Analysis of Exposure and Prevalence Risk Factors of Non-Communicable Diseases at the University of Lagos

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Abstract

Diseases of various types exist and constitute serious danger to individuals' survival and to the economy. The mode of exposure of individuals' to diseases varies from place to place; some diseases are occupationally originated; some are environment related while others are genetically transferred. This article examines the exposure to the incidence and the prevalence risk factors in different socio-demographic groups of the University of Lagos community. In terms of actuarial terminology, the cases are stratified into Starters, New entrants, Withdrawals and Enders over a period of nine years. The empirical findings reveal that exposure is age-specific, but also characterized by sex, marital status and occupation of participants. Hence, control could be organized from the angle of any of these demographic variables. The policy implications are also being discussed

Key Words: NCDs, Measurement of Exposure, Prevalence Risk Factors, Actuarial Valuation, Continuous Model.

1. Introduction

Occupational hazards can result either from safety hazards or from health hazards. The first category is accident related while the other usually results from exposure to diseases. Diseases, either communicable or non-communicable could manifest anywhere and often without the individual having any knowledge of their onset. The factors causing health hazards in the work place are multifarious and can be classified into physical, biological, chemical and genetic factors. Physically related hazards can result from heat, noise, vibration, ionizing radiation and atmospheric pressure; biological factors include amongst others tuberculosis and hepatitis, chemical based factors can be caused by lead, mercury or manganese while genetic conditions include asthma, hypertension and diabetes mellitus are very frequent. Illnesses cropping up from these health hazards may hinder proper functioning of the affected individual. In recent times, the individual employee's exposure to hazards from diseases is on a daily increase. This increase in exposure to hazards has propelled man to be cautious of his physical environment and to seek control of these diseases before they manifest.

With advancement in science, technology and public health education the incidence of non communicable diseases (NCDs) is dropping dramatically in developed economies. The experience in developing economies is, however, different as some of the diseases are still rapidly on the rise. According to a report credited to World Health Organization (WHO), this episode is turning the situation in developing economies into a global epidemic that threatens the health of people and of the economy in various forms (Mathers and Loncar, 2006). This is corroborated by an observation by the Population Reference Bureau (2006) that low income countries, in the next two decades, will be overwhelmed by exposure to various diseases such as strokes and health attacks. The worry is that as children who spent their youth in increasingly unhealthy cities metamorphosed into adults, in few years, they will carry with them into adulthood accumulated risk from a youth characterized by under-nutrition and exposure to NDCs (ECOSOC *et al.*, 2009).

Further evidence of the rapidly growing epidemic is provided by Omran (1971), WHO (2004), WHO (2005) and Stuckler (2008), who variously observed that these diseases have emerged among the leading killers in poor countries, especially in Africa. It is thus imperative that urgent action be taken to address the burden in this region. Sabri (2007), Abegunde and Stanciole (2008), Hossain et al (2007), Elrayah *et al.* (2005), Elrayah-Eliadarous (2007) and Stuckler (2008) stated that most NCDs threatens to overwhelm health systems. This is creating a poverty trap through high cost and expenditure thereby, slowing economic development. These happen because NCDs have so many ways of dragging on economic growth, where deaths are more usually premature than in high income countries. Diseases reduce savings incentives and social capital.

Moreover, repeated studies indicated that populations, even in countries with a high burden of (NCDs), are often unaware of the diseases, or of their risk factors. Therefore, people act in a time inconsistent manner especially in the case of children and adolescents faced with addictive manners. In order to meet the agenda of the millennium development goals (MDGs), Nigerian government put up several initiatives to curb the menace of diseases but lack of education has proven to be a menace. Education has been reckoned as capable of raising the standard of hygiene. Collaboration is also important as illustrated by Udoh *et al.* (1987) who insisted that prevention and control of diseases require the cooperation and coordination of the activities of the health departments, medical doctors, medical groups, parents, schools and society at large. This study combines actuarial mortality approach with method of epidemiology to examine the exposure rate and the prevalence risk factors of some common non-communicable diseases in different socio-demographic groups among the University of Lagos community over a period of nine years (2000 to 2008).

2. Data, Material and Methods

We discuss in this Section data collection, the methodology adopted in the study and the material used.

