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GENERAL MORTALITY RATE IN NIGERIA: A CASE STUDY OF FEDERAL MEDICAL CENTRE JABI, ABUJA

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ABSTRACT: *Mortality is one of the components of population changes; it is completely out of human control and affects every segment of a population. Mortality is a term used to describe the contribution of death to population change and refers to the permanent disappearance of all evidence of life at any time after live birth has taken place. This study applies a retrospective design through the conduct of record review using the mortality registers from 2013 – 2017 with key variables of interest extracted. The Chi-square test of independence technique, two ways ANOVA, life table, and population projection model (exponential model) were employed for the analysis of the relevant data. The null hypothesis of "No significant association between causes of death and sex" was accepted; P-value of 0.377 is greater than 0.05, we accept H_o and conclude that there is no significant association between diseases and sex. More males than females died of congestive cardiac failure, diabetes and severe birth asphyxia. About 160 males and females were recorded dead in the 2013 – 2017; out of which 53.8% of them were males and 46.2% of them were females – this implies that the risk of death at any given age is less for females than for males. The five-leading cause of death in Nigeria were Congestive Cardiac Failure (45%), Sepsis (23%), Pneumonia (15%), RVD (12%) and Respiratory Distress (5%). The general population growth rate shows a decrease in the rate of mortality across all ages; but the age specific growth rate shows that infant mortality is on the rise and tends to double in the year 2025 if the current growth rate persists. The life table shows that the life expectancy at birth is 43.5 years ($\ell_x = 8.69$) and that a man aged 20 years has about 44% chances of dying before his 50^{th} birthday. The study showed that the risk of death at any given age is less for females than for males, while under – 5 years have the higher risk of dying compared to other age categories with about 28.1% of new born babies dying before reaching age five. Regular medical checks remain optimally essential in prolonging of life as well as ensuring a healthy well-being.*

KEYWORDS: general, mortality rate, Nigeria, Federal Medical Centre, Jabi, Abuja

INTRODUCTION

Mortality is one of the components of population changes; it is completely out of human control and affects every segment of a population. Mortality is a term used to describe the contribution of death to population change (Eleazer et al, 2009). It is the frequency of death in a population. Anthony Stewart (2002) defines mortality as death from a disease. Death refers to the permanent disappearance of all evidence of life at any time after live birth has taken place (NBS, 2017). The risk of death at any given age is less for females than for males, except during the childbearing years. The risk of death for both sexes is high immediately after birth, diminishing during childhood and reaching a minimum at 10 to 12 years of age. The risk then rises again until at late ages it surpasses that of the first year of life.

The maternal and new-born mortality in Nigeria is one of the highest in the world with an estimated 576 maternal deaths per 100,000 live births (NDHS, 2013). Infant and under – 5 mortality rate is estimated at 108.8 per 1000 live births for 2015 as per the interagency model on under – 5 rate (U5R). Globally, under nutrition contributes to 45% of all under-five deaths in 2011 (Black et al. 2013) and this possibly holds same for Nigeria. Estimates of 110 Nigeria women die each day with a greater proportion occurring in Northern Nigeria where the health and nutrition indices are poorer.

This study is majorly concerned with causes of mortality (death), the age at which it occurs for both male and female and uses secondary data collected from Federal Medical Centre Jabi Airport road, Abuja.

LITERATURE REVIEW

Mortality in demographic usage is the frequency of death in a population. It is the relative incidence of death within a particular group categorized according to age or some other factor such as occupation. Anthony Stewart (2002) defines mortality as death from a disease. Mortality is another term for death. According to the National Bureau of Statistics (2007), death refers to the permanent disappearance of all evidence of life at any time after live birth has taken place.A mortality rate is the number of deaths due to a disease divided by the total population. According to Eleazar et al (2009), both death rate and mortality rate are measures of the frequency of deaths in relation to the population exposed to the risk of death. However, while death rate is used to describe the frequency of death in relation to the exposed population at the mid- point of an interval (i.e. Central rate), mortality rate is used to describe the frequency of death in relation to the exposed population at the beginning of the interval (i.e. probability); nevertheless the two concepts are used interchangeably.

The risk of death at any given age is less for females than for males, except during the childbearing years. The risk of death for both sexes is high immediately after birth, diminishing during childhood and reaching a minimum at 10 -12 years age. The risk then rises again until at late ages it surpasses that of the first year of life. Anthony Stewart (2002) states that mortality is higher in old people, men tend to die earlier than woman. While Mike Walsh (2002) and Aggleton (1990) suggested that there is a significant social component to health, with emphases that health and mortality were closely linked to social class and wealth. The investigators showed that, for a whole range of medical conditions, mortality and morbidity were lowest amongst the wealthiest and highest amongst the poorest. That is to say: your life expectancy and health are heavily influenced by where you are in society.

The mortality study of British Pathologist 1974 – 80, shows that the overall mortality experience was favourable for men, less so for women. Notable deficits occurred for deaths among men from all neoplasm and in particular from lung cancer and in deaths from diseases of the circulatory and respiratory system. The maternal and new-born mortality in Nigeria is one of the highest in the world with an estimated 576 maternal deaths per 100,000 live births (NDHS, 2013). Infant and under – 5 mortality rate is estimated at 108.8 per 1000 live births for 2015 as per the interagency model on under – 5 rate (U5R). Globally, under nutrition contributes to 45% of all under five deaths in 2011 (Black et al, 2013) and this probably holds same for Nigeria. Nigeria contributes about 10% of the global burden of maternal deaths and 10% of burden of children with Severe

Acute Malnutrition (NDHS, 2015). An estimated 110 Nigerian woman die each day with a greater proportion occurring in Northern Nigeria where the health and nutrition indices are poorer. Due to combination of the high mortality rate and its large population size, Nigeria has the second largest number of stunted under five children next to India. Maternal and Infant mortality rates are 3 – 4 times the national average. According to Jean Ziegler (the United Nation's Special Rapporteur on the Right to Food for 2000 to March, 2008), mortality due to Malnutrition accounted for 58% of the total mortality in 2006: "In the world, approximately 62 million people, all causes combined, die each year. In 2006, more than 36 million died of hunger or diseases due to deficiencies in micronutrients." Of the roughly 150,000 people who die each day across the globe, about two thirds – 100,000 per day, die of age related cause.

