

Life Expectancy of Diabetes and Hypertension Patients in Osun State (A Case Study of Specialist Hospital, Osogbo)

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ABSTRACT

This hospital-based, cross-sectional and retrospective study investigated life expectancy of diabetes and hypertension patients in Osun state. A total of 2,610 patients with diabetes and hypertension who were referred to the specialist hospital, Asubiaro, Osogbo, Osun-state from 2007 to 2016 were eligible for inclusion. Both diabetic and hypertension patients, diabetes patients and hypertension patients' status were classified using the record system. Descriptive statistics and Life table analyses using 5 year class interval were carried out to determine life expectancy of the patients. It was discovered that age 10-14 of both diabetes and hypertension patients will live on the average of 33.28 years, patients with hypertension only will live on the average of 37 years diabetes patients will live on the average of 38.48 years. Diabetes patients on the average will live longer than hypertension patients and both hypertension and diabetes patients.

Key words: Diagnosed, diabetes, hypertension, ailment, expectancy, patients

I. INTRODUCTION

Life expectancy in statistical sense is the number of years of life remaining at a given age depends on event under considerations. In many occasions life expectancy varied significantly to class and gender (Ajayi et al., 2014). There are so many factors that can support the long life of individuals both natural

and non-natural factors. The non-natural factors can be categorized into public health, medical care, and exposure to different type of diets while natural factors are family background, peer groups, economic circumstances, and climate

after detection of ailments can have great influence on life expectation.

Life expectancy can be estimated from simple methods to advanced methods. Dana (2008) itemises six ways to estimate life expectancy from life expectancy table and simple calculators. In the paper, the approaches were in order from simple life expectancy table, Joint life expectancy probability table, Joint life expectancy based on health and life style factor and a customised personalised expectancy report use of planning decisions. According to Hilary (2007), there are other methods that could be used to analyse life expectancy, these methods of life expectancy have been used in different field of knowledge with the outcome that have different opinion based on either the focus, or sample plan, sample size selection or even the analysis procedures might have one defect or the other. Several studies have been carried out on diabetes and hypertension and their victims but no single one have ever spread out the average life expectancy of post diagnosed of the diabetes and hypertension.

Diabetes is a chronic disease in which the body cannot regulate the amount of sugar in the blood. People with diabetes have high blood sugar because their body cannot take more sugar from the blood into muscle and fat cells to be burned or stored for energy, and because their liver makes too much glucose and release it into the blood (David et al 2011). Arayne et al (2007) confirmed that diabetes is a chronic disease caused by inherited and or acquired deficiency in production of insulin by the pancreas, or by the effectiveness of the insulin produced such a deficiency results in increase concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves. Diabetes

often refers to as diabetes mellitus, describes a group of metabolic disease in which the person has high blood glucose (blood sugar), either because insulin production is inadequate, or because the body's cells do not respond properly to insulin or both (Shimamoto, 2014).

Over time, high blood glucose damages nerves and blood vessels, leading to complications such as heart disease, stroke, kidney, blindness, dental diseases and amputation. Other complication of diabetes may include increased susceptibility to disease, loss of morbidity with aging, depression, and pregnancy problems. No one is certain what starts the process that causes diabetes, but scientist believes genes and environmental factors interact to cause diabetes in most cases.

Diabetes could be type 1 diabetes, type 2 diabetes and the third type gestational diabetes, it develops only during pregnancy. Other types of diabetes are caused by defects in specific genes, diseases of the pancreas called beta cells. They are the one that make insulin. Type 1 Diabetes typically occurs in children and young adults, though it can appear at any age. In the past, type 2 Diabetes was called juvenile diabetes or insulin dependent diabetes or insulin dependent diabetes mellitus.

According to Lana Barhum (2017), hypertension is known as silent killer. Hypertension usually has no signs or symptoms and many people are not aware they have it. According to IDF (2017), 415 million people have diabetes in the world and more than 14 million are in Africa Region; by 2040 this figure will be more than double. There were 1.56 million case of diabetes in Nigeria in 2015.