2.1 Data

The study population is drawn from the health records of staff and students from the University of Lagos, Nigeria. This involves records of patients in a given factor time interval, and the population covered cases of various ages from the day of diagnosis till date of termination of study. The population characteristics include 'Starters', consisting of those who are already on treatment before the year of observation, 'New Entrants', whose date of first diagnosis falls within the period of observation, 'Withdrawals', comprising those who are out of observation as a result of leaving school or service, or having graduated from school or retired from service and finally, 'Enders', comprising those who remain in the population from the first date of observation to the date of discontinuing the observation. This could be as a result of being a student in school or an active worker during the period of observation. Four diseases namely: hypertension, diabetes mellitus, asthma and malaria are considered in this study. From the population, 259 cases were randomly selected to form the sample. This covers participants of various ages and other attributes. The data collected were based on Age, Sex, Marital Status, Occupation and Work status of the individual at risk. Also, onset period (period of diagnosis) from date of observation, new entrants into the study from date of observation, any loss to follow-up due to withdrawal, death or otherwise and Enders or were recorded. The non-communicable diseases included in the study are: Malaria, Hypertension, Asthma and Diabetes Mellitus. The general pattern of exposure was measured using continuous model.

2.2 Methods

Prevalence and Incidence Risks Measures

We use in the study the following prevalence and incidence risk factors computational methods (Elandt-Johnson and Norman, 1980; Szklo and Nieto, 2007).

Measurement of Prevalence

Prevalence is defined as :

$$Prevalence = \frac{Number\ of\ cases\ of\ disease\ A\ at\ specific\ date}{Number\ of\ persons\ in\ the\ community\ at\ observation\ period} \times k$$

where persons in the community implied the total number of cases and *k* is the Radix taken in this case to be 100.

Measurement of Incidence

The Annual Incidence Rate Method (AIRM) is defined as:

$$AIR = \frac{Number\ of\ cases\ of\ disease\ A\ at\ a\ specific\ period\ T\ years}{Number\ of\ persons\ in\ the\ community\ at\ observation\ period\ \times T} \times k$$

where *T*, the observation period is 9 years in this study (2000 – 2008).

The point prevalence is given as:

$$Point\ Prevalence = Incidence \times Duration(T)$$

Odds of Diseases

Thus, the incidence and prevalence odds are defined as:

$$Incidence\ Odds = \frac{q}{1-q} = \frac{proportion\ of\ a\ specific\ disease\ present}{proportion\ of\ disease\ absent}$$

$$. \qquad Point\ Prevalence\ Odd = PPO = \frac{Point\ Prevalence}{1-Point\ Prevalence}$$

Measurement of Exposure

Furthermore, the analysis was conducted using the following actuarial valuation exposure functions.

$$E_X = \sum_{k=a}^{n-1} t_k + h_X$$

where **Ex** is the net exposure at age **x,** *a* is first age at observation and *n* is last age at observation; t_k is the summation of the variables less death, withdrawals and enders at age x respectively. Thus, $t_k = S_x + n_x - W_x - e_x - \Theta_x$. h_x is the algebraic sum of the variables based on age last birth day and $S_x = S_x]_x^{x+1/2}$, $n_x = n_x]_x^{x+1/2}$, $W_x = W_x]_x^{x+1/2}$, $e_x = e_x]_x^{x+1/2}$ *and* $\Theta_x = \Theta_x]_x^{x+1}$.

Therefore, the categories include

$S_x^{x+1/2}$, $n_x^{x+1/2}$, $W_x^{x+1/2}$, e_x^{x} *and* Θ_x^{x+1}.
Then, $h_x = 1(S_x^{x+1/2}) + 1/2(n_x^{x+1/2}) - ½(W_x^{x+1/2}) - 0(e_x^{x}) - 1(\Theta_x^{x+1})$. Valuation of exposure for a single interval using net exposure method will involve:

$$E_X = \sum_{k=a}^{k-X-1} t_k + \left(S + \frac{1}{2}n - \frac{1}{2}W\right)X$$

For the valuation of exposure for a continuous interval, the exposure formulae derived below was used. Thus, let E_X from the equation above be the initial value at starting age x, then at age X+1, we have

$E_{X+1} = E_X + (1/2n - ½W - \Theta)_x + (s + 1/2n - ½W)_{x+1,}$ and at age n,
$E_{X+n} = E_{x+n-1} + (1/2n - 1/2W - \Theta)_{x+n-1} + (s + 1/2n - 1/2W)_{x+n,}$

where, every computed preceding exposure at an age, is the starting exposure for succeeding age.

