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Recent Trends in Maternal Mortality Among Low-Income Countries: A Case Study of Zimbabwe.

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ABSTRACT

Recent Trends in Maternal Mortality Among Low-Income Countries: A Case Study of Zimbabwe.

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This paper examines the trends in maternal mortality among low-income countries while paying a particular focus on Zimbabwe. Precisely, the research paper examines seven (7) factors affecting maternal mortality in these low-income countries to understand the significance of each variable. Factors examined include total fertility rate; adolescent fertility rate; prevalence of HIV among women aged 15years and above; prevalence of anemia among pregnant women; current health expenditure per capita; Gross Domestic Product (GDP) per capita and Gross Domestic Product (GDP). The research paper examines the behavior of each variable in 21 low-income countries for a period of 18 years, (2000 to 2017). The 21 countries were selected on the basis of their respective GDP which is relatively comparable to that of Zimbabwe – the country of interest. The results show two broad groups. The first group consists of factors showing a positive correlation with maternal mortality and a second group that has factors that shows a negative correlation with maternal mortality. This paper may benefit policymakers in developing countries to appreciate certain factors affecting maternal mortality.

Key words: maternal mortality; trends; determinants; correlation.

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ABBREVIATIONS

AIDS	- Acquired Immune Deficiency Syndrome
AU	- African Union
CEDAW	- Convention on the Elimination of All Forms of Discrimination against Women
ECOSOC	- International Covenant on Economic, Social and Cultural Rights
GDP	- Gross Domestic Product
HIV	- Human Immune Virus
ICESCR	- International Covenant on Economic, Social and Cultural Rights
ISCD-10	- International Statistical Classification of Diseases
MDG	- Millennium Development Goals
MICS	- Multiple Indicator Cluster Survey
MMR	- Maternal Mortality Rate
SDG	- Sustainable Development Goals
SADC	- Southern Africa Development Community
NGP	- National Gender Policy
NGO	- Non-Governmental Organisations
UDHR	- Universal Declaration on Human Rights
UN	- United Nations
WB	- World Bank
WDI	- World Development Indicators
WHO	- World Health Organisation

CHAPTER 1. INTRODUCTION

The right to health in general and maternal health in particular is a well-established narrative today. Other than being a right to health, maternal health is also a massive economic matter. By virtue of it having been a global challenge since time immemorial, maternal health is now provided for in several international normative frameworks designed to influence national constitutions, policies, programs and activities of individual countries. Be that as it may, maternal mortality remains a huge challenge for low-income countries today just as much as it has been several decades ago. The World Health Organization (WHO), (2010; 2011) posits that the magnitude of maternal death in the global south has remained catastrophic. Indeed, hundreds of thousands of women in the poor countries of the world continue to experience complications and illnesses relating to pregnancy and child birth which, at the worst-case scenario, results in death.

As aptly summed up in their research on maternal mortality in low-income countries in which they paid a particular focus on Sub-Saharan Africa, Roser and Ritchie (2013) concludes that if the world could make maternal deaths in low-income countries as rare as they are in high-income countries, almost 300,000 mothers could be saved each year. It is certainly true, as posited by Loppie and Wien (2009) that in a wide spectrum of economic, socio-cultural, religious and political problems that keep threatening the mental and physical well-being of women, maternal mortality is arguably in the top echelon of the list. Despite the fact that maternal mortality has brought untold suffering to women especially those in poor countries, the problem has largely received less attention than it deserves. Hence pregnancy remains one of the biggest albatrosses of death that keeps menacing almost every woman within the child bearing age range. And Sub-Saharan Africa has been the worst affected of all the regions of the world.