Over the years, it has become highly essential to study the major causes of high mortality rates after which it was revealed apart from road accident, the major causes of death is traceable to numerous disease among which diabetes and hypertension stands out due to fact that, hence two deadly diseases are silent killer disease. It was revealed that nearly 30 million battle diabetes and every 23 seconds someone new is diagnosed. Diabetes causes more deaths in a year than breast cancer and AIDS combined (ADA 2018). James et al. (2012) in a study put forward that cardiovascular diseases (CVDs) are the major causes of mortality in persons with diabetes, and many factors, including hypertension, contribute to this high prevalence of CVD. Hypertension is approximately twice as frequent in patients with diabetes compared with patients without the disease. Conversely, recent data suggest that hypertensive persons are more predisposed to the

development of diabetes than are normotensive persons. Eddouks et al (2002) in his study the medicinal plants used in the treatment of diabetes mellitus, hypertension and cardiac diseases were inventoried based on the ethnopharmacological survey in south-eastern Morocco, frequency and percentage of medicinal plant use In this study, 700 patients were questioned; 320 were diabetics and 380 had hypertension and/or cardiac disorders.

Song, Jie et al (2016) put forward that hypertension and diabetes mellitus were often jointly present, especially in the setting of endocrinology. Presence of both hypertension and diabetes were observed in 32.9% of hypertensive patients in cardiology and 58.9% of diabetic patients in endocrinology. In the study of Quoc Manh Nguyen, et al (2012), it was concluded that in relatively young adults, predictability of baseline cardiometabolic risk factors along with race, sex, and parental history of diabetes for the onset of type 2 diabetes varied by age-group. These findings have implications for early prevention and intervention in relatively young adults.

However, with the increase in mortality, there is surely a definite decrease in life expectancy of persons which now brings us to the research of evaluating and examine the life expectancy of persons living with diabetes and hypertension, it will determine and compare the average life remaining for people living with both diabetes (both type 1 and type 2) and hypertension, diabetes and hypertension. The information gathered from the study will be useful to medical personnel and individual to plan one's life, the government and individual can use the information to plan for the health needs of citizen in Osun state using the state specialist hospital Asubiaro, Osogbo, as a case study. The data used in the course of this research work covers information on age, sex of person living with diabetes, hypertension and both. This data span from the year 2007-2016 and if possible to recommend a way to reduce the recurrent case

Study Design and Data Collection

A total of 2,610 in patients with type 1, type 2 and type 3 diabetes and hypertension were referred to the specialist hospital; cottage hospital Ede, Osun state from 2007 to 2016 was eligible for inclusion in this cross-sectional and retrospective study. The diabetes and hypertension were diagnosed using the criteria of the World Health Organization [WHO study group (1999)].

Medical record review was undertaken by a single researcher; demographic details, and physical and biochemical data, were recorded on a form. Demographic details included age, sex, age

at diagnosis, duration of diabetes, and the general and ophthalmological medical histories. Physical examination included: systolic blood pressure (SBP), diastolic blood pressure (DBP), waist circumference (WC), and body-mass index (BMI). Laboratory data included the glycosylated hemoglobin (HbA1c) level; MA status; and the levels of fasting plasma glucose (FPG), triglycerides (TG), total cholesterol (TC), C-reactive protein, high-density lipoprotein (HDL), and low-density lipoprotein (LDL); and the estimated glomerular filtration rate (eGFR). The eGFR was calculated using the equation of the Modification of Diet in Renal Disease study (Levey, 1999). Each patient underwent a comprehensive ophthalmologic examination that included a review of ophthalmologic history, measurement of visual acuity and intraocular pressure (IOP), slit lamp biomicroscopy, and fundoscopic examination through dilated pupils via fundus photography and reading center to grade the retinopathy. Color photographs were acquired with

a Zeiss Visucam 200 digital fundus camera (Carl Zeiss Meditec AG, Jena, Germany) using a macula-centered field of view. However, supplementary fundus photographs of lesions were taken for those who showed any evidence of DR. Diabetic retinopathy status was graded using the system of the Early Treatment Diabetic Retinopathy Study (ETDRS): 1) no DR; 2) nonproliferative disease (mild, moderate, severe); and, 3) proliferative. Whenever the two eyes were graded differently, the more advanced was chosen (Wenjun, and Lisha, 2016).

