AIMS - GHANA

A REPORT ON CHILD MORTALITY IN SOME SELECTED AFRICAN COUNTRIES

GROUP ONE
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1 Introduction

About 29,000 deaths are being recorded everyday from children under the age of 5 in Sub Saharan Africa[1]. Reducing child mortality rates in Africa is one of the key goals of the millennium development goals. We will like to study the possible causes of these deaths in some selected African countries namely; Cameroon, Nigeria, Egypt, Ghana, Ethiopia, Kenya, Sudan, Uganda, Rwanda and Malawi.

1.1 Definition of concepts

In order to have a proper understanding of the report, we have defined some concepts which are imperative to this cause.

- **Child mortality** is the number of children under the age of 5 dying from both preventable and non- preventable causes in a population.
- **Child mortality rate** is the number of deaths of under 5 children per 1000 live births in a year.
- **Per capita Income** is the average income per person in a country in a particular year.

1.2 Objectives

The objectives of this project work are as follows:-

- To investigate child mortality rates across the top '10' African countries to determine the trend.
- To relate child mortality with increase or decrease in the country's per capita income.
- To investigate if there is any relationship between the mother's birth age, the educational level of the mother, percentage of births that were attended to by skilled personnel and the child mortality rates of a country.

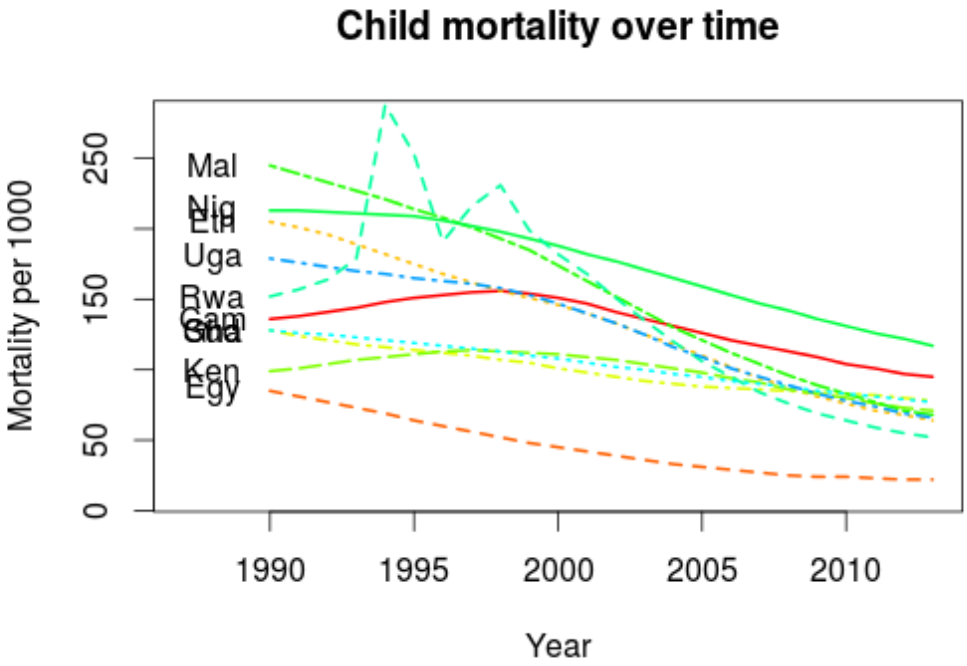
2 Data Sources

The data used for this research work was obtained from two sources:

- Perception data was obtained by administering a survey to the AIMS -Ghana students. Respondents were asked to rate countries in terms of the mortality rates, per capita income and the average literacy levels.
- Actual data on the child mortality across a period spanning 24 years was obtained from the UN data repository. The World bank group provided data on the country's per capita income, educational level of the mother and the literacy levels of the mother.