From the above computation of continuous exposures, a table of exposures is computed which shows various accumulated t_k and h_x values at various specific ages. At the end, the exposure analysis, we draw the exposure curve which displays the trend of exposure by age.

3. Analysis Discussion

From the results displayed in Table 4.2a, we observe that malaria recorded the highest level of incidence and that male participants appear to be more prone to this disease than female participants, with incidence of 3.13 per 100 cases. This also represents 61.34% of malaria cases and the female participants have an incidence of 1.97 per 100 cases. Hypertension is also a disease with high incidence risk on men. Out of 82(31.66%) cases, 53(64.63%) are males with disease incidence rate of 2.27 per 100 cases. Females have 1.24 per 100 cases. The same situation is observed for Diabetes mellitus on which out of the 26(10.04%) cases, 14(53.85%) are male participants with disease incidence rate of 0.6 per 100 cases and females have an incidence of 0.51 per 100 cases. Contrary to this, Asthma incidence is pronounced on female participants. Out of 32(12.36%) cases of Asthma, 23(71.86%) are females with 0.97 incidence risk. On Marital Status of participants, the results given in Table 4.2b show that the prevalence and incidence of the various diseases are as usually expected in this part of the world. Thus, the commonest disease (malaria) posses a great challenge on those who are married. Out of 191(73.75%) married couples, 77(40.31%) are exposed to malaria which occupies 64.71% of malaria cases with annual incidence rate of 3.3 per 100 cases. For singles, the annual incidence is 1.8 per 100 cases. Also, on hypertension which is the second prevalent disease on the sample with 82 cases, those that are married are 78(95.12%) which is 40.84percent out of 191 married participants. This represents an annual incidence of 3.35 per 100 cases. Singles have an incidence rate of 0.17 per 100 cases. More so, on Diabetes Mellitus, out of the 26 cases, 25(96.15%) are married couples which represents 13.09% of the married samples with incidence of 1.07 per 100 cases while the single participants have an annual incidence rate of 0.04 per 100 cases. However, Asthma, which represents 12.36% of cases, has 21(65.63%) singles. The singles participants represent 68(26.25%) of the total cases with annual incidence of 0.9 per 100 cases. The married couples have annual incidence of 0.47 per 100 cases.

Also, Table 4.2c displays the exposure to diseases by occupation of the participants. In this situation, out of the 259 cases, 77(29.73%) are students while 182(70.23%) are staff. On exposure to malaria, the incidence falls more on staff participants with 73(61.34%) out of 119 cases. This represents an incidence rate of 3.13 per 100 reported cases. On students with malaria, the incidence is 1.97 per 100 cases but there are a lot of debate about young students indulging in malaria self medication in the community. Out of 82 cases of hypertension, 76(92.68%) are staff with disease incidence of 3.3 per 100 cases. 23(88.46%) out of 26 cases of diabetic patients are also staff with disease incidence of 0.99 per 100 cases. Students, have annual incidence of 0.26 per 100 cases and 0.13 per 100 cases on hypertension and diabetes mellitus respectively. However, out of the 32 cases of Asthma, 22(68.75%) are students which represents 28.57percent of the total cases with annual incidence of 0.94 per 100 cases. Staff have annual incidence of 0.43 per 100 cases on Asthma. Generally, 82(31.66%) cases are hypertensive with annual incidence of 3.52 per 100 cases, 26(10.04%) are diabetic with annual incidence of 1.12 per 100 cases, 119(45.95%) have malaria with annual incidence of 5.11.per 100 cases while 32(12.36%) are asthmatic with annual incidence of 1.37 per 100 cases.

