
Statistical Analysis on Infant Mortality Rate in Bauchi State

By

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ABSTRACT

The risk of a child dying before completing the first year of age is quiet alarming. This is referring to Infant mortality and is specifically stated as one of the goals of the MDGs in Nigeria, i.e. to reduce infant mortality by two-third in the year 2015. Therefore, this research is based on the statistical analysis on infant mortality in Bauchi State. The secondary data was collected from the Specialist Hospital Bauchi in the form of the yearly record of infant mortality between 2000 and 2014. Time series (TREND) was employed to determine the trend and estimate the model parameters. The researchers also followed the trend to forecast for the next 20years. Based on the findings, the recommendations made include: government to organize a workshop in order to enlighten general public on maternal healthcare. It is therefore concluded that there was a decrease in the infant death particularly between 2010 and 2014.

Keywords: Mortality, Infant, Forecast, Trend

INTRODUCTION

One of the challenges that eat deep in the world population currently now is infant mortality. The term infant mortality is use to describe the death of a baby before his or her first birthday. Infant mortality rate is an estimate of the number of infant's death for every 1000 live birth. Infant mortality rate is not only used as a demographic measure, but also as an important health indicator of a society as well as measure of its living standard. There are three (3) major classifications of infant mortality, that is, peri-natal, neonatal and post neonatal mortality. Neonatal death is often attributed to inadequate access to basic medical care during pregnancy and after delivery (Alvin,

Rencher& Bruce, 2008). Post neonatal mortality is the death of children aged 29 days to one year. The major contributors to post neonatal death are malnutrition, infectious diseases and environmental problems. Peri-natal mortality is late fetal death or death of a new born up to week post partum.

Douglas (2010) discovered that more than ten million children under-five years die each year and most of these deaths occurred in Africa. Africa is one of the young and rapidly growing populations, currently the second most populated continent in the world. World Health Organization (WHO) (2015) stated that African Region accounts for about twelve (12) percent of the world's

population. African is among the major contributors of the global under-five mortality with about 50 percent of under five deaths occurred in these five countries namely, India, Nigeria, Pakistan, Democratic Republic of Congo and China with India and Nigeria both accounting for one-third of the total number of under-five deaths World Wide.

The risk of child dying before completing the first year of age is highest in the sub-Sahara region at an estimated rate of 60 per 1000 live birth. Perhaps, Nigeria is among the major contributors of the global under-five death occurred in these five countries namely; India, Nigeria, Pakistan, Democratic Republic of Congo and China, however, India and Nigeria both accounting for one-third of the total number of under-five death worldwide. This is disturbing and worrisome and therefore need to be addressed so as to save the lives of our children tomorrow.

Objectives of the Study

The objectives of the study are: -

1. To determine the trend of infant and child mortality.
2. To build a model for infant mortality in Bauchi.
3. To ascertain the influencing factors on infant and child mortality
4. To forecast future infant mortality

REVIEW OF RELATED LITERATURE

Oronto (2010) argued that most of infant deaths are from preventable and treatable condition, and almost all deaths are in poor countries. Infant and child mortality rate vary among world regions and these differences are large and increasing. In 1990 Sub-Sahara Africa (SSA), there are 180 deaths

per 1000 live births, and only 9 deaths per 1000 live births in industrialized countries that is a 29-fold differences in 2000, SSA had a mortality rate of 175 death per 1000 children and 6 deaths per 1000 children in industrialized countries, an increase to 29-fold difference for the past three decades, significant progress had been made towards the reduction of infant mortality rates in the third world countries. As a result, between 1960 and 1993 in Arab states, infant mortality deluded from 167 to 97 per 1000 live births. At present, the high infant mortality rate in SSA is attracting international researchers seeking effective and definitive health program or methodology to implement sustainable measures or solution towards reduction of infant mortality rate (Fagbeamibe and Alabi, 2014).