3 Exploratory Data Analysis

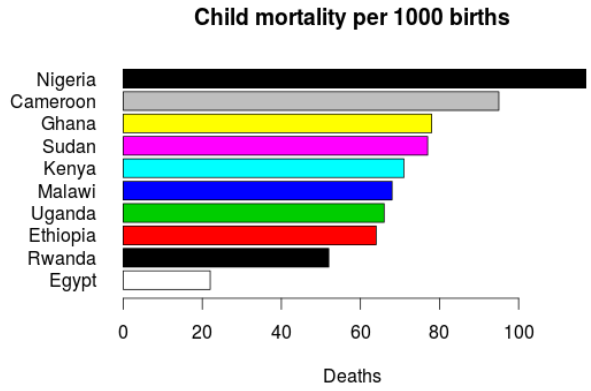
Trends for the 24 years of child mortality for the 10 African countries was plotted as shown below:

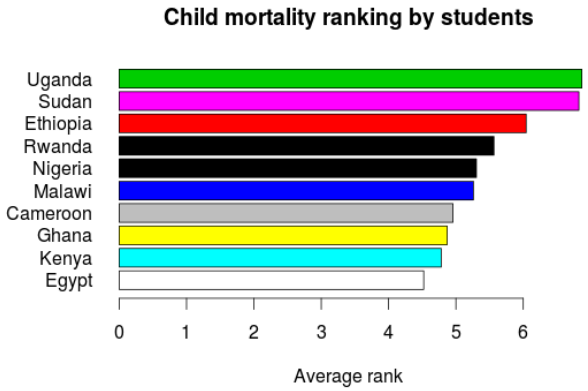


It can be noted from the plot that child mortality is generally decreasing in all countries over the years. However, Rwanda shows an increase in child mortality between 1994 to 1995 then 1997 to 1999. According to Jean Paul (primary source) this, among other factors, increase between 1994 to 1995 is attributed to the genocide and closure of health facilities whereas increase between 1997 to 1999 is attributed to civil war which arose from rebels who had fled to Democratic Republic of Congo after the genocide.

3.1 Comparing child mortality from perception and actual data

Child mortality from both sources of data were plotted. The actual mortality data for the year 2013 was compared with the mortality ranking of the perception data.

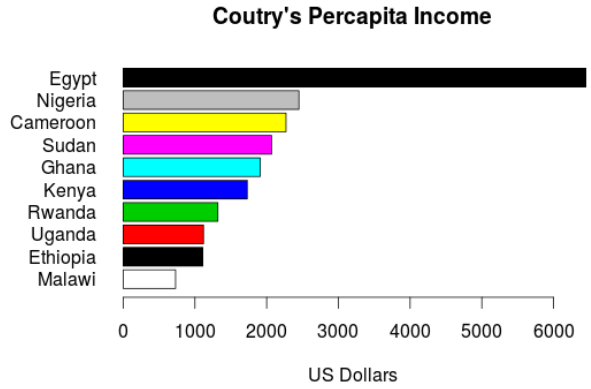


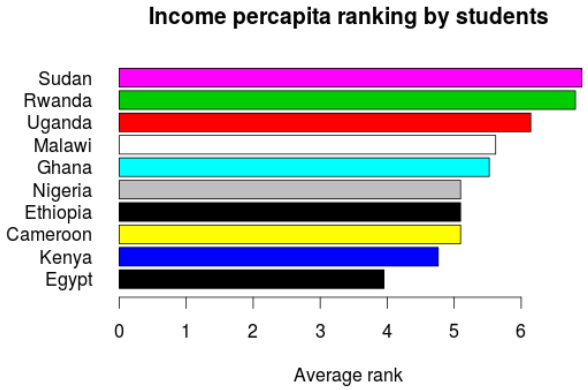


From the actual data collected, Nigeria had the highest mortality rate per 1000 live births. In contrast to the actual data, perception data ranked Uganda as having the highest mortality rate followed closely by Sudan. Egypt had the lowest mortality rate from both perceived and actual data.

3.2 Comparing Income Per Capita from perception and actual data

The actual per capita income data for the year 2013 is compared with the per capita income ranking of the perception data by Students.





The Per capita income rating for the 10 African countries ranked by the students had Sudan as the country with the highest per capita income followed by Rwanda, and Egypt having the lowest. For the actual data, Egypt has extremely high per capita income (more than double that of other countries), while Malawi had the lowest per capita income.