Moreover, Table 4.3.a shows the cross tabulation of sex on exposure status of participants. From the results, we have 19(7.34%) are male starters, 131(50.58%) are male new entrants, 26(10.04%) are male withdrawals and 123(47.49%) are male Enders. On the other hand, 21(8.11%) female are starters, 89(34.36%) females are new entrants, 11(4.25%) females are on withdrawals and 99(38.22%) females are Enders. Table 4.3.b summarized the distribution of participants' marital statuses of the cases observed by the exposure status. Out of the 259 cases, only 4(1.54%) singles are starters, 64(24.71%) are new entrants, 18(0.69%) are on withdrawals status and 50(19.31%) singles are Enders. Also, 36(15.44%) married couples are new starters, 156(60.23%) are new entrants, 19(7.34%) are withdrawn cases while 172(66.41%) are married couples. In addition, from Table 4.3.c results, we observed that 4(1.54%), 73(28.19%), 22(8.49%) and 55(21.24%) students are starters, new entrants, withdrawn cases and Enders respectively. More so, 36(13.90%), 147(56.76%), 15(5.79%) and 167(64.48%) staff are starters, new entrants, withdrawn cases and Enders respectively. Table 4.3.d results show the classification of various NCD selected diseases on exposure status. Out of the registered 259 cases, 11(4.25%) starters, 72(27.80%) new entrants, 6(2.32%) withdrawn cases and 76(29.34%) are Enders which still suffering from hypertension. Also, on diabetic patients, 2(0.77%) are starters, 24(9.26%) are withdrawn cases and 26(10.04%) are Enders. More so, on malaria, 23(8.89%) cases are starters and withdrawn cases respectively while 96(37.07%) cases are new entrants and Enders respectively. On asthma cases, 4(1.54%) are starters, 28(10.81%) are new entrants, 8(3.09%) are withdrawn cases and 24(9.27%) are Enders.

On the general note, out of the 259 reported cases, 40(15.44%) are starters, 220(84.94%) are new entrants, 37(14.29%) are withdrawn cases while 222(85.71%) are Enders.

Table 4.4 displays the frequency distributions of disease prevalence by exact age at exposure. It was observed that malaria is a very common disease which represents 119 (45.95%) of the total sample and an incidence of 5 in every 100 cases. The incidence falls on age 40 with 10 (0.429) and has 17 (0.729) of the total diseases. Also, Asthma is a common disease among children with incidence of 5(15.63%) at age of 19 years. Although, Asthma has 20.13 percent of the total sample with annual incidence of 1.37 per 100 cases, that does not anyway reduce its effect. Hypertension has 82 (31.66%) cases which is the second most prevalent disease and falls on age 45 and 60 years with 6 (7.32%) with 3.52 per 100 cases of incidence rate. Diabetes mellitus with 26 cases represents 10.04% which shows that it is not a very common disease in this community. However, its prevalence is mainly in the age bracket 59 – 60 years with incidence rate of 1.12 per 100 cases. The analysis results of Table 4.4 and 4.3 suggest that the nature of exposure of people to diseases is a characteristic of age factor. This means that diseases generally and especially those under the line of analysis, depend on declining age. Hypertension, Diabetes, Asthma and malaria on the dispersal, are risk factor diseases that could operate by age. The trend distributions of exposure curve computed using the continuous valuation model displayed in Figure 4.1 supports this assertion. Thus, it shows that people are more exposed to diseases as they advance by age in complete agreement with the basic principles of actuarial survival analysis and life and health insurance policy.

Further analysis results displayed in Table 4.5 gives the summary of risk exposure rate of diseases in different socio-occupational groups, whereas, Table 4.6 displays the summary statistics of incidence, point prevalence and odds ratios of various NCD considered in the study. Thus, can state with a good measure of confidence that, from the results displayed in Panel A of Table 4.5, there is indication that for every 100 persons, 5-6 persons are exposed to any one of the diseases under study. For every 100 individuals, there is the chance of 3 getting affected by any disease and 2 females are at risk of contacting any of disease. Among the unmarried cases, 1-2 persons out of every 100 stand the chance of getting affected by any disease, whereas, for every 100 couples, 4 have the chance of being exposed to diseases. Also, for every 100 cases of students, 1-2 persons have the apparent chance of being affected by a disease and for every 100 staff of the University, 4 persons are standing the risk of getting any of the diseases. Furthermore, looking at the results displayed in Panel B of the same Table, there is indication that, out of every 100 disease cases, 2-3 persons stand the risk of being affected by malaria. Also, in every 1000 disease cases, 5-6 persons are at risk of being diabetic. This relates to the fact that for every 100cases, 1-2 persons are at risk of being hypertensive. Finally, out of every 1000 cases of diseases, 7 persons are at risk of being affected by asthma. Moreover, from Table 4.6, we observe that Malaria has the highest incidence odd, point prevalence and prevalence risks. This is followed by Hypertension, and diabetes mellitus in second and third place respectively. Asthma which only common for young female student is last since most of the patients leaved the school community after graduation.