According to Umar LW et al (2014), under five mortality rate is an important index for assessing achievements by countries and thus its targeted reduction is adopted as benchmark towards realizing the millennium development goal number 4 by 2015. West Africa still contributes significantly to the global burden of child mortality, with over half of the deaths caused by infections. However, Knoema (2018) defines under-five mortality rate as the probability per 1000 that a new born baby will die before reaching age five, if subject to current age-specific mortality rates.

According to the World Development Indicators (WDI) database and related products, adult mortality rate refers to the probability that those who have reached age 15 will die before reaching age 60. Furthermore, UNFPA (2012) states that adult mortality is usually defined as mortality at ages 15 or more. It refers solely to mortality between exact ages 15 and 60 years, and is contrasted with older – age mortality, which is used to refer to mortality at ages 60 or more. The probability that a person on their 15^{th} birthday dies before their 60^{th} birthday, (45q15 in the life table) has become a widely used indicator of adult mortality.

According to Global Health Observatory data (GHO, 2018), India, Nigeria, Democratic Republic of Congo, Pakistan and China collectively accounted for half of the total number of under-five deaths globally. In India, around 1.7 million children died before reaching the age of 5 years in 2010, and more than half of them (52%) died in the first month of life. The major causes of deaths were pneumonia (24%), prematurity (20%) and diarrhoea (13%). While in Nigeria, around 700,000 children died before their 5^{th} birthday; 60 percent of these death were due to the following conditions; malaria (20%), pneumonia (17%), prematurity (12%) and diarrhoea (11%). In the same vein, World Health Organisation (WHO) stated that preterm birth accounts for 30% of global neonatal deaths, sepsis or pneumonia for 27%, birth asphyxia for 23%, congenital abnormality for 6%, neonatal tetanus for 4%, diarrhoea for 3% and other causes for 7% of all neonatal deaths. In addition, the primary obstetric antecedent factor or sequence of events leading to the death of the neonate includes; preterm labour (<37 weeks), premature rupture of membranes, ante-partum haemorrhage, intra-partum asphyxia, infection, intra uterine growth retardation including post maturity, hypertension, foetal abnormality, maternal disease, trauma and unexplained intra uterine death. Intra partum asphyxia includes prolonged labour, meconium aspiration and umbilical cord compression or accident; foetal abnormalities include chromosomal and somatic abnormalities. The final cause of a neonatal death could also be assigned according to the event that caused the death, as follows; immaturity related, birth asphyxia or hypoxia, infection, congenital abnormality, trauma, other or unknown. Immaturity-related deaths include those due to extreme multiorgan immaturity (only in infants born less than 28 weeks' gestation) and hyaline membrane disease or

clinical respiratory distress in the absence of any other detectable cause. Death due to birth asphyxia results when a normally formed term baby was unable to initiate and sustain respiration at birth or had a low Apgar score or clinical signs of hypoxia or meconium aspiration.According to the office for National Statistics (2017), period life expectancy at birth in the U.K in 2016 was 82.9 years for females and 79.2 years for male. In 50 years', time, by 2066, period life expectancy at birth in the U.K is projected to reach 88.9 years for females and 86.4 years for males; while cohort life expectancy at birth in the U.K in 2016 was 91.9 years for females and 89.3 years for males. In 50 years', time, by 2066, cohort life expectancy at birth in the U.K is projected to reach 98.1 years for females and 96.1 for males. In 2066 in the U.K, 50.0% of new born baby girls and 44.2% of the new born baby boys are projected to live to at least 100 years old.Ingrid K. Van Dijk (2018) assert that early –life mortality in contemporary and historical populations has shown that infant and child mortality tends to cluster in a limited number of high mortality families; and that the death of an older child harms the survival chances of younger children in that family.

According to the World Life Expectancy, Nigeria ranks number 177 with life expectancy of 54.5 falling below the world's life expectancy bench mark of 68.9 years. While Japan is rank 1st with life expectancy of 83.7and Sierra Leone with life expectancy of 50.1 years ranks 183 on the table. The World Life expectancy stated that the ten leading causes of deaths globally are coronary heart disease, stroke, influenza / pneumonia, lung disease, lung cancer, diabetes, Alzheimer's/dementia, diarrhoeal diseases, tuberculosis, and RTA while the ten (10) leading cause of death in Nigeria are as follows; influenza/pneumonia, diarrhoeal diseases, tuberculosis, HIV/AIDS, malaria, low birth weight, stroke, birth trauma, coronary heart disease, and maternal conditions. The life expectation function: the complete expectation of life at age x is defined as:

$$\ell_x = \frac{T_x}{l_x}$$

$$= \frac{1}{l_x} \int_0^\infty l_x + {}_t d_t = \int_0^\infty {}_t P_x d_t$$

The life expectancy function may be interpreted as representing the expected average future lifetime remaining at age x. Because of the gender difference; life expectancy is calculated also separately for men and women.