George et'al (1994), stated that child deaths have a seasonal pattern occurring more frequently during certain months of the year. There may exist seasonality in death level among children, that is there are more deaths occurring in a particular time of the year or day due to specific diseases being rampant in that particular period e.g. cases of death due to anemia, are predominant in dry seasons when there is little vegetable, and also when malaria cases are rampant causing breakdown of red blood cells. Cases due to malaria are most predominant in the months of April, June, July, September, and December, when the stagnant of water, which are used by mosquitoes as breeding places.

Asindi and Ibia (2014) reported that the main cause of infant mortality is diarrhea which may result in acute weight loss-proving fatal at times. Babies often find it hard to fight and resist this situation. The problems are particularly alarming in the

countries that are economically not stable and have a health care system which lacks basic requirements. It was also noted that country struggling economically are facing a significant mortality problem. The risk of death in infants is clearly due to lower weight, which is usually caused by poverty, lack of nutrition and other environmental factors. The infant around 3 kg are more resilient and have been shown to have the least number of deaths. The rate of infant mortality gets lower as the amount of space between each birth increases, the gap of 3 years reduces the risk of child death.

Behrman and Wolf (2015) used indirect methods to estimate levels and trends of mortality in Malawi. The results indicated that source of drinking water and sanitation facilities are strong predictors of child mortality. Also, Jefferies (2016) in her study, determined the relative significance of environmental and maternal factors on childhood mortality in south western Nigeria found that child mortality rate continued to be a function of an environmental factor namely sources of drinking water and a child care behavior factor, where the child was kept when the mother was at work. Similarly, a Bayesian geo-additive survival model was introduced by Adebayo (2012) to child mortality in Nigeria. The results showed the existence of a district specific geographical variation in the level of child mortality.

Angaharan and Micheal (2014) used probit analysis to model mortality in Pakistan and found that girls have a significant lower probability of dying in age group 0 – 1 but have a significant higher probability of dying in the age group 1 – 5. Thus, the higher mortality of girls in the age group 1 – 5 reflects discrimination against

girls in the form of lower health and other resources inputs. Additionally, they found mother's education beyond a certain threshold and increased duration between births' to significantly reduce child mortality.

Sources of Data

The data used from this research work is secondary data. It was extracted from the medical records of hospital activities analysis unit and health information departments of specialist hospitals in Bauchi state which covers a period of fifteen years from 2000 – 2014.

Method of Analysis

The statistical techniques used for data analysis are time series analysis (Trend) to estimate the parameters of the model.

Time Series Analysis

Time series analysis is a procedure for investigating the variation or fluctuation in the quantity or occurrence of the variable over a specified period of time. In other words, a time series is the given name of some statistical variable measured over a uniform set of time. Statistical variable simply means anything that changes as time changes. The series analysis accounts for the fact the data points taken over time may have an internal structure such as autocorrelation, trend or seasonal variation that should be accounted for.

DATA PRESENTATION AND ANALYSIS

Data presentation is a statistical procedure where information or observation is displayed. For this research work, we use tabulation and graphical method to display the information.

Table 1: Yearly record of infant mortality from 2000 - 2014

S/N	YEAR	MALE	FEMALE	TOTAL
1	2000	300	306	606
2	2001	259	300	559
3	2002	300	250	550
4	2003	200	210	410
5	2004	280	170	450
6	2005	250	360	610
7	2006	190	180	370
8	2007	260	300	560
9	2008	270	250	520
10	2009	340	230	570
11	2010	390	200	590
12	2011	365	272	637
13	2012	280	255	535
14	2013	185	149	334
15	2014	182	152	334

Source: Hospital Activities Analysis Unit, Health Information Department of Specialist Hospital Bauchi

Time Series Plot

Time Series Plot of Infant Mortality in Bauchi from 2000-2014 is given on the figure below.

