

## Correlation Matrix of Five Child-Killer Diseases and Under-Five Mortality Rate in Yola, Adamawa State, Nigeria

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### Abstract

*The study investigated the extent of the correlation matrix (degree of the relationship) between the five-child killer diseases and under-five mortality rate in Yola Metropolis. A quantitative secondary data from 2001 to 2018 was obtained from the document of Adamawa State Primary Health Care Development Agency regarding the number of children immunized and number of children that were infected and later died due to Pneumonia, Diarrhoea, Measles, Tetanus, Polio and the overall under-five mortality rate irrespective of the diseases within that timeframe. The study used a method of correlation matrix for analysis of the data. The results of the correlation matrix revealed that Pneumonia, Measles and Tetanus had strong positive and significant relationship with under-five mortality rate, while diarrhoea had a weak positive and insignificant relationship. Polio was excluded from the analysis because it did not register any incidences and deaths within the timeframe. The study recommends that government needs to implement the Global Action Plan for Pneumonia and Diarrhoea as campaigned by WHO and UNICEF and the children infected with HIV/AIDs should be given daily vaccines to reduce the risk of contracting these five child-killer diseases.*

**Keywords:** Correlation Matrix; Immunization; Hygiene; Diseases; Under-Five Mortality Rate.

### Introduction

Globally, under-five mortality rate has dropped from 12.7 million per year in 1990 to 5.9 million in 2015; this being the first year the figure has gone below the 6 million mark; according to the 9th September, 2015 World Health Organization (WHO) report. New estimates in “Levels and trends in child mortality report 2015,” released by United Nations Children’s Fund (UNICEF), WHO, the World Bank Group, and the Population Division of United Nations Department of Economics and Social Affairs (UNDESA), indicates that although the global progress has been substantial, 16 000 children under-five still die every day. The 53% drop-in under-five mortality rate however is not enough to meet the Sustainable Development Goals (SDGs) of a two-thirds reduction between 1990 and 2015 (Adebayo, Fahrmeir and Klasen, 2004).

The risk of a child dying before completing five years of age is still highest in the WHO African Region (81 per 1000 live births), about 7 times higher than that in the WHO European Region (11 per 1000 live births). Many countries still have very high under-five mortality – particularly those in WHO African Region, with an under-five mortality rate above 100 deaths per 1000 live births. In addition, inequities in under-five mortality between high-income and low-income countries remain large. The under-five mortality rate in low-income countries was 76 deaths per 1000 live births – about 11 times the average rate in high-income countries (7 deaths per 1000 live births). Reducing these inequities across countries and saving more children’s lives by ending preventable child deaths are important priorities (Adetunji, 1995).

The word mortality comes from the Latin word mortalitas. Mortality rate is a parameter in epidemiology for characterizing the deaths within a given population. Under-five mortality rate is the number of deaths in children 0-5 years of age per time, usually expressed per 1,000 or 100,000 persons per year (Norman, Spilsbury and Semmens, 2011). The five child-killer diseases used in this study are pneumonia, measles, diarrhoea, polio, and tetanus. These are grouped classification of the five diseases that are frequently responsible for the death of under-five children in Yola Adamawa State, Nigeria.

Nigeria, in the past few years has experienced some worsening of under-five mortality rate. The under-five mortality rate was evaluated at 100 per 1000 in 2003 and at 87 per 1000 in 1990. This can be in part explained by the persisting low numbers of births occurring in health centres and the low number of births attended by trained healthcare service providers. In 2003, two third of the births in Nigeria still occurred at home. In

addition, only slightly more than one-third of births are attended by doctors, nurses, or midwives (Mathews and Mac Dorman, 2011).

In Adamawa State, among other states in Nigeria, there are about 31 under-five deaths daily in 2003, and 147 die daily in 2008 (Okechukwu, Benedict and John, 2015). The prevalence of tetanus among children investigated in Adamawa State were found to be 4% in 2008, 8% in 2009 and 12% in 2013 (Jalal-Eddeen, 2014).