According to Andrew Hinde (1998), a life table is a convenient way of summarizing various aspects of the variation of mortality with age. In essence, it is derived by following a birth cohort of persons through life and tabulating the proportion still alive at various ages. In the same vein, Elezar et al (2009) define life table as a table describing the life history of a group of persons or cohort (real or hypothetical) as its member is reduced by force of mortality from birth until all have died. [4] In practical applications, life tables are based on q-type mortality rates calculated either for groups of people of the same age or for broader age groups.

According to a UN study, "population projections are calculations which show the future course of fertility, mortality and migration. They are in general purely formal calculations, developing the implications of the assumptions that are made." A population projection is a calculation showing what happens if particular assumptions are made. The population projections are trend – based. They are, therefore, not policy – based forecasts of what the government expects to happen.Mortality projections are an extrapolation of historical mortality data into the future. The accuracy of mortality population projections is generally considered directly proportional to the size of the existing population and historical rate of growth, and inversely proportional to the

length of the time projection.According to Hinde (1998), population projection is all about trying to determine what the future population will be like; the term projection is used to describe a predicted population. Population projections are needed to enable the future demand for food, power, transport and other services to be estimated.

RESEARCH METHODOLOGY

Sources of Data, Types of Data and Time Period Covered

This study analyzed the trend of mortality in Federal Medical Centre Jabi, Airport road, Abuja. The primary causes of death and the age that these deaths occurred, among others. The data collection for the study covers a period of five (5) years, spanning from 2013 – 2017. This study utilized the secondary data obtained from Federal Medical Centre Jabi, Abuja on mortality disaggregated by cause of death, sex, years and length of stay.

Mortality Projection

The life table was employed to analyse the life expectancy across age x using the sample data. In the same vein, the trends of mortality were observed using bar charts, and curves.
There are two commonly used models, the exponential model and the logistic model.

i. **Exponential Model** – the exponential growth formula is:

$$P_t = p_{o^r}\ell^{rt} \text{.....eqn.1}$$

Where P_t is the population in some future year t, P_0 is the population in some base year (usually the latest year for which we have data), and r is the constant annual rate of population growth. Differentiating equation 1 with respect to t produces:

$$\frac{dP_t}{d_t} = p_0{}^r \ell^{rt} \text{.....eqn2}$$

Solving equation 2 for "r" gives:

$$r = \frac{dP_t}{d_t} x \frac{1}{P_0\,\ell^{rt}} \text{.....eqn.3}$$

And using equation 1, equation 3 can be simplified to read:

$$r = \frac{dP_t}{d_t} x \frac{1}{P_t} \text{.....eqn.4}$$

ii. **The Logistic Model** – A problem with the exponential growth model is that if population growth continues indefinitely at a constant annual rate, the population size will either increase without limit or approach zero. One way of modifying the exponential model to avoid these implications is to allow the annual rate of growth in any year to be determined in part by population size in year t, Pt. Thus:

$$\frac{dP_t}{d_t} x \frac{1}{P_t} = r + f(P_t) \text{.....eqn.5}$$

Under the linear growth model, P_t is related to $P_{0,\,r}$ and $_t$ by the expression:

$$P_t = P_0(1+rt) \text{.....eqn.6}$$

Where P_0 and P_t denoting the populations at the beginning and end of the interval (0, t) respectively and r is the rate of population growth.

The linear growth model may be more appropriate when the length of the interval (0, t) is short. It assumes that the increment is only at the end of the interval. [4]

ESTIMATES OF RATE OF GROWTH (r)

When the rate of the population growth (r) is unknown, its estimates may be derived in any of the following ways:

a. Given the values of P_0 and p_t (i.e. the populations of an area at the beginning and end of the interval (0, t), estimate of "r" can be obtained as, using any of the following model:

i. Using linear model

$$r_1 = \frac{1}{t}\left(\frac{P_t - 1}{P_0}\right)$$

ii. Using Geometric Model thus:

$$r_2 = \left(\frac{P_t - 1}{P_0}\right)^{\frac{1}{t}}$$

iii. Using the Exponential Model thus:

$$r_3 = \frac{1}{t} In\left(\frac{P_t}{P_0}\right)$$

b. Since the growth rate (r) in use is only an average, a more appropriate base population may be the population at the midpoint of the interval $(\bar{P})$ instead of the population at the beginning of the interval (P_0). An estimate of the midpoint population is given by:

$$\bar{P} = P_{\frac{1}{2}}(P_0 + P_t)$$

Hence, the estimate of "r" is given by:

$$r = \frac{1}{t}\left(\frac{P_t - P_0}{\bar{P}}\right)$$

$$= \frac{2}{t}\left(\frac{P_t - P_0}{P_t + P_0}\right)$$

Where, $P_t - P_0$ is the total absolute change in population in the interval (0, t). This helps to eliminate the bias which may arise as a result of differences in the length of the interval (0, t), differences in increasing population and the prolonged use of P_0 as a base population. [4, 12]

Time in Population Change

The interest in the analysis of population change may be in the time (t) required by a population to reach a certain level. A common concept in demographic analysis is the concept of "**Doubling time.**"For any population, the doubling time is the time at which the population reaches twice its present size if the current pattern and average rate of growth would persist.