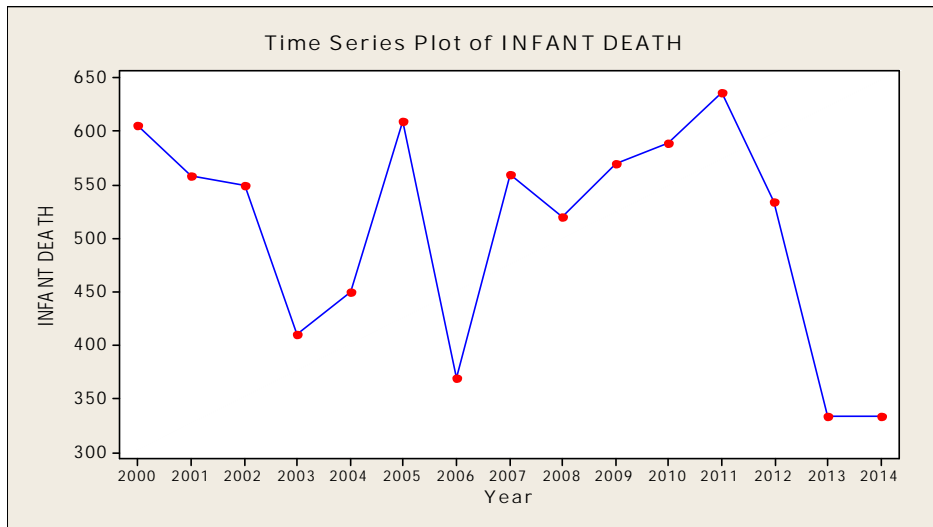


Fig.1: Time Plot of Infant Mortality

Trend Analysis Plot for Infant Death for different models

(i) Linear Trend Model

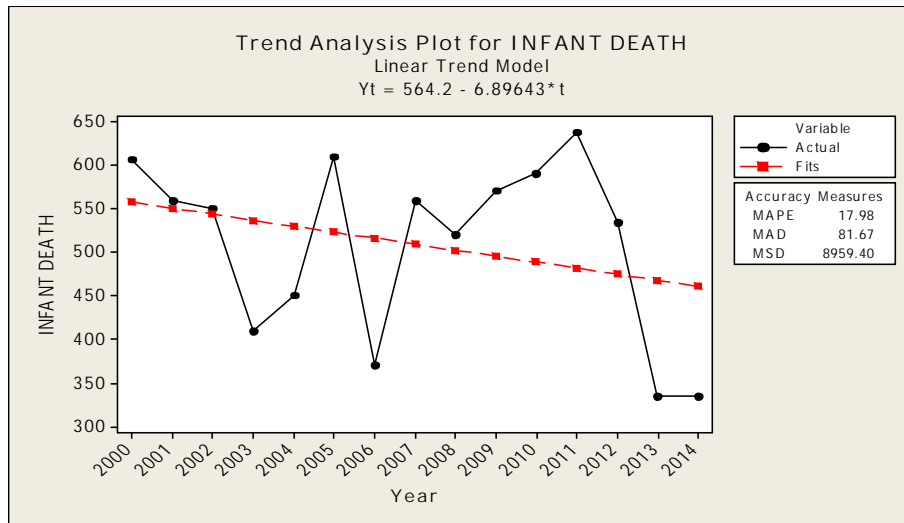


Fig.2: Trend Analysis for Infant Death

Fitted Trend Equation

$Y_t = 564.2 - 6.89643 \cdot t$; Accuracy Measures; MAPE 17.98; MAD 81.67; MSD 8959.40