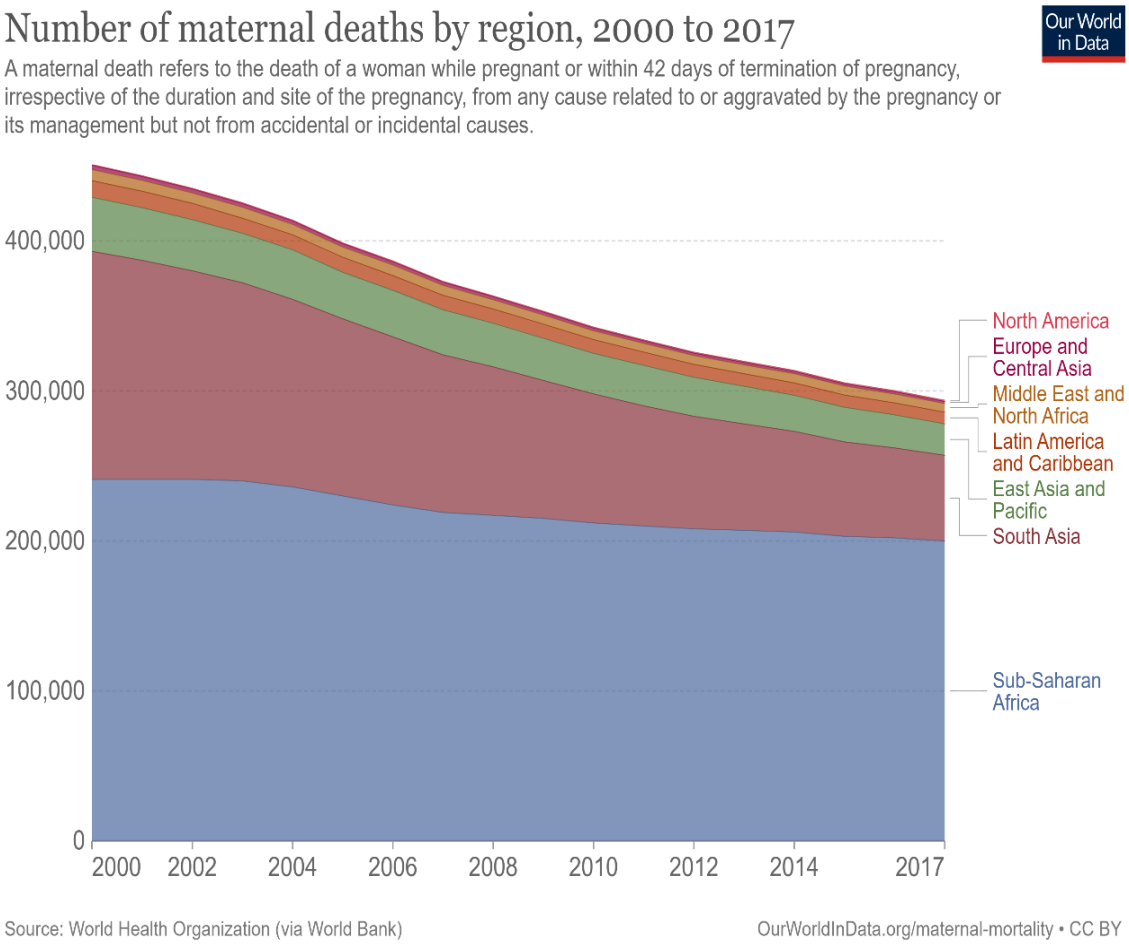
As the global trends on health are changing constantly over time and place (WHO 2014) so should be the narrative on the right to health and maternal health precisely. These constant changes imply that factors affecting maternal mortality change over time and place. And for that reason, all important areas in dealing with maternal health, including academic research, policies, legislation, programs and activities also have to constantly evolve and develop in such a manner that they remain in tandem with the new trends and trajectories of all health-related challenges. And to keep abreast with these constant changes in the health sector, research apparently becomes core to national health management. It is such a realization of the importance of research on maternal health that has influenced this paper.

The paper also seeks to situate Zimbabwe within the broad global and regional context in respect of maternal mortality. The research traces the trends of maternal mortality and ultimately depict the current status of the same by way of considering the socio-economic and health-related variables of maternal mortality in low-income countries paying a particular focus on Zimbabwe.

Taking maternal mortality (modeled estimate, per 100,000 live births) as the dependent variable, the research paper interrogates the impact of a number of its independent correlates including total fertility rate (births per woman); adolescent fertility rate (births per 1,000 women ages 15-19); prevalence of HIV among women above 15years; prevalence of anemia among women of reproductive age (% of women ages 15-49); current health expenditure per capita (current US$); GDP per capita (current US$) and GDP (current US$). The research notes that total fertility rate, prevalence of HIV among pregnant women and adolescent fertility rate have a more significant impact on maternal mortality than current health expenditure and GDP Per-Capita and GDP.

From 2000 to 2017, the low-income countries selected for this research have averaged 680 deaths per 100 000 live births. The Multiple Indicator Cluster Survey, (MICS 2019) puts

Zimbabwe's MMR at 462 deaths per 100 000 lives births. This figure, just like the average MMR for the low-income countries, remain very high as measured against global expectations of less than 70 deaths per 100,000 live births espoused in the Sustainable Development Goals (SDGs).



Clearly, most low-income countries will miss this SDG target just like they did with the MDG 2015 target. As such, this study identifies maternal mortality in low-income countries as a problem that needs urgent and serious attention at the international, regional and local levels. This academic research therefore seeks to contribute towards the processes of finding effective, efficient, applicable and sustainable solution to this global problem.

The broad objectives of the study are to contribute to the body of knowledge on maternal health in low-income countries with a view to proffer possible solutions to the

challenge of high maternal mortality. The precise objectives of this study are to:

(a) track the global trend of MMR with a particular thrust on in low-income countries.

(b) describe and analyze variables to maternal mortality in low-income countries.

(c) comparatively analyze the status of MMR in Zimbabwe vis-à-vis that of other low-income countries with relatively similar circumstances.

(d) proffer possible ways of reducing MMR in low-income countries in general and Zimbabwe in particular – (recommendations).