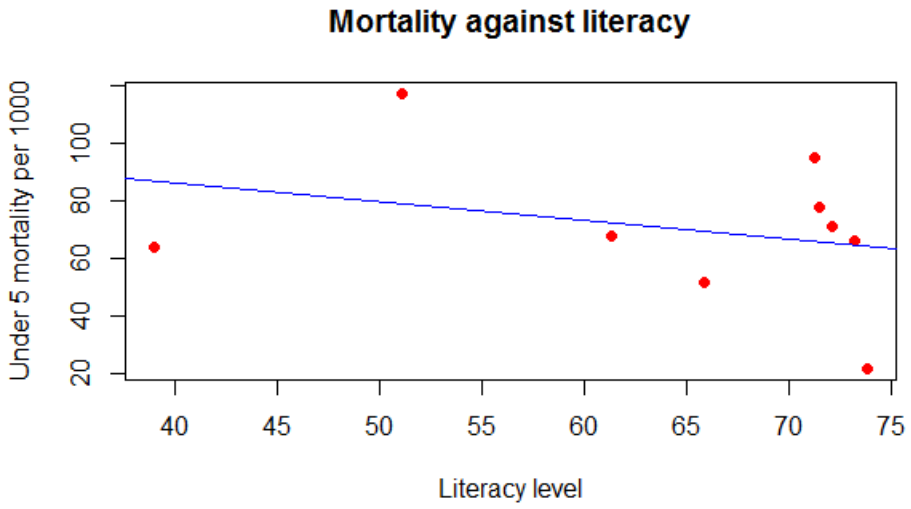
3.3 Results from the perception data

The results from the exploratory analysis are as follows:

- The 75% of the students agreed that skilled personnel used in delivery also affects the child mortality rate.
- When perception on the average child bearing age was considered, 90% of the students responded in the affirmative.
- When the average childbearing age from the perception data was analysed, 62% considered $25-29$ years as the mean age for mothers in Africa.

3.4 Child Mortality against Literacy

To investigate if there is any significant relationship between the child mortality and the literacy level of the country, we fitted a linear model to explain the relationship.



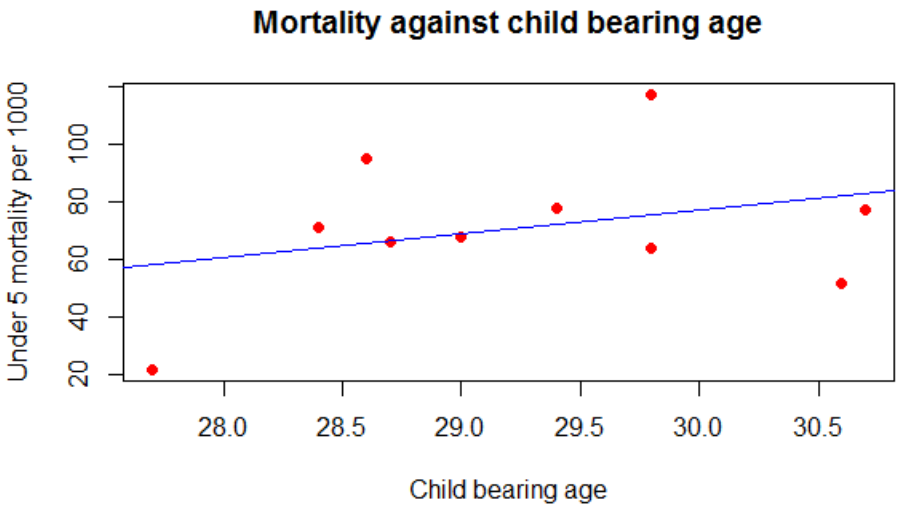
From the graph, we can see that as the literacy levels of the mothers increase, the child mortality rate decreases. The equation of the fitted model is given by,

$$child\,mortality \;=\; 111.75 \;-\; 0.6436 \;\times\; literacy\,level$$

which indicates that, increase in literacy level by one percent decreases mortality by 0.6 units.

3.5 Child Mortality against Child bearing age

Child mortality was plotted against the child bearing age, the following graph was obtained.

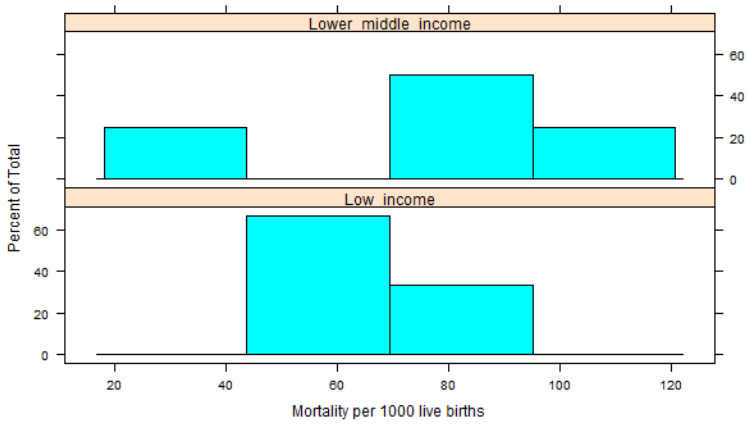


The child bearing age and the mortality was found to be positively correlated. The equation of the fitted model is given by,

$$child\,mortality \;=\; -169.08 \;+\; 8.202 \;\times\; child\,bearing\,age$$

which indicates that, increase in child bearing age by one year increases mortality by 8.2 units.