The length of time "t", required by a population of size P_0, growing at an annual average rate r, to reach the size P_t is given by:

i. Using linear model

$$t_1 = \frac{1}{r}\left(\frac{P_t - 1}{P_0}\right)$$

ii. Using Geometric Model thus:

$$t_2 = In\frac{\left(\frac{P_t}{P_0}\right)}{In(1+r)}$$

iii. Using the Exponential Model thus:

$$t_3 = \frac{1}{r}In\left(\frac{P_t}{P_0}\right)$$

Please note that if $P_t = 2\ (P_0)$ then the't' obtained is the doubling time of the population (P_0).[4, 12]

DATA ANALYSIS, RESULT AND INTERPRETATION

Analysis on Causes of Death and Sex

Table 4.1 below presents the data on the primary causes of death by each disease and sex category. About 160 males and females were recorded dead in the year 2013 to 2017, out of which 53.8% of them were males and 46.2% of them were females. With these findings as shown in the table below, the researcher agrees with the submissions made by Gloria Lotha and Marco Sampaolo editors of encyclopaedia Britannica which suggested that the risk of death at any given age is less for females than for males, except during the childbearing years. The world life expectancy stated that the ten (10) leading causes of deaths in Nigeria were Influenza/pneumonia, diarrhoeal diseases, tuberculosis, HIV/AIDS, malaria, low birth weight, stroke, birth trauma, coronary heart disease, and maternal conditions. [30] But the table below shows that the ten leading cause of death in Federal Medical Centre Jabi Nigeria are as follows; congestive cardiac failure/heart diseases, sepsis, pneumonia, RVD/AIDS, respiratory distress/asthmatic attack, severe birth asphyxia, diabetes mellitus, VOC/SCDX, malaria and cancer of the prostate/primary liver cell cancer.

Table 1: ANALYSIS ON CAUSES OF DEATH AND SEX

CROSS TABULATION ON CAUSES OF DEATH AND SEX				
S/N	PRIMARY CAUSE OF DEATH	SEX		TOTAL
		MALE	FEMALE	
1	SEPSIS/NNS/UROSEPSIS	7 (4.4%)	12 (7.5%)	19 (11.9%)
2	ECLAMPSIA/POST-PARTUM HAEMORRHAGE	0 (0%)	2 (1.2%)	2 (1.2%)
3	ABM/CRYPTOCOCCAL MENINGITIS	2 (1.2%)	1 (0.6%)	3 (1.9%)
4	DM/IDM/T2DM/HYPOGLYCAEMIA/HYPERGLYCAEMIA/DKA	5 (3.1%)	3 (1.9%)	8 (5.0%)
5	VOC/SCDX/PANCYTOPAEMIA/MASSIVE UGI BLEEDING	4 (2.5%)	4 (2.5%)	8 (5.0%)
6	LIVER DX./INTRA-HEPATIC CHOLELITHIASIS	1 (0.6%)	1 (0.6%)	2 (1.2%)
7	SEVERE BIRTH ASPHYXIA/SEVERE PERINATAL ASPHYXIA	6 (3.8%)	1 (0.6%)	7 (4.4%)
8	B.I.D	6 (3.8%)	4 (2.5%)	10 (6.2%)
9	OTHERS	16 (10%)	7 (4.4%)	23 (14.4%)
10	RESPIRATORY DISTRESS/RESPIRATORY-ARREST/ASTHMATIC ATTACK	2 (1.2%)	5 (3.1%)	7 (4.4%)
11	MALARIA	2 (1.2%)	3 (1.9%)	5 (3.1%)
12	CCF/HEART FAILURE/OTHER HEART DX.	20 (12.5%)	18 (11.2%)	38 (23.8%)
13	BRAINSTEM EMBOLISM CVA/CEREBRAL OEDEMA/STROKE	3 (1.9%)	1 (0.6%)	4 (2.5%)
14	Ca PROSTATE/METASTATIC Ca PROSTATE/Ca HEAD OF PANCREASE/PRIMARY LIVER CELL CANCER	3 (1.9%)	1 (0.6%)	4 (2.5%)
15	PNEUMONIA/BRONCHIETITIS/BPN	3 (1.9%)	7 (4.4%)	10 (6.2%)
16	RVD/HIV ENCEPHALOPATHY/HIV EXPOSED INFANT	5 (3.1%)	4 (2.5%)	9 (5.6%)
17	RTA	1 (0.6%)	0 (0%)	1 (0.6%)
TOTAL		86 (53.8%)	74 46.2%)	160 (100%)

Source: Author's computation using SPSS (2018)

The above table shows that more males than females die of CCF/Heart Failure, Diabetes and Severe Birth Asphyxia while more females than males die of Sepsis, Pneumonia and Respiratory distress.

CHI-SQUARE TEST ON PRIMARY CAUSE OF DEATH /SEX			
	VALUE	D.F	ASYMP. Sig. (2 - sided)
Pearson Chi-square	17.141a	16	0.377
Likelihood Ratio	18.902	16	0.274
No. Of Valid Cases	160		

a. 26 cells (76.5%) have expected count less than 5. The minimum expected count is .46.

Source: Author's computation using SPSS (2018)

Hypothesis: there is no significant association between cause of death and sex.

Conclusion: the decision rule states that if the P-value is greater than level of significance (α), we accept the H_o and conclude that there is no significance difference. P-value of 0.377 is greater

than 0.05, we accept H_o and conclude that there is no significant association between diseases and sex.

The Analysis on Period of Death and Sex

Table 4.2 below shows that the year 2016 recorded the highest number of death (61 deaths) with about 38.1% of the total deaths occurring within the years under study (2013 – 2017), while the least number of deaths were recorded in the year 2014 having only 12.5% of the total deaths occurring with just 20 deaths throughout that year.

TABLE 2: ANALYSIS ON PERIOD OF DEATH AND SEX

CROSS TABULATION ON PERIOD OF DEATH AND SEX			
PERIOD OF DEATH	**SEX**		**TOTAL**
	MALE	**FEMALE**	
2013	**16 (10%)**	**16 (10%)**	**32 (20%)**
2014	**10(6.2%)**	**10(6.2%)**	**20(12.5%)**
2015	**15(9.4%)**	**9(5.6%)**	**24(15.0%)**
2016	**31(19.4%)**	**30(18.8%)**	**61(38.1%)**
2017	**14(8.8%)**	**9(5.6%)**	**23(14.4%)**
TOTAL	**86(53.8%)**	**74(46.2%)**	**160(100%)**

Source: Author's computation using SPSS (2018)

CHI-SQUARE TEST ON PERIOD OF DEATH AND SEX			
	VALUE	**D.F**	**ASYMP. Sig. (2 - sided)**
Pearson Chi-square	**1.713a**	**4**	**0.788**
Likelihood Ratio	**1.727**	**4**	**0.786**
No. Of Valid Cases	**160**		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.25.