### **Objective of the Study**

The objective of this study is to determine the extent of the correlation matrix (degree of the relationship) between the five child-killer diseases and the under-five mortality and to establish a measure of controlling the mortality rate in the studying area.

### **Literature Reviews**

Liu *et al.* (2012) updated the total numbers of deaths in children aged 0–27 days and 1–59 months were applied to the corresponding country-specific distribution of deaths by cause. They applied the multinomial logistic regression model to vital registration data for low-mortality countries without adequate vital registration. The results of their study indicated that between 2000 and 2010, the global burden of deaths in children younger than 5 years decreased by 2 million, of which pneumonia, measles, and diarrhoea contributed the most to the overall reduction. However, only tetanus, measles, and pneumonia (in Africa) decreased at an annual rate sufficient to attain the Sustainable Development Goals 4. Scott *et al.* (2008) note that historically, pneumonia was the main cause of under-five mortality in developed countries, and in the United States in 1900, it is estimated that pneumonia killed 47 of every 1,000 children before the age of 5 years. In Nigeria, Esangbedo (2010) explained that pneumonia kills nearly 1.6 million children under five annually worldwide. An estimated 98 percent of children who die of pneumonia live in developing countries and according to 2008 estimates, about 177,000 children under the age of five died of pneumonia in Nigeria. This means that within an hour, 20 children across Nigeria will die from pneumonia. This number is the highest in Africa and second highest overall in the world.

Diarrhoea is second to pneumonia as a killer in children. Before the age of 5 years, practically every child in the African environment has had at least one episode of childhood diarrhoea with some having up to three episodes per year (Okoro and Itombra-Okoro, 1996). The introduction of oral rehydration therapy (ORT) in 1975 has significantly reduced the mortality rate from this disease condition. This mode of treatment is cheap, acceptable, affordable, safe, and can be applied in virtually any environment (Grant, 1993). In Nigeria a study conducted by Onyiriuka (2011), revealed that measles accounted for 3.1% of all admissions in the Paediatric Department, with different age distribution. Although 22.1% had vaccination against measles, 77.9% were not vaccinated against the disease. It was further observed that a significant number of the cases occurred in the dry season as compared to the wet season

Fagbule and Orifunmishe (1988) investigated measles vaccination in two hundred and sixty-nine children who presented with measles between April 1983 and March 1986 at the University of Ilorin Teaching Hospital, Nigeria. Lack of vaccination, high vaccination failure rate, early age of contracting the disease, malnutrition, prevalent bacterial infections and a delay in seeking medical attention were the main factors identified as the probable causes of high morbidity and mortality rate in measles in Ilorin. In a related study conducted in Yola, Adamawa State Nigeria by Peter (2011) revealed that, the degree of the relationship between pneumonia and under-five mortality was positively strong with correlation coefficient  $r = 0.552$ .

### **Methods and Materials**

Correlational design with quantitative approach was used involving the use of secondary data on five-child-killer diseases and under-five mortality across the study area for a period of 2001 to 2018 obtained from Adamawa State Primary Health Care Development Agency (PHCDA), Yola.

The method used to determine the extent of the correlation between the child- killer diseases and under-five mortality in the study area is correlation matrix.

Using the correlation matrix, the data of the four child-killer diseases after excluding polio was correlated against the Total Mortalities Irrespective of Disease (TMID) at 95% confidence interval to examine the extent of the degree of the relationship between the child-killer disease and the under-five mortality rate. A student t - distribution with n-2 degrees of freedom was also used to test the significance of each disease. STATA software was used to run the analysis as shown in Table 1.