4. Summary of Findings

The nature of the spread of non-communicable diseases in the University of Lagos is dynamic and dependent on nature of diseases and age. Malaria is a very common disease and mostly attacks people across ages even though it reaches its incidence peak at about the age of 40 years. This may be as a result of the school being bounded by Lagos lagoon and swamps where Mosquitoes have sufficient breeding spaces. Therefore, for every 100 persons, malaria has point prevalence odds of attacking 31 persons within a specified period of time. Diabetes mellitus was seen to be an old age disease and not very common as malaria. However, the incidence falls mostly on patients above the age of 50years thereby, having point prevalence odds of 5 per 100 persons.

The incidence and prevalence of diseases were observed to be very pronounced for males with the exception of Asthma. On those that are married, disease incidence and prevalence read wide. Those patients, who are single females, are on the other hand; threatened by asthma attack thus, on point prevalence, 6-7 persons per 100, have the chance of falling victim at a point in time. The prevalence and incidence of the selected diseases according to the working status of the patients revealed that those who are staff of the University of Lagos are much more attacked by hypertension, diabetes mellitus and malaria while students of the University are much exposed to the attack of malaria and asthma.

On the measurement of exposure, it was generally discovered that male are highly exposed to various diseases with most of them standing the risk of being exposed any time thereby, forming new entrants into various case studies. Female are majority starters and in case of new entrants, those who are married formed the major bulk. Incidentally, the married patients are good starters, withdrawers and Enders, since most of them are staff of the University. As expected, exposure of the patients according to occupation indicated that staff of the University of Lagos form the bulk of starters, new entrants and Enders. Students form bulk of withdrawals. The basis of this is due to the fact that staff having much permanent period of stay of about 35 years, while students have maximum of 4-8years to graduation maturity date under the current set-up.

A careful look at the analysis of diseases by their exposure nature suggested that among the starters, new entrants, withdrawals and Enders, malaria which is the commonest disease and forms the majority. This is supported by the degrees of computed prevalence risk factors and odds ratios. Malaria within any period in time has a very high odd ratio indicating a common incidence and prevalence feature of this disease within the living environment of the community. Exposure measurement using age as a specific risk factor showed that exposure increases as age advances. This is quite expected for some diseases like hypertension and diabetes mellitus which are mostly age related disease in Nigerian environment.

In summary, in the University of Lagos, the exposure rate indicates that in every 100 persons (staff and students), 5-6 of them stand the risk of being affected by any of the study diseases. Thus, by their sex, 3 might be male while 2 might be female. On their marital status, 1 out of them might be single and 4 could be married. This is reflected on work status because, 1 out of the affected persons, could be a student and 4 cases of staff. On the effectiveness of diseases, it was observed that for every 100 persons, 2-3 could be affected by malaria and 1-2 persons might suffer from hypertension which on odd prevalence analysis, has high ratio next to malaria. Also, for every 1000 persons, 5-6persons might be suffering from diabetes mellitus and 7 persons, might be affected by asthma. This reveals that diabetes and asthma, are necessarily both genetic and age induced illness in this community as being confirmed by a second look at the record files.

5. Conclusion and Recommendations

The present study discovered that exposures to various diseases are affecting both students and staff in the University of Lagos community. This is referent on both sexes and ages even though males are more affected than their females' counterpart. On the principle of prevalence, incidence and exposure, the staff stands a higher risk due to job relationship. Hypertension and Diabetes mellitus are two operating diseases much more common amongst staff. Hence, since staff are much more affected by diabetes mellitus, they stand higher risk of being affected by hypertension. Malaria is a very common disease because of the environmental characteristics of the community. Therefore, it is general occurrences to both staff and students regardless of their ages and sexes. Asthma, on the principle of exposure is more of a genetic problem as being expatiated by the medical core of the health centre. The nature of exposure to various diseases results from socio-demographic, environmental, work, feeding habit and genetic factors. Since exposure results from any of the above characteristics, recommendations must be related to them.