The study is significant first and foremost to the researcher and the academic field of gender and women's rights. But most importantly, the study will be important to policy makers, the health sector, and the women's movement in low-income countries such as Zimbabwe. The absence of data and/or lack of critical analysis to demystify the often-limited available data on maternal health and other related matters has always constituted the major challenges hindering remedial work on the same in low-income countries. Indeed, lack of data has hindered policy making and even research itself such that the whole processes of redressing the challenge of high maternal mortality in low-income countries has been chaotic. All this stands against the natural logic that all interventionist activities should be premised on a comprehensive appreciation of what exactly the problem and the situation is pertaining the challenge in question. So, the nature, trend, extent and context of the problem – maternal mortality in this case – has to be clear. In view of the observation by WHO (2014), that changes within the global health narrative have happened at an increased pace of late, academic research on the same also has to remain in touch with these rapid changes. It is from this background that this paper seeks to interrogate recent trends in maternal mortality among low-income countries.

This study seeks to answer the following questions:

a) Which are the variables affecting maternal mortality in low-income countries?

b) What has been the trend in maternal mortality in low-income countries and in Zimbabwe?
c) How does the prevailing situation look like?
d) How is the MMR in other countries especially those with similar conditions to Zimbabwe?

On the premise of the first research question, the research seeks to identify and explain the independent factors affecting maternal mortality in low-income countries. And the idea behind the second question is to focus the research on tracking the trend of maternal mortality in low-income countries and paying a particular focus on Zimbabwe with a view to then present the current state of the problem as directed by the third question. The fourth research question speaks to a comparative analysis of maternal mortality among the selected low-income countries. The idea is to learn from other countries that have circumstances closely similar to Zimbabwe – the country of interest.

There is quite a comprehensive body of research and knowledge on maternal mortality in developed countries but unfortunately, the same cannot be said about the developing countries. And much of progress made towards reducing maternal mortality in these developed countries has been heavily influenced by research. And this places the need for research on maternal mortality at the center of the entire response mechanism to the scourge of maternal mortality in low-income countries like Zimbabwe where the same remains a huge national burden.

CHAPTER 2. BACKGROUND AND LITERATURE REVIEW

2.1. Brief overview of maternal mortality

The right to life for every human being is captured unambiguously in the Universal Declaration on Human Rights (UDHR) and the right to health is a fundamental element of this over-arching right. Precisely, Article 25 of the UDHR stipulates that every human being has a right to a standard of living that provides them adequate health through medical care among other means. Article 25(2) of the UDHR specifically demands that mothers and children be granted special care and assistance. These provisions in the UDHR on this inalienable right to health and consequently to life, resonates well with many other provisions of the international normative framework.

Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) clearly states that everyone has a right to enjoy the highest attainable standard of physical and mental health. General Comment 14 of the ICESCR states that the right to maternal and reproductive health should include access to family planning, pre-natal and post-natal care, emergency obstetric services and access to information. The Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) enjoin states to take all necessary measures to protect women`s right to health which includes access to maternal health, family planning and appropriate services in regard to pregnancy such as pre-natal and post-natal care. And maternal mortality, itself an essential indicator of development – (Hoj et al, 2003) – falls squarely under the afore-mentioned provisions of human and/or women's rights just as much as it is provided for in many other instruments.

WHO (1992) defines maternal health as the well-being of women during pregnancy, childbirth and the postpartum period. WHO's definition includes the death of a woman while pregnant or within 42 days of termination of pregnancy – irrespective of the duration and site of the pregnancy – from any cause related to or aggravated by the pregnancy or its management.

However, accidental or incidental causes are excluded. This expansive definition means that maternal health encompasses the entire child-bearing process from family planning, preconception, pregnancy, pre-natal, child birth and post-natal care in order to ensure a positive and fulfilling experience for pregnant women and new mothers. In fact, the International Statistical Classification of Diseases and Related Health Problems (ICD-10) introduced the Late Maternal Death as a new category. The late maternal death includes the death of a woman from direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy.

According to the World Health Organization (WHO 2012), over 135 million women give birth each year, and approximately 20 million of these women experience pregnancy related illness during and after child birth. Among the 20million who experience pregnancy and/or childbirth related illnesses, over a million of them die as a direct result of these complications. And 99 percent of these maternal deaths happen in the global south. (WHO 2012). The report (WHO 2012) further states that global maternal mortality ratio has gone down by only 2.2% annually since 1990 instead of the 5.5% which was envisaged to achieve the MDG5 target. The new era of the Sustainable Development Goals (SDGs) envisages a target of less than 70 deaths per 100 000 live births.

The 2012 WHO report further posits that more maternal deaths happen in Sub-Saharan Africa than in any other continent in the world. In 2012, the average MMR in Sub-Saharan Africa was 533 maternal deaths per 100,000 live births which translates to 68% – over a third – of all maternal deaths per year worldwide. (WHO 2012). At 462 deaths per 100 000 live births, Zimbabwe is ranked number 15 in Sub-Saharan Africa and