**Table 1: STATA output of correlation matrix of child-killer diseases and under-five mortality**

	Disease: Pneumoni a	Disease: Diarrhoe a	Disease: Measles	Disease : Tetanus	Total Mortalities Irrespective of Disease
Disease: Pneumonia	1				
Disease: Diarrhoea	0.497	1			
Disease: Measles	0.845	0.327	1		
Disease: Tetanus	0.554	0.197	0.690	1	
Total Mortalities Irrespective of Disease	0.760	0.206	0.625	0.638	1

Source: Researcher's Results (2019)

Results in Table 1 revealed that there exist a relatively strong and positive relationship between the incidences of Pneumonia and overall under-five mortality rate in Yola. This is because the correlation coefficient associated with this relationship is  $r = 0.760$  ( $t = 6.4872$ ), an increase in the number of pneumonia cases may be associated with an increase in the number of deaths for the children under-five years. The degree of the relationship was significant since it associated with a P-Value = 0.000014, less than the stated level of significance (0.05). The results also show that the degree of relationship between the case of diarrhoea and under-five mortality is very weak. The correlation coefficient produced a value of  $r = 0.206$  ( $t = 0.7756$ ), implying that an increase in the diarrhoea cases would be associated with a subsequent increase in the deaths for the children under-five years. This degree of the relationship was not significant since it was associated with a P-Value = 0.450889, more than the stated level of significance. Further, the analysis also revealed that measles and under-five mortality rate has a strong positive relationship, with correlation,  $r = 0.625$  ( $t = 3.6977$ ). That implies that an increase in the incidences of measles in the under-five children would be associated with an increase in the under-five mortality rate. The relationship was significant since it associated with a P-Value = 0.002388, less than the stated level of significance. Finally, the study shows that there exists a strong positive relationship between incidences of tetanus and under-five mortality rate in Yola. The correlation coefficient  $r = 0.638$  ( $t = 3.8791$ ). This implied that as an increase in one of the two variables would lead to an increase in other. This degree of the relationship was significant since it associated with a P-Value = 0.001669, less than the stated level of significance.

### Discussion of Findings

Correlation is the extent of the degree of the relationship between a dependent variable and one or more independent variables. It explains how the two variables fluctuates together, hence this study revealed the extent of the degree of the relationship between the child-killer diseases and under-five mortality in the study area. This finding is in agreement with related study by Peter (2011) in Yola, who indicated that, the degree of the relationship between pneumonia and under-five mortality was positively strong with correlation coefficient  $r = 0.552$ , while this investigation shows that pneumonia has a positively strong relationship with the overall under-five mortality with correlation coefficient  $r = 0.760$ , which is statistically significant with the p-value. Furthermore, the investigation shows that both measles and tetanus diseases got a relatively high relationship with under-five mortality with correlation coefficient  $r = 0.625$  and  $0.638$  respectively, which

were both significant. While in a related study by James (2014) in Yola, revealed that both measles and tetanus has relatively weaker relationship with under-five mortality with correlation coefficient  $r = 0.135$  and  $0.191$  respectively. This could be due to the fact that there were proper measures against the child killer diseases. For diarrhoea, the degree of the relationship with the under-five mortality is also positively weak with correlation coefficient  $r = 0.206$  and it is statistically insignificant, which nearly agreed with related investigation by Peter (2011) that the degree of their relationship is positively weak with correlation coefficient  $r = 0.211$  and statistically insignificant.

### Conclusions

Among the child-killer diseases considered in this study, the investigation revealed that pneumonia has the highest and most significant relationship with the under-five mortality. The study also revealed that in Yola, diarrhoea has positively weak and insignificant relationship with under-five mortality. Even though diarrhoea explains a small relationship with under-five mortality, the number of children that died at a marginal level is still great.

### Recommendations

Based on the conclusions, the study recommends that:

- (i) policy makers should make adequate provision for transportation and storage of vaccines and revise the immunization policies so that a significant number of children at risk receive unexpired and genuine vaccines against the child-killer diseases for the recommended number of dosages to reduce the incidences of deaths
- (ii) government needs to implement the Global Action Plan for Pneumonia and Diarrhoea with immediate effect as campaigned by WHO and UNICEF,
- (iii) both government and individual should promote adequate nutrition as a key factor in improving children's natural defenses against child-killer diseases with exclusive breastfeeding for the first 6 months of life,
- (iv) children infected with HIV/AIDs should be given daily vaccines to reduce the risk of contracting the child killer-diseases like pneumonia and diarrhoea,
- (v) addressing environmental factors such as air pollution, encouraging sanitation and good hygiene in crowded area would be an ideal solution to reduce the prevalence of the diseases.

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