To mitigate diseases that result from environmental factors, the following steps should be considered. People have to embark seriously on environmental cleanliness and upgrading to reduce environmental hazards as being recommended by the University management and Lagos state government. Green vegetation should be enhanced to promote more natural and less stressful environment and routine environmental fumigation should be enhanced to take care of larvae of mosquitoes that are causal agents of malaria. With respect to diseases that are work related the following protective measures have to be taken: Staff needs to be given leave in order to reduce tension that might affect health and cause damages and changes in body chemistry. On the part of the students, academic work should be balanced with accredited social activities (e.g. cultural week) that will educate and at the same time reduce tension. From the perspective of nutrition and feeding habit, we advocate the following: People should avoid consumption of food with high cholesterol concentration. Sports should be enhanced to wade off some stored fats that could enhance heart problems and obesity.

On diseases that are caused by hereditary factors, the following must be considered: There should be routine check-up to make sure that the level of exposure is reduced to the lowest level. Exposure to factors that will promote the prevalence and incidence of such diseases should be avoided.

In general, to be able to note the correct age at exposure, exact ages of the community members should be recorded to avoid age crashing. All the staff of the community must be encouraged for timely registration for National Health Insurance Scheme (NHIS). Finally, apart from the popular terminal diseases like hypertension, cancer and diabetes mellitus, health and life insurer must consider also the serious treat of malaria to life in the underwriting policy. Based on the present findings, this must be applicable to all members of the community.

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Table 4.2a: Cross Distribution of Diseases by Gender

		Exposure to selected diseases.				
		Hypertension	Diabetes mellitus	Malaria	Asthma	Total
Sex	male	53	14	73	9	149
	Female	29	12	46	23	110
	Total	82	26	119	32	259

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.2b. Cross Distribution of Diseases by Marital status

		Exposure to selected diseases.				
		Hypertension	Diabetes mellitus	Malaria	Asthma	Total
Marital status	Single	4	1	42	21	68
	Married	78	25	77	11	191
	Total	82	26	119	32	259

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.2c. Distribution of Diseases Prevalence by Occupation

		Exposure to selected diseases.				
		Hypertension	Diabetes mellitus	Malaria	Asthma	Total
Occupation	Students	6	3	46	22	77
	Staff	76	23	73	10	182
	Total	82	26	119	32	259

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.3.a Distribution of Sex by exposure status

		Exposure status.			
		starters	New entrants	Withdrawals	Enders
Sex	Male	19	131	26	123
	Female	21	89	11	99
	Total	40	220	37	222

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.3.b. Distribution of Exposure by Marital Status

		Exposure status.			
		Starters	New entrants	Withdrawals	Enders
Marital Status	Single	4	64	18	50
	Married	36	156	19	172
	Total	40	220	37	222

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.3.c. Distribution of Exposure by Occupation

		Exposure status.			
		starters	New entrants	Withdrawals	Enders
Work Status	Students	4	73	22	55
	Staff	36	147	15	167
	Total	40	220	37	222

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.3.d. Distributions of Diseases prevalence by exposure status

		Exposure status			
		Starters	New entrants	Withdrawals	Enders
Diseases.	Hypertension	11	72	6	76
	Diabetes mellitus	2	24	-	26
	Malaria	23	96	23	96
	Asthma	4	28	8	24
	Total	40	220	37	222

Source: University of Lagos Medical centre, Main campus, Akoka, yaba.

Table 4.4 Distribution of Diseases by Age.