Hypothesis: there is no significant relationship between period of death and sex.

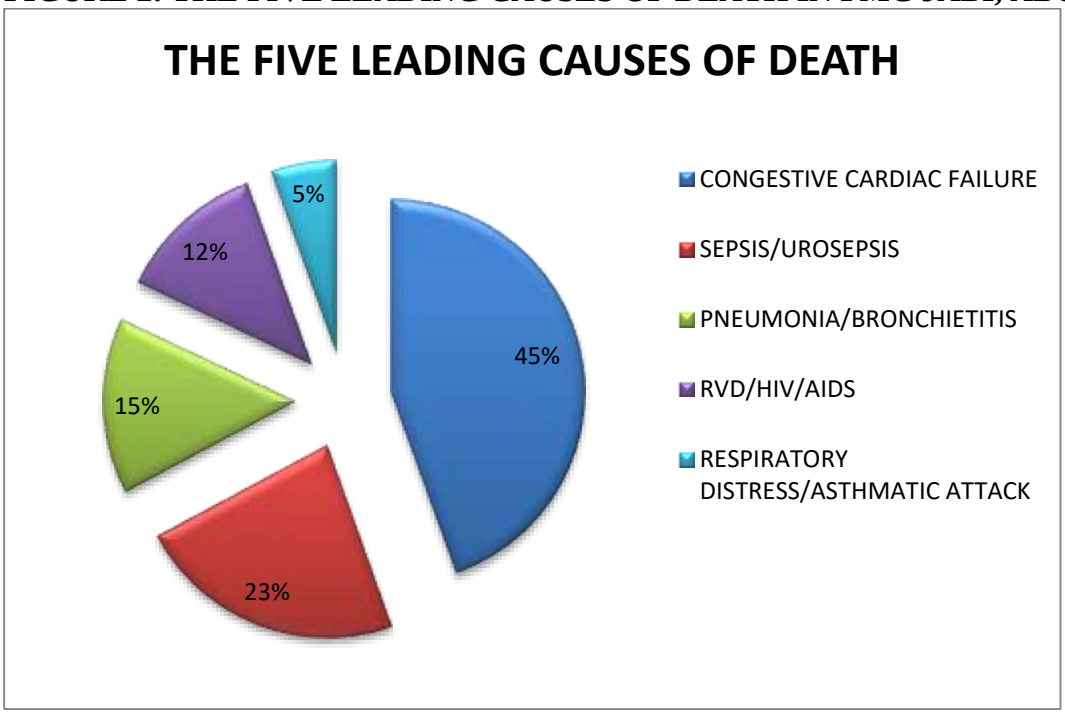
Conclusion: the decision rule states that if the P-value is greater than level of significance (α), we accept the H_o and conclude that there is no significance difference, whereas if the P-value is less than significant level, we reject H_o and accept H_1 and conclude that it is a significant difference. Since the P-value 0.79 is greater than 0.05, we accept the null hypothesis (H_o) of no significant relationship between period of death and sex.Looking at the trends of mortality from 2013to 2017, it shows an inconsistent/unstable death pattern. In the year 2013, the facility recorded 32 deaths, which dropped to 20 deaths the following year and rises to 24 deaths in 2015, got to its peak of 61 deaths in the year 2016 and then declined to 23 deaths in the year 2017.

TABLE 3: THE FIVE LEADING CAUSES OF DEATH IN FMC JABI, ABUJA

S/N	CAUSE OF DEATH	SEX		TOTAL
		MALE	FEMALE	
1	CONGESTIVE CARDIAC FAILURE	20	18	57
2	SEPSIS/UROSEPSIS	7	12	29
3	PNEUMONIA/BRONCHIETITIS	3	7	19
4	RVD/HIV/AIDS	5	4	16
5	RESPIRATORY DISTRESS/ASTHMATIC ATTACK	2	5	7

Source: Author's computation using SPSS (2018)

FIGURE 2: THE FIVE LEADING CAUSES OF DEATH IN FMC JABI, ABUJA



The above figure on the five-leading cause of death shows that the five major leading cause of death as recorded in the Federal Medical Centre Jabi were respiratory distress, sepsis, pneumonia, HIV/AIDS and congestive cardiac failure. 45% of major deaths were as a result of congestive cardiac failure, this implies that the chances of patient suffering from heart diseases die is very high compare to other leading causes of death in the hospital. Community sensitization and awareness must be carried out on possible causes of heart diseases and possible ways of staying healthy. More cardiologists should be employed in this facility, this help to reduce the high rate of mortality resulting from congestive heart failure. Sepsis recorded 23% of the mortality cases making it second on the list of five leading cause of death. While respiratory distress as well as asthmatic attack is the fifth leading cause of death as experienced in this facility.

Analysis on Period of Death and Age

The table below shows that more people died at age less than 1 year (0 year) with about 21.9%, this implies that the rate of infant mortality is on the high side in this facility, next is the age categories of 70 – 74 years with about 11.2% of the population, then the age categories of 35 – 39 years with about 7.5%. While the teen – ages experienced a very low outcome of mortality ranging from 0 to 1 % of the total mortality. According to Gloria Lothan et al editors of encyclopaedia Britannica the risk of death for both sexes is high immediately after birth, diminishing during childhood and reaching a minimum at 10 to 12 years of age. The risk then rises again until at late ages it surpasses that of the first year of life. In this study, mortalities at infant age recorded the highest value; this could also mean that the mortality risk factor is very high at infant age and so more experts are required to contend with risk factors associated with the infant mortality.