Statistical Analysis

All patients were observed and divided into two groups based on the presence of diabetes and hypertension. Descriptive statistics (frequency distribution, percentage and histograms were calculated to identify the characteristics of respondents. Life table analyses using 5 year class interval were carried out to determine life expectancy of the patients.

II. RESULT

	Variables	Frequencies	Percentages
Total Respondents	Male	1224	47.06
	Female	1377	52.94
	Total	2601	100
Hypertension	Male	898	44.99
	Female	1098	55.01
	Total	1996	100
Diabetes	Male	326	53.88
	Female	279	46.12
	Total	605	100

Table 1: Demographic characteristics of the respondents

The table 1 above shows the distribution of the respondents' demographics characteristics during the periods of study. It was discovered that the total respondents that reported both diabetes and hypertension was 2,601. Song, et al (2016) put forward that hypertension and diabetes mellitus were often jointly present. The male respondents that reported both diabetes and hypertension were 47.05% while female respondents that reported both diabetes and hypertension were 52.9%. The total number of respondents of diabetes was 1996. The frequency male respondents reported diabetes only was 44.99% while female only respondents reported diabetes were 55.01%. The total number of the respondents that reported hypertension only was 605. The frequency of male respondents reported hypertension was 53.88% while female respondents reported hypertension only was

46.11%. It could be observed that the total respondents of diabetes is nearly as twice as the total number of respondents reported for hypertension, result was in line with findings of James et al. (2001) in his study Hypertension is approximately twice as frequent in patients with diabetes compared with patients without the disease. A conclusion from this observation is that high proportion of females reported both diabetes and hypertension and diabetes than males but it was otherwise for hypertension i.e high proportion of males reported hypertension only than females.

Figure 1 below shows the distributions of respondents both diabetes and hypertension. The distribution is negatively skewed. The majority of the patients were clustered at the between age 40-44 and 65-69. Only very few patients were between ages 15-19 and 35-39.

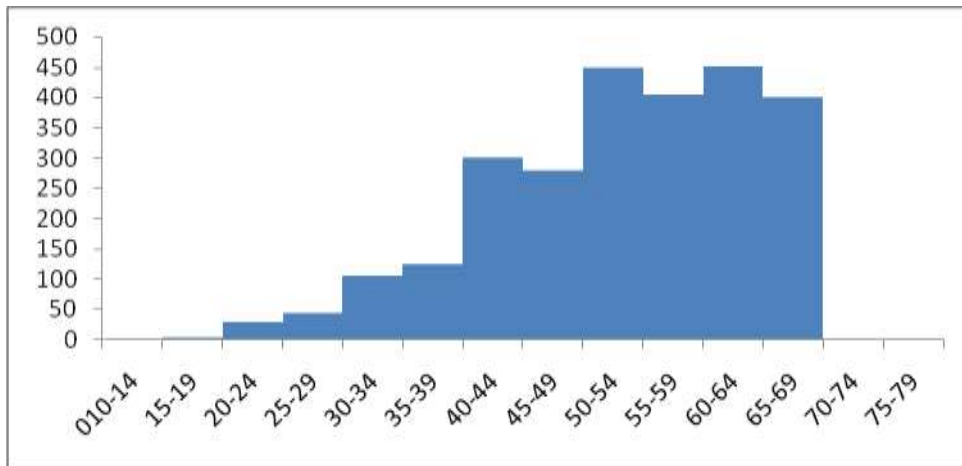


Figure 1: All Respondents for that were diagnosed for both diabetes and hypertension