		Exposure to selected diseases.				
		Hypertension	Diabetes mellitus	Malaria	Asthma	Total
Age	7	-	-	-	1	1
	10	-	-	-	1	1
	11	-	-	1	-	1
	12	-	-	1	-	1
	13	-	-	1	1	2
	15	-	-	1	1	2
	16	-	-	1	1	2
	17	-	-	2	-	2
	19	-	-	2	5	7
	20	-	-	1	1	2
	21	-	-	1	1	2
	22	-	-	4	1	5
	23	-	-	3	-	3
	24	-	-	3	-	3
	25	-	-	5	1	6
	26	-	-	3	1	4
	27	-	-	5	2	7
	28	2	-	3	2	7
	29	-	1	4	1	6
	30	-	-	1	1	2
	31	-	-	-	1	1
	32	1	-	1	-	2
	33	-	-	3	-	3
	34	-	-	3	-	3
	35	-	-	1	-	1
	36	-	-	2	-	2
	37	1	-	4	2	7
	38	-	-	1	1	2
	39	1	-	2	-	3
	40	4	2	10	1	17
	41	3	-	3	-	6
	42	5	2	2	1	10
	43	3	-	2	-	5
	44	-	-	2	-	2
	45	6	2	5	-	13
	46	3	1	5	-	9
	47	1	1	3	-	5
	48	4	1	1	-	6
	49	1	-	2	-	3
	50	5	1	3	1	10
	51	4	1	1	-	6
	52	5	3	3	-	11
	53	3	-	5	1	9
	54	1	1	3	-	5
	55	3	1	1	-	5
	56	5	1	2	-	8
	57	3	1	3	2	9
	58	2	-	-	-	2
	59	4	3	2	-	9
	60	6	3	1	1	11
	61	1	-	1	-	2
	62	4	-	-	-	4
	63	-	1	-	-	1
	65	1	-	-	-	1
Total		82	26	119	32	259

Table 4.5: Exposure rate by risk factors and disease type

Panel A: Exposure rate by socio-demographic factors

	Gender		Marital status		Occupation		Total
	Male	Female	Married	Single	Staff	Student	
Exposure rate	*0.0327*	*0.0242*	*0.0419*	*0.0149*	*0.0400*	*0.0169*	*0.0569*

Panel B: Exposure rate by NCD

	Selected Diseases			
	Malaria	Diabetes mellitus	Hypertension	Asthma
Exposure rate	0.0261	0.0057	0.0180	0,0070

Table 4.6 Summary of incidence, point prevalence and the odds ratios of the selected diseases

	Risk Statistics		
Diseases	Incidence Odd	Point Prevalence	Prevalence Odd
Malaria	0.02680	0.2412	0.3179
Hypertension	0.01830	0.1647	0.1972
Diabetes mellitus	0.00573	0.0516	0.0544
Asthma	0.00710	0.0639	0.0683

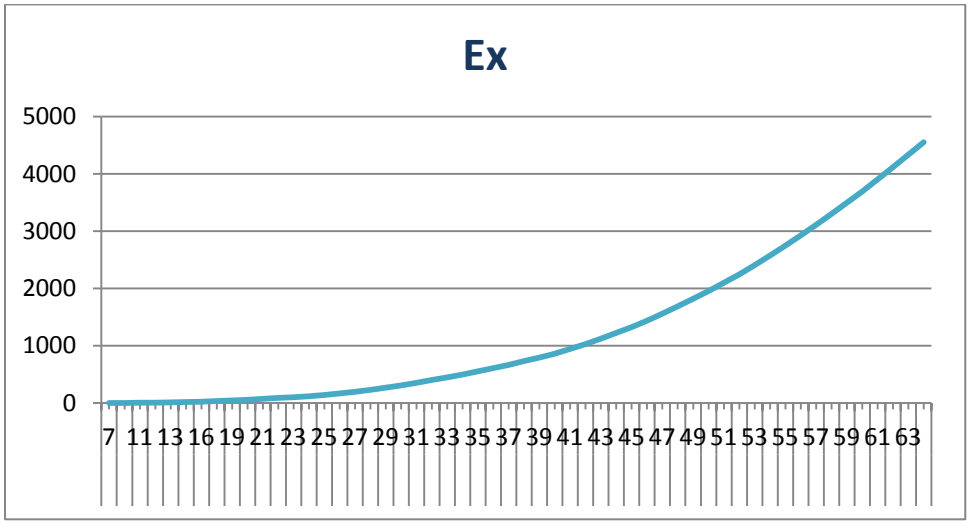

Fig.4.1 Exposure curve by age derived using the continuous valuation model