(ii) Quadratic Trend Model

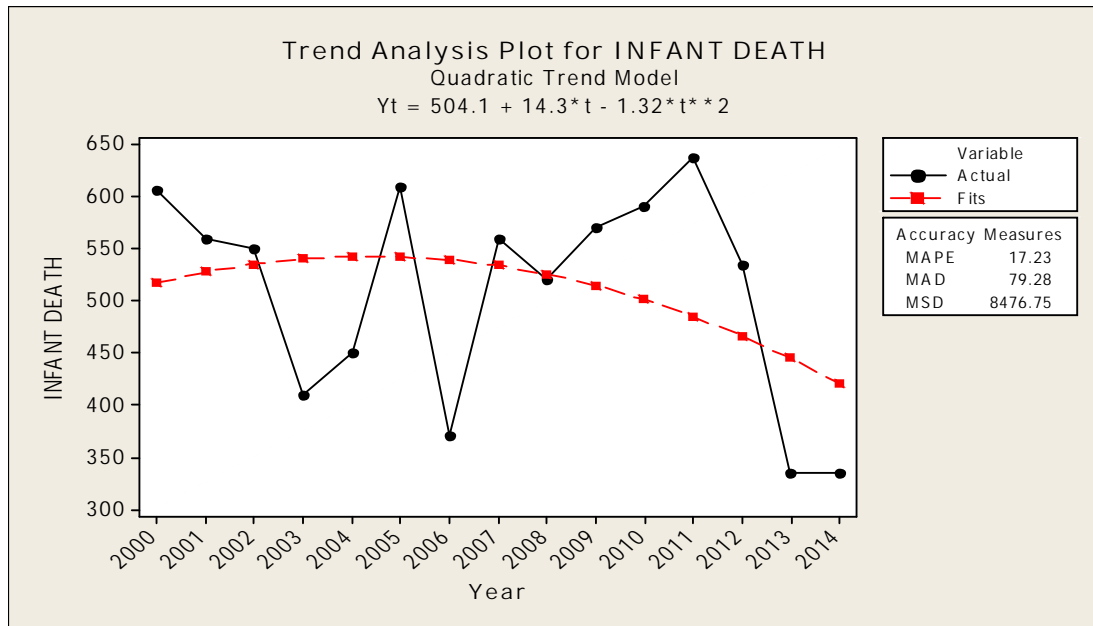


Fig. 3: Trend Analysesfor Infant Death

Fitted Trend Equation

$Y_t = 504.1 + 14.3*t - 1.32*t^2$; Accuracy Measures; MAPE 17.23; MAD 79.28; MSD 8476.75

