If such a firm is outside Kenya please specify the name of the country.

Q.4 How many actuaries do you know in Kenya?
State where they are employed.

Q.5 Are you an actuary?

Ans. (a) Yes (b) No

Q.6 When did your Company start transacting life insurance business for Africans in Kenya?

Ans. Specify the year please.

Q.7 Do you use any actuarial tables for determining the life insurance premiums for Africans insured in Kenya?

Ans. (a) Yes (b) No

Q.8 What is the origin of the tables which you are using? (Specify the name of the country and the year in which the tables were constructed).

Q.9 Do you make any adjustments to these tables when working out life insurance premiums for Kenya Africans?

Ans. (a) Yes (b) No (If yes to Q.9 ask Q.10)

Q.10 What kind of adjustments do you actually make on these tables? (Specify).

Q.11 Have you got full confidence in these tables when using them to determine premiums for Africans in Kenya?

Ans. (a) Yes (b) No

Q.12 Do you think an attempt should be made to construct different tables to use for Kenya insured Africans?

Ans. (a) Yes (b) No

Q.13 Do you know of any attempt which has been made in Africa to construct life tables for Africans? (Specify the name of the country and year of the attempt and its results).

Q.14 Can you imagine certain problems which have tended to discourage attempts of this nature in Africa?

Ans. (a) Lack of qualified personnel (b) Shortage of funds (c) Lack of enough data (d) Shortage of the necessary equipments.

Q.15 In your opinion whom do you think ought to pave the way in the attempt to construct actuarial tables for Africans in Kenya?

Ans. (a) The private insurance firms (b) The foreign governments (if so, specify)
(c) The Kenya government (d) both (a) and (c).

Q.16. Do you think there is enough demand in Kenya (or East Africa) for people educated in actuarial science to request support to develop a special programme in actuarial science in any other institutions of higher learning apart from the university?

Ans. (a) Yes (b) No.

CHAPTER FIVECONCLUSION

This thesis has attempted to throw some light on the life expectancy and mortality of Kenyans with special reference to Africans in this country. I believe that the study is unique since my library research and field survey, failed to uncover a similar analysis. Of course the question of life expectancy and mortality has been discussed in this country, but not in a coordinated and exhaustive manner. There are many data and publications on rural-urban migration, population growth and road traffic accidents in this country. All these are based on small scale separate surveys conducted by various academicians. However no author to my knowledge, has attempted to put all the above topics together and relate them to the life expectancy and mortality of Kenyans as I have attempted to do in chapter two of this thesis.

On the topic of the construction of mortality table, especially for Kenya, I would like to note here that no author in this country has touched the area. The main reason is apparently the shortage of competent persons i.e. statisticians and actuaries to tackle such technical topics. I have tackled the above topic in this thesis but not in as much detail as I

would have liked. This was due to lack of adequate and reliable data and to time constraints.

The study based on the operations of Life Insurance firms in this country, particularly their experience in using the foreign based mortality tables, is another task that has not been undertaken by anyone in this country. In other words no surveys have been conducted in the area to find out what is actually going on in the life insurance industry in this country. I have also ventured into this field in my study even though I did not have enough time to go deeply into the exercise.

The three areas mentioned above constitute the main body of this thesis. I collected data on them, analysed the results, and came up with some conclusions. On the basis of these, I have made some recommendations which are given at the end of chapters two, three and four of this thesis. These are my own views based on my research, analysis and interpretation. The reader should note that the three statistical processes above are in some cases subject to errors and, I would not therefore say that my case was an exception. In view of this, I would not say that my recommendations in this thesis are ideal. Similarly, they vary in

terms of their level of significance.

However, I would like to emphasize some of the recommendations I have made above because I regard them as basic and urgent. First, the redistribution of the medical facilities and medical personnel in this country is a matter of urgency in my opinion. There is enough evidence in chapter two to support this recommendation. Second, the trend of rural-urban migration needs to be reversed as soon as possible because its negative outcomes are intolerable in this country. Third, the rate of deaths due to road traffic accidents has to be reduced by cutting down the number of road traffic accidents. This could be done by allocating a greater fraction of the available resources to the improvement of traffic regulations and to educate road users (drivers and pedestrians particularly). Our economy cannot tolerate such a high death rate due to road traffic accidents. Fourth, and lastly, all attempts should be made to speed up the compilation of vital population statistics (deaths and births). These should be kept in the most convenient form for research use. I would particularly emphasize the urgent need by the government agencies to keep the death and population records according to individual ages rather than in groups

which they use today.

It is my hope that this thesis will be of some use both to the government and to private organizations. Lastly, I must apologize in advance if any of the material in this thesis should offend an individual or institution.

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