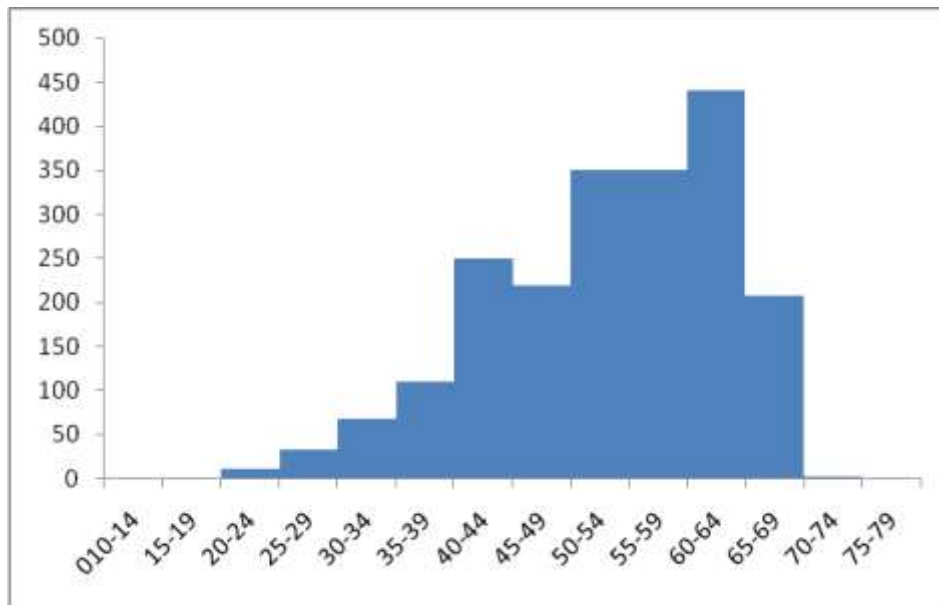


Figure 2: Distribution of respondents diagnosed for Diabetes only

Figure 2 above shows all the distributions of respondents diagnose with Diabetes. The distribution is negatively skewed. The majority of the patients were clustered at the between age 50-54 and 65-69. At age 35-39 and 40- 44 with few patients while very few were between ages 20-24 and 30-34.

Figure 3 below shows the distributions of respondents diagnosed for Hypertension only. The distribution is negatively skewed like that of figure 1. The majority of the patients were clustered between age 40-44 and 65-69. At age 15-19 and 35- 39 very few patients were reported.

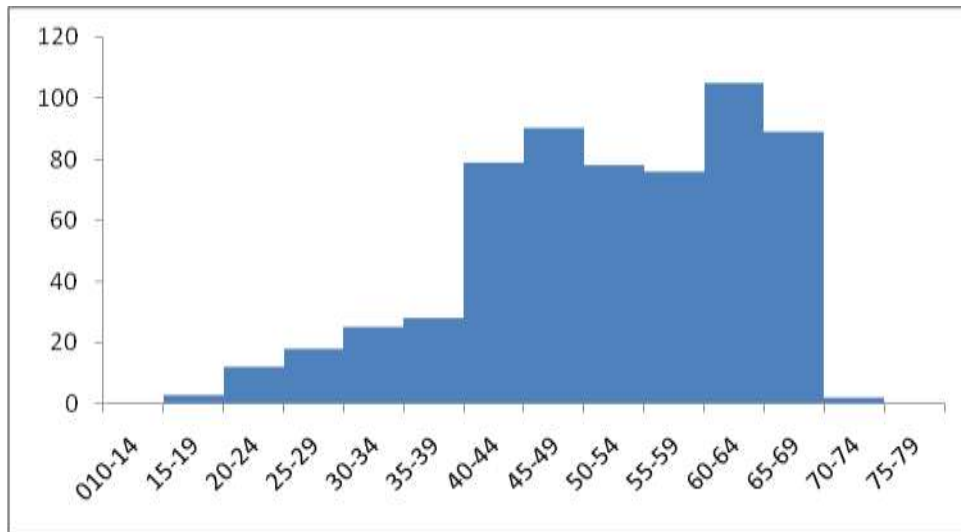


Figure 3: Distribution of respondents diagnosed for Hypertension only.