(iii) Moving Average Plot for Infant Death

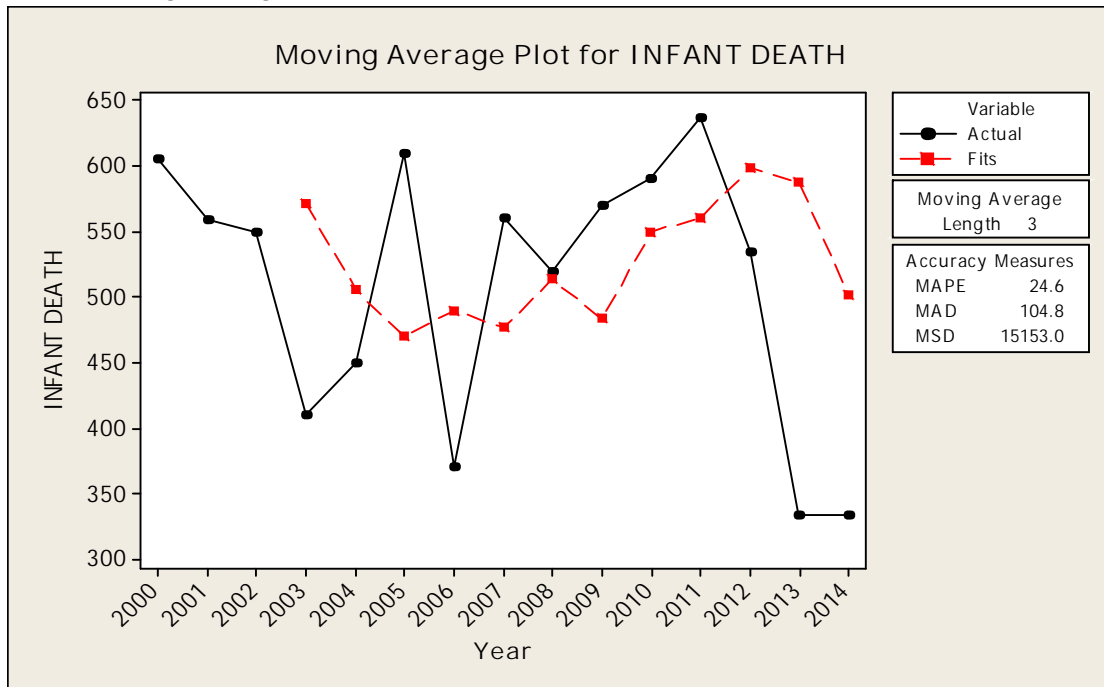


Fig.4: Moving Averagefor Infant Death

Data: INFANT DEATH

Moving Average; Length 3; Accuracy Measures; MAPE 24.6, MAD 104.8, MSD 15153.0

Table 2: This table shows the accuracy measures of the three difference models.

Accuracy Measures	Linear Trend	Quadratic Trend	Moving Average
MAPE	17.98	17.23	24.6
MAD	81.67	79.23	104.8
MSD	8959.40	8476.75	15153.0

The table above summarized the various models and their accuracy measures. The results showed that the quadratic model having the least accuracy measures is the best model that fits the data.

SEASONAL ANALYSIS OF INFANT DEATH

The seasonal analysis of infant death is given on the figure below:

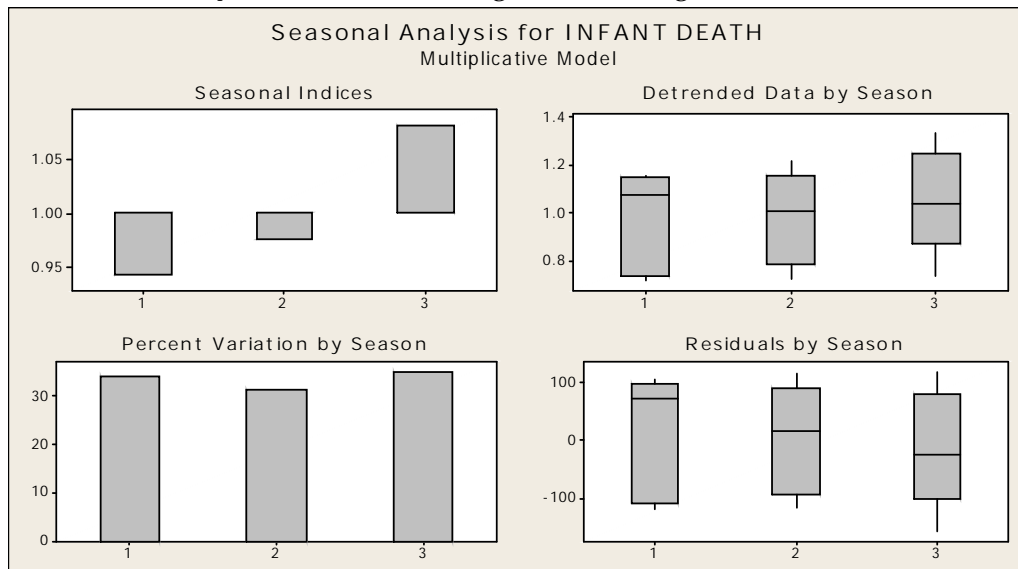


Fig. 5: Seasonal Indices of Infant Mortality in Bauchi

The above seasonal indices divide the whole data into three parts, the data is made up fifteen years record and each part contains five years. The last part shows that there was high infant death.