At the ages 10 – 14 years across the five years (2013 -2017) under review, there were no death recorded, these age categories appear to be death free zone with very minimal risk factors. The risk factor then gradually rises again at the ages of 20 – 24 years and became very high between the ages of 70 – 74 years.

TABLE 4 CROSS TABULATION ON PERIOD OF DEATH AND AGE

CROSS TABULATION ON PERIOD OF DEATH AND AGE						
AGE	**PERIOD OF DEATH**					**TOTAL**
	2013	**2014**	**2015**	**2016**	**2017**	
0 YEAR	**5**	**7**	**5**	**11**	**7**	**35 (21.9%)**
1 - 4 YEARS	**1**	**1**	**2**	**5**	**1**	**10 (6.2%)**
5 - 9 YEARS	**2**	**0**	**0**	**0**	**2**	**4 (2.5%)**
10 - 14 YEARS	**0**	**0**	**0**	**0**	**0**	**0 (0%)**
15 - 19 YEARS	**0**	**0**	**0**	**0**	**1**	**1 (0.6%)**
20 - 24 YEARS	**1**	**1**	**0**	**1**	**0**	**3 (1.9%)**
25 - 29 YEARS	**1**	**0**	**1**	**5**	**1**	**8 (5.0%)**
30 - 34 YEARS	**1**	**3**	**1**	**5**	**0**	**10 (6.2%)**
35 - 39 YEARS	**5**	**0**	**5**	**2**	**0**	**12 (7.5%)**
40 - 44 YEARS	**1**	**0**	**1**	**5**	**0**	**7 (4.4 %)**
45 - 49 YEARS	**2**	**1**	**0**	**5**	**1**	**9 (5.6%)**
50 - 54 YEARS	**1**	**1**	**5**	**3**	**1**	**11 (6.9%)**
55 - 59 YEARS	**4**	**1**	**0**	**3**	**3**	**11 (6.9%)**
60 - 64 YEARS	**0**	**0**	**2**	**2**	**0**	**4 (2.5%)**
65 - 69 YEARS	**1**	**1**	**2**	**1**	**0**	**5 (3.1%)**
70 - 74 YEARS	**4**	**3**	**0**	**7**	**4**	**18 (11.2%)**
75 - 79 YEARS	**3**	**0**	**0**	**5**	**1**	**9 (5.6 %)**
80 YEARS +	**0**	**1**	**0**	**1**	**1**	**3 (1.9%)**
TOTAL	**32 (20%)**	**20 (12.5%)**	**24 (15.%)**	**61 (38.1%)**	**23 14.4%)**	**160 (100%)**

TABLE 5: TWO WAY ANOVA TEST ON PERIOD OF DEATH AND AGE
Two-way ANOVA: Dependable variable versus Period of Death, Age grouping

Source	DF	SS	MS	F	P
Period of Death	4	62.778	15.6944	7.41	0.000
Age grouping	17	212.756	12.5150	5.91	0.000
Error	68	144.022	2.1180		
Total	89	419.556			

S = 1.455 R-Sq = 65.67% R-Sq(adj) = 55.07%
Source: Author's computation using MINITAB

Hypothesis: there is no significant relationship between period of death and age of the diseased.
Conclusion: the decision rule states that if the P-value is less than significant level, we reject H_o and accept H_1 and conclude that it is a significant difference. Since the P-value 0.001 is less than 0.05, we reject H_0 and accept H_1 and conclude that there is a significant relationship between period of death and age of the diseased. This implies that the period of death is associated with age.