III. DISCUSSION

Life expectancy was estimated using life table analysis procedure in spread sheet for the cohort. Life table is produced; using 5 year intervals is the major basis for the tables. The 5 year interval is chosen to ensure adequate cell frequencies for the age expectancy analysis to follow. This analysis invokes the assumption that mortality rates are stable over the 5 year time intervals, and the death rates are similar over the 65 year period. A summary of life table based on all patients 2601 individuals, of whom 1590 died, total number of individuals not identified as dead from record is 1011 (right-censored) at the time of the study as shown in Appendix 1. The life table based on diabetes patients of 605 individuals, 464 died total number of individuals not identified as dead from record were 141 (right-censored) at the time of the study as shown in Appendix 2. In the study 1996 individual were identified as hypertensive patients, the record shows that 1451 individual died while 545 individuals were unable to be accounted for (right-censor) as shown in appendix 3

In appendix 1, we have the results of the life table analysis for 2601 of all total respondents i.e both diabetes and hypertension patients for both length of mortality 65 years. Column 1 x to $x+5$ i.e. interval 10-14 refers to the 1st 5year of patients' age; interval 15-19 refers to 2nd 5year, (e.t.c). Each interval is a cohort for the mortality function.

Column 2 (l_x) is the number of cases that have survived to the beginning of the current interval i.e those who are alive at beginning of the interval. All 2601 and 1011 respondents were alive during their

1st and 2nd year after diagnose of the ailment consecutively while only 106 were alive during 34th year. Successive entries in this column are obtained using this formula:

$$l_{x+1} = l_x - (d_x + w_x)$$

Number withdrawn alive during Interval is column 3 (w_x). These are patients who are known to be alive at the close of the study. During this study, there is record for respondents withdrawing from the study at different years. The highest withdrawal (censor) is recorded in the age group 44-45 with 220 respondents and lowest censor is recorded in the age group 10-14 and 75-79 with 2 respondents simultaneously. Number of patients died during Interval (d_x) i.e Column 4, gives the number of both diabetes and hypertensive patients who died during the interval year. For example, 102 respondents died from Age group 45-49 and 14 died in age group 30-34, e.t.c. The proportion dying during interval in column 5 (q_x), is an estimate of the probability of dying during the interval. The proportion of dying in the age group 24-29 was 0.005 while for the age group 65-69 was 0.938. It is obtained by dividing the number of deaths by the effective number of exposed to risk ($col5 \div col4$) or $q_x = d_x \div l_x$

Proportion of surviving in column 6 (p_x) is the alternatively to the probability of surviving in the interval, or the surviving rate. It is obtained by subtracting the proportion dying during the interval

from unity i.e $p_x = 1 - q_x$. The column 7 is the person-years lived at each age. It is the number of year lived by the life table cohort between ages x and $x+1$. The value of L_x is calculated as $0.5(l_x + l_{x+1})$. The person year lived by age group 10-14 was 2601 and for age group 55-59 was 1059. The column 8 (T_x) is the total number of years lived after each age. The total number of year lived by a cohort is simply the sum of the years lived at every age. It is obtained by $T_x = T_{x+1} + L_x$. The total number of year lived for age group 65-69 was 209, for age group 10-14 was 22516. The column 9 is the mean expected of life (e_x). This is equal to the total number of years lived after age x , divided by the number of persons who survived at that age

$e_x = T_x / l_x$. The expected average age of age group 10-14 is 8.66 years, and for age group 60-64 is 0.98.