Forecast using Quadratic Model

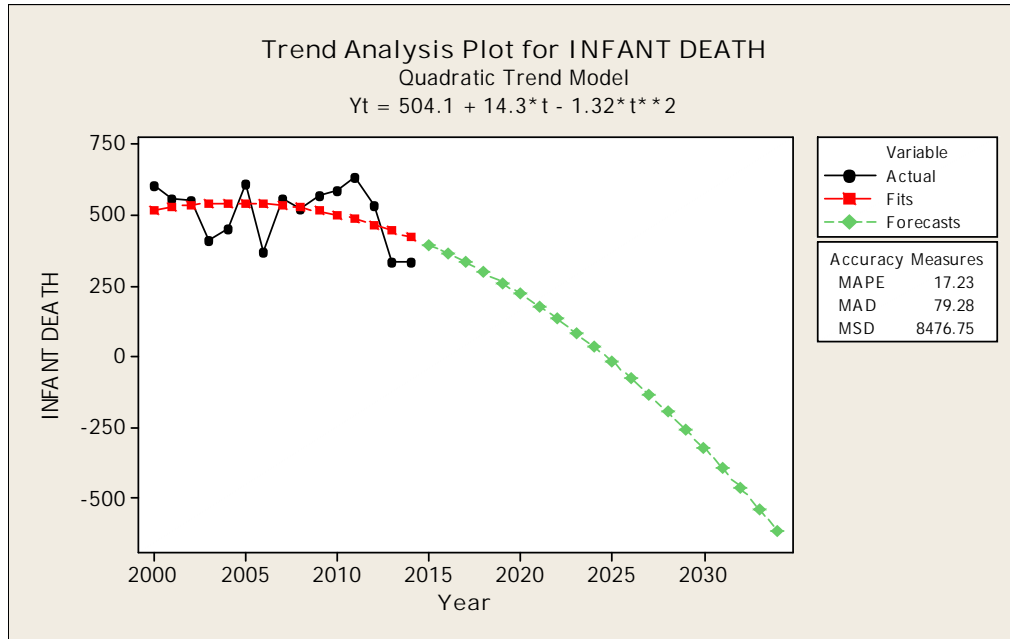


Fig. 6: Trend Analysis for Infant Death

Fitted Trend Equation

$Y_t = 504.1 + 14.3*t - 1.32*t^2$, Accuracy Measures: MAPE 17.23, MAD 79.28, MSD 8476.75

FORECASTS

Period Forecast

2015	393.774
2016	364.357
2017	332.290
2018	297.574
2019	260.209
2020	220.194
2021	177.529
2022	132.215
2023	84.252
2024	33.639
2025	-19.623
2026	-75.535
2027	-134.097
2028	-195.307
2029	-259.168
2030	-325.678
2031	-394.837
2032	-466.646
2033	-541.104

2034 -618.212

FINDINGS FROM THE ANALYSIS

The trend analysis showed a downward movement which is a clear indication of a continuous decrease in the number of infant deaths in Bauchi. Quadratic trend model is the best model that fit the data having the least accuracy measures. Also, the seasonal indices indicated that the infant death is highest in 2000 - 2004 and is lowest in 2010 - 2014 which has the highest percentage variation.

CONCLUSION

Based on the model obtained, Bauchi state was predicted to have a least or likely to have zero infant death in future, by the year 2025 if factors remain constant. Finally, it has been observed that infant mortality was higher prior to the commencement of Millennium Development Goals program in

2009 which make Bauchi state had the highest rate of infant death across the country. While from 2010 -2014, there was a decrease in infant mortality. This indicated that MDG intervention particularly in Bauchi state has help in reducing infant mortality.

RECOMMENDATIONS

Based on the findings, the following recommendations are made

1. Government should organize workshops in other to enlighten general public on maternal health care.
2. Government should ensure full coverage of infant mortality occurring in the society or hospitals.
3. Government should enhance the record system in various hospitals.
4. All maternal patients should avoid personal medication so as to reduce the risk of dying
5. Government should focus on expanding infrastructure particularly health facilities in proportion to growth in population.

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