POPULATION PROJECTION ON MORTALITY

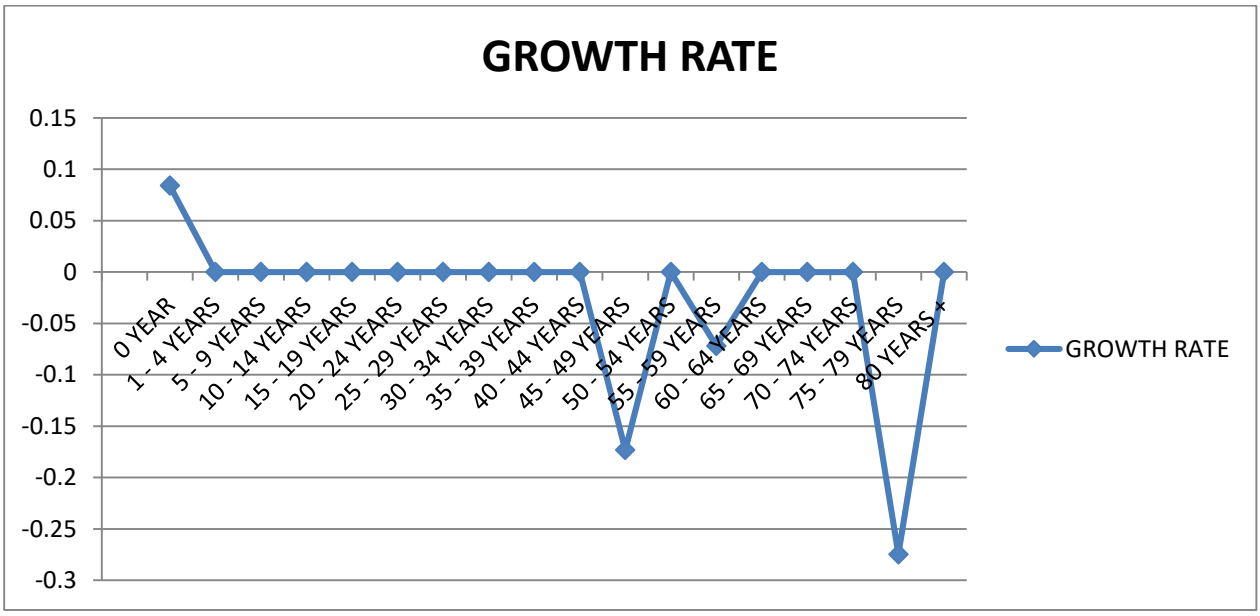
Table 6: Age Specific Growth Rate

AGE SPECIFIC GROWTH RATE			
AGE	**PERIOD OF DEATH**		**GROWTH RATE**
	2013 [P0]	**2017 [Pt]**	
0 YEAR	**5**	**7**	**0.0841**
1 - 4 YEARS	**1**	**1**	**0**
5 - 9 YEARS	**2**	**2**	**0**
10 - 14 YEARS	**0**	**0**	**0**
15 - 19 YEARS	**0**	**1**	**0**
20 - 24 YEARS	**1**	**0**	**0**
25 - 29 YEARS	**1**	**1**	**0**
30 - 34 YEARS	**1**	**0**	**0**
35 - 39 YEARS	**5**	**0**	**0**
40 - 44 YEARS	**1**	**0**	**0**
45 - 49 YEARS	**2**	**1**	**-0.1733**
50 - 54 YEARS	**1**	**1**	**0**
55 - 59 YEARS	**4**	**3**	**-0.0719**
60 - 64 YEARS	**0**	**0**	**0**
65 - 69 YEARS	**1**	**0**	**0**
70 - 74 YEARS	**4**	**4**	**0**
75 - 79 YEARS	**3**	**1**	**-0.2747**
80 YEARS +	**0**	**1**	**0**
TOTAL	**32**	**23**	

General population growth rate using exponential growth model, describes the real-life situation better than the linear and geometric model.

$$r = \frac{1}{t} In\left[\frac{p_t}{p_0}\right] = \frac{1}{4} In\left[\frac{23}{32}\right]$$
$$= \frac{1}{t} In[-0.33024]$$
$$= -0.0826$$

FIGURE 3: Curve on Growth Rate in Federal Medical Centre Jabi



Looking at the general population growth rate, it could be deduced that there is a decrease in the rate of mortality across all ages, but on the contrary the age specific growth rate shows that the '0 year' is on the rise with growth rate of 0.0841 as against -0.0826 of the general growth rate. It is obvious to say that the overall population growth is under estimating the main population for almost all; it is not as good as age specific growth rate.

Assuming that this rate of growth (- 0.0826) persists, the mortality of this facility at the same time in 5 years time beginning from 2017 i.e. year 2022 if the population is growing exponentially will be:

$$P_t = P_0 \ell^{rt}$$
$$= 32 \times \ell^{(-0.0826 \times 4)}$$
$$= 32 \times \ell^{(-0.3304)}$$
$$= 22.996 \text{ or } 23$$

These imply that the mortality population of Federal Medical Centre Jabi, growing exponentially at the rate of about – 8.26%, would attain the value of about 23 deceased cases in the year 2022 (i.e. after about 5 years).

Doubling Time

Doubling time is the time at which the population reaches twice its present size if the current pattern and average rate of growth would persist.

Assuming that the rate of mortality growth persists, the doubling time of the population starting from 2017 will be:

$$if\ P_t = 2P_0$$

$$Then\ t = \frac{1}{r} \ln\left(2P_0 / P_0\right)$$

$$= 1/-0.0826 \ln(32 \times 2/32)$$

$$= 1/-0.0826 \times 0.6931$$

$$= -8.3916$$

$$= 8 \text{ years}$$

Conclusion: Doubling time which is a very important demographic component, a negative value is an indication that the population is smaller at the end, so negative values describe declining populations. This imply that the general mortality population in this facility is on a decline, it could be attributed to improved health care both in human resource and advancement in technology.

Considering the age specific population rate, assuming the growth rate for 0 year (0.0841) persists the doubling time of the population starting from 2017 will be:

$$if\ P_t = 2P_0$$

$$Then\ t = \frac{1}{r} \ln\left(2P_0 / P_0\right)$$

$$= 1/0.0841 \ln(5 \times 2/5)$$

$$= 1/0.0841 \times 0.6931$$

$$= 8.24$$

$$\approx 8 \text{ years}$$

These imply that the value of the infant mortality may double in the year 2025 if and only if the current pattern and average rate of growth would persist.

Life Table

Life table is a table describing the life history of a group of persons or cohort (real or hypothetical) as its member is reduced by force of mortality from birth until all have died.