The table 2 below shows the distributions of the life expectancy of patients that reported both diabetes and hypertension. At age group 10-14 the average life expectancy is 23.28 years, for age group 55-59, it is 2.47 years. The life expectancy for patients that reported diabetes only at age group 10-14 is 38.48 years on the average, for age group 55-59 it is 4.14 years. The life expectancy for patients that reported hypertension only at age group 10-14 is 37.05 years on the average, while for age group 55-59 is 4.87 years on the average.

Table 2: Summary table of life expectancy of patients diagnosed for both diabetes and hypertension, diabetes only and hypertension only

Age group	Expected year Both Diabetes and Hypertension	Expected year for Diabetes patients	Expected year for Hypertension patients
10-14	33.28335	38.48447	37.05372
15-19	28.31474	33.52056	32.22591
20-24	23.36994	28.70838	27.83051
25-29	18.73099	24.15213	23.62762
30-34	14.19643	19.93488	19.59324
35-39	10.14913	16.01779	15.51541
40-44	6.104803	12.7387	12.85227
45-49	3.155779	9.405996	10.51429
50-54	3.10812	6.820679	7.8125
55-59	2.47026	4.143625	4.872449
60-64	0.09918	2.57109	2.60989
65-69	0.41975	2.5	2.0
70-74	0	0	0

We observed from table 2 that average expected years of all respondents are decreasing linearly as the age increases. A closer look at figure

4 and 5 below shows that expected life for the patients did not start at the same origin but converge at the older age below age 74.

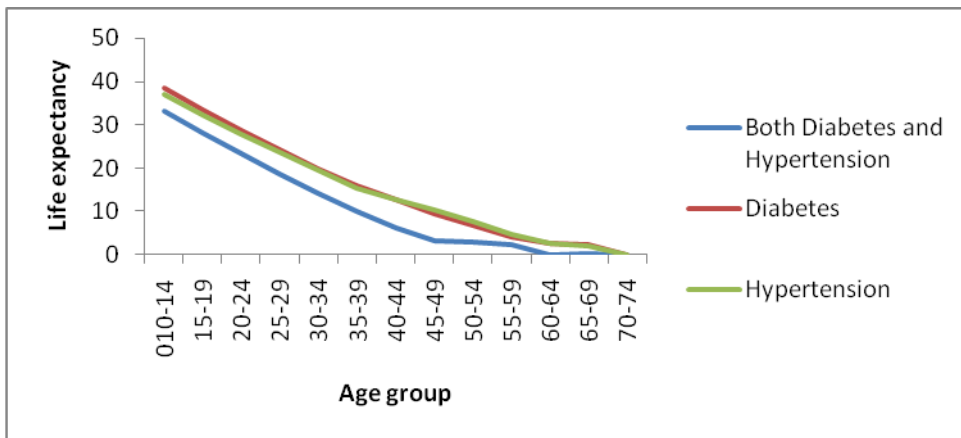


Figure 4: Line graph of age group of the diabetes and hypertension, diabetes and hypertension patients and life expectancy in years.