3.6 Comparing mortalities of different Country categories



From the plot, it can be seen that the lower income countries have lower mortalities compared to lower-middle income countries.

4 Confirmatory analysis

We need to establish if the results from the exploratory analysis are actually valid.

4.1 T- test to compare child mortality with income levels

We need to test if the means of the two income levels are the same or not. The assumption of this test is that the child mortalities of different countries are normally distributed.
Hypothesis
H_0- Child mortality means for the two income levels are equal.
H_1- Child mortality means for the two income levels are different.

```
> t.test(U5MR~Category)

Welch Two Sample t-test

data:  U5MR by Category
t = 0.546, df = 3.181, p-value = 0.6211
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -52.26432  74.76432
sample estimates:
mean in group Lower_middle_income     mean in group Low_income
                            77.75                       66.50
```

From the result, we see that there isn't any significant difference in the means of the two income levels. We therefore do not have sufficient evidence to reject the null hypothesis.We can therefore conclude that the child mortality means for the two income levels are the same.

4.2 Model Fitting

4.2.1 Relationship between covariates and mortality

```
> fit=lm(U5MR~per capita+literacy+skilled birth+Child bearing age)
> summary(fit)

Call:
lm(formula = U5MR ~ per capita + literacy +
    skilled birth + Child bearing age)

Residuals:
      1       2       3       4       5       6       7       8      10
 28.245 -16.895 -24.350   8.602  -5.145  -2.565  42.864 -21.701  -9.055

Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)          10.292759 649.031600   0.016    0.988
```

```
per capita           -0.004904   0.008836  -0.555    0.608
literacy              0.201335   1.937017   0.104    0.922
skilled birth        -0.358542   0.973489  -0.368    0.731
Child bearing age     2.658900  20.006293   0.133    0.901
Residual standard error: 32.3 on 4 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.2523,Adjusted R-squared:  -0.4953
F-statistic: 0.3375 on 4 and 4 DF,  p-value: 0.8411
```

From the analysis careried out, it can be seen that the covariates do not contribute significantly to the dependent variable due to high p-values.The R-squared value shows a value of 0.2523 which implies that the covariates we have only explains about 25% of the variation observed in child mortality rate.

5 Limitations of the research work

In the course of carrying out this work, the limitations we encountered are explained below:-

1. Lack of relevant and correct sources that can provide data on significant predictors of child mortality rates in Africa.
2. Lack of recent data for literacy rates and the child bearing ages of women in the country

6 Conclusion

Despite the high values obtained from the perception data on the predictors of child mortality, the analysis carried out on the trend and important covariates chosen that can explain child mortality, shows that all the covariates were not significant in explaining the child mortality rates. This paves way for investigation into other possible causes of child mortality.

References

[1] UNICEF (http://www.unicef.org/mdg/childmortality.html)

[2] World Health Organisation (http://www.who.int/gho/en)

[3] World Bank Group (http://www.worldbank.org/en/research)

[4] UN Data (http://data.un.org/)

7 Appendix

This research work was performed collectively by all the group members. Specifically, we worked independently on a shared dropbox folder where members could monitor the overall progress of the research work. Each member was assigned tasks as follows to take lead;

Jean Paul Nsabimana

1. Choice of countries used in the study.
2. Interpretation of time series plot.
3. Proofreading of the entire report before final submission.

Maryam Onifade

1. Designing the questionnaire used in collecting perception data from respondents using the google forms.
2. Typesetting the work in Latex format.
3. Proofreading of the entire report before final submission.

Stephen Kogo

1. Designing the questionnaire used in collecting perception data from respondents using the google forms.
2. Typesetting the work in Latex format.
3. Data cleaning and analysis using the R statistical package.
4. Proofreading of the entire report before final submission.

Emmanuel Nthala

1. Generation of relevant plots.
2. Contributed in the choice of countries.
3. Proofreading of the entire report before final submission.

Zeray Hagos G.

1. Extraction of data from websites.
2. Interpretation of output from analysis.
3. Proofreading of the entire report before final submission.