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TABLE 7: LIFE TABLE

LIFE TABLE										
AGE	**NO. OF DEATH**	**NO. OF SURVIVOR**	**Lx**	**nx**	**Log 10 nx**	**dx**	**qx**	**Tx**	**ex**	**YEARS**
0 YEAR	**35**	**160**	**1**	**1000**	**0**	**220**	**0.22**	**8690**	**8.69**	**43.45**
1 - 4 YEARS	**10**	**125**	**0.78**	**780**	**-0.11**	**60**	**0.08**	**7690**	**9.858974**	**49.29487**
5 - 9 YEARS	**4**	**115**	**0.72**	**720**	**-0.14**	**30**	**0.04**	**6910**	**9.597222**	**47.98611**
10 - 14 YEARS	**0**	**111**	**0.69**	**690**	**-0.16**	**0**	**0**	**6190**	**8.971014**	**44.85507**
15 - 19 YEARS	**1**	**111**	**0.69**	**690**	**-0.16**	**10**	**0.01**	**5500**	**7.971014**	**39.85507**
20 - 24 YEARS	**3**	**110**	**0.68**	**680**	**-0.17**	**20**	**0.03**	**4810**	**7.073529**	**35.36765**
25 - 29 YEARS	**8**	**107**	**0.66**	**660**	**-0.18**	**50**	**0.08**	**4130**	**6.257576**	**31.28788**
30 - 34 YEARS	**10**	**99**	**0.61**	**610**	**-0.21**	**60**	**0.09**	**3470**	**5.688525**	**28.44262**
35 - 39 YEARS	**12**	**89**	**0.55**	**550**	**-0.26**	**70**	**0.13**	**2860**	**5.2**	**26**
40 - 44 YEARS	**7**	**77**	**0.48**	**480**	**-0.32**	**50**	**0.1**	**2310**	**4.8125**	**24.0625**
45 - 49 YEARS	**9**	**70**	**0.43**	**430**	**-0.37**	**50**	**0.12**	**1830**	**4.255814**	**21.27907**
50 - 54 YEARS	**11**	**61**	**0.38**	**380**	**-0.42**	**70**	**0.18**	**1400**	**3.684211**	**18.42105**
55 - 59 YEARS	**11**	**50**	**0.31**	**310**	**-0.51**	**70**	**0.23**	**1020**	**3.290323**	**16.45161**
60 - 64 YEARS	**4**	**39**	**0.24**	**240**	**-0.62**	**30**	**0.13**	**710**	**2.958333**	**14.79167**
65 - 69 YEARS	**5**	**35**	**0.21**	**210**	**-0.68**	**30**	**0.14**	**470**	**2.238095**	**11.19048**
70 - 74 YEARS	**18**	**30**	**0.18**	**180**	**-0.74**	**110**	**0.61**	**260**	**1.444444**	**7.222222**
75 - 79 YEARS	**9**	**12**	**0.07**	**70**	**-1.15**	**60**	**0.86**	**80**	**1.142857**	**5.714286**
80 YEARS +	**3**	**3**	**0.01**	**10**	**-2**	**10**	**1**	**10**	**1**	**5**
				8690				**0**	**0**	**0**

Source: Author's computation using M.S. Excel

Life expectancies are simply the average number of years lived across a range of ages. The life table of the Federal Medical Centre Jabi, shows that the life expectancy at birth is simply **8690/1000** which equals to 8.69. The 310 cohort members who attain age 55 years have a total of 1020 total years of life remaining, or average of 3.3 years. In the same vein, 70 year-olds have an average life expectancy of 1.4 years.

The probability of a man aged 20 years dying before his 50th birthday is given as thus:

Probability that man, aged 20 years $= \frac{l_{20} - l_{50}}{l_{20}}$

dies before his 50th birthday $= \frac{680 - 380}{680}$

$= 0.44$

Thus, a man aged 20 years has about 44% chance of dying before his 50th birthday.

SUMMARY OF THE STUDY

- This study utilized the data from the Federal Medical Centre, Jabi on mortalities (spanning from 2013 – 2017). Cross tabulation, Chi-square, two-way ANOVA, population projection and life table have been applied to identify the leading cause of mortality in the facility. Close observation that theoretical hypothesis raised in the study were not supported to analysis using Chi-square test.
- Under five (5) mortality rate appears to be on the high side with about 45 (28.1%) new-born babies dying before reaching age five.
- 72 (45%) adults die before reaching age 60 years. This implies that the probability that a person on their 15^{th} birthday dies before their 60^{th} birthday is 0.65, thus a man aged 15 years has about 65.2% chances of dying before his 60^{th} birthday.
- The major causes of deaths were congestive cardiac failure (45%), sepsis (23%), pneumonia (15%), RVD such as HIV/AIDS (12%) and respiratory distress (5%).
- The study showed that the risk of death at any given age is less for females than for males. More males than females died of congestive cardiac failure and retroviral diseases such as HIV/AIDS, while more females than males died of sepsis, pneumonia and respiratory attacks.
- The life table of this facility (Federal Medical Centre Jabi) shows that the life that the life expectancy at birth is 43.5 years ($\ell_x = 8.69$), while the doubling time of the population under review (2013 – 2017) starting from 2017 has the value of - 8.39 which is an indication of declining mortality population. The study also showed that the value of the infant mortality may double in the year 2025 if nothing is being done to the current mortality pattern/growth rate.

RECOMMENDATIONS

- Regular medical checks are highly essential in prolonging of life as well as ensuring a healthy wellbeing.
- Having seen that the under five years poses to be one of the stages with the highest occurring mortality risk, parents are hereby advised to closely monitor the health of their children below the age of five years. Routine vaccinations for the infants must be completed as at when due. While mothers must be encouraged to adopt the exclusive method of breast feeding – this will help to build up the immunity of the child.
- More Cardiologists are required in this facility and other facilities in order to reduce the high rate of mortality resulting from cardiovascular problems.
- Community sensitization on healthy life style and how to prolong our lives should be carried out on regular basis via all forms of media.
- The table on the causes of death shows that 2.5% of the deaths were as a result of cancer and cancer associated diseases; and the prevalence cancer in Nigeria is on rise. Hence, the Nigerian government as well as the ministry of health must take proactive measures to rip off the spread of cancer less it will turn out to be the first on the list of leading cause of mortality in this country.
- Poverty, malnutrition, unemployment, to mention but a few must be eradicated.
- Finally, the world life expectancy shows that Japan is rank 1^{st} on the list with life expectancy of 83.7%, the Nigeria government should fund researchers to study the secrets to their healthy living – findings from such research if implemented may improve our standard of living.

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