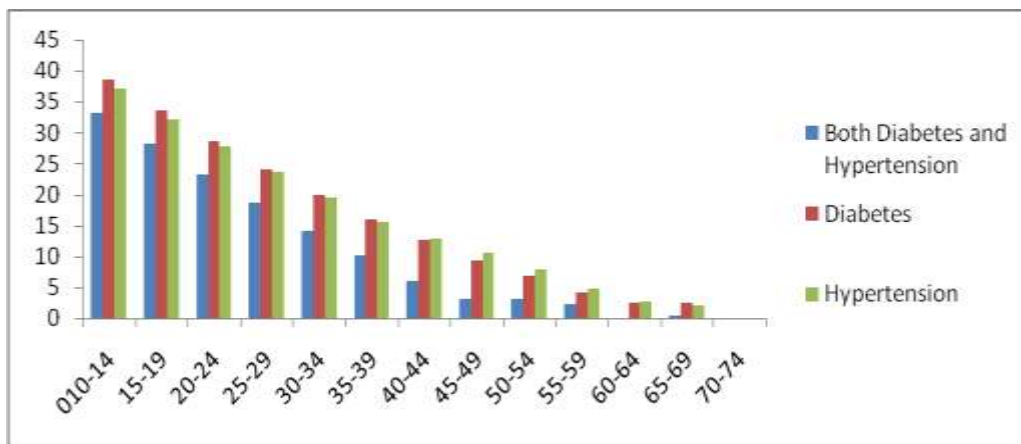


Figure 5: Bar chart of age group of the diabetes and hypertension, diabetes and hypertension patients and life expectancy in years.

In conclusion, we discovered that those who have diabetes only can live longer than those who have hypertension only. The patients that diagnosed for both diabetes and hypertension have shorter years to live than patients reported for both diabetes and hypertension. At age 10-14, the diabetes patients has average of 38.48 years to live while patients diagnosed of hypertension has average of 37.28 to live and for both diabetes and hypertension age group 10-14 has 33.28 years to live if the diagnosed ailment are well managed according to Eddpuks et al. (2002).

At age group 40-44, diagnosed diabetes only and diagnosed hypertension has equal number of years to live on the average. We observed that age group 50-54 and age group 55-59 patients

diagnosed for diabetes can live longer than hypertension patients' on the average. Looking at the older age groups 60-64 and 65-69, the diabetes patients and hypertension patients has equal average life expectancy. The patients of both diabetes and hypertension have lower expected years to live throughout the observed age group.

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Appendix I Both Diabetes and Hypertension

Age	lx	Dx	qx	Tx	Ex
14	2601	0	0	22516	33.28335
19	2599	0	0	19916	28.31474
24	2595	14	0.005395	17319	23.36994
29	2565	20	0.007797	14739	18.73099
34	2520	60	0.02381	12195	14.19643
39	2414	75	0.031069	9728	10.14913
44	2290	80	0.034934	7376	6.104803
49	1990	102	0.051256	5236	3.155779
54	1711	250	0.146113	3385	3.10812
59	1261	300	0.237906	1899	2.47026
64	857	309	0.36056	840	0.09918
69	405	380	0.938272	209	0.41975
74	5	0	0	4	0
79	2	0	0		0

Appendix II
Diabetes

Age	lx	Death	Qx	Lx	Tx	ex
14	1996	0	0	1995	15363	38.48447
19	1994	1	0.5	1988	13368	33.52056
24	1982	8	0.666667	1965.5	11380	28.70838
29	1949	28	0.848485	1915	9414.5	24.15213
34	1881	45	0.661765	1826	7499.5	19.93488
39	1771	76	0.690909	1671	5673.5	16.01779
44	1571	167	0.835	1461	4002.5	12.7387
49	1351	189	0.859091	1176	2541.5	9.405996
54	1001	205	0.585714	826	1365.5	6.820679
59	651	215	0.614286	431	539.5	4.143625
64	211	357	0.811364	107	108.5	2.57109
69	3	157	0.754808	1.5	1.5	2.5
74	0	3	1	0	0	0

Appendix III

Hypertension

Age	lx	dx	Qx	Lx	Tx	ex
14	605	0	0	603.5	4483.5	37.05372
19	602	1	0.333333	596	3880	32.225191
24	590	8	0.666667	581	3284	27.83051
29	572	10	0.555556	559.5	2703	23.62762



34	547	15	0.6	533	2143.5	19.59324
39	519	18	0.642857	479.5	1610.5	15.51541
44	440	55	0.696203	395	1131	12.85227
49	350	63	0.7	311	736	10.51429
54	272	62	0.794872	234	425	7.8125
59	196	59	0.776316	143.5	191	4.87244
64	91	98	0.933333	46.5	47.5	2.0
69	2	74	0.831461	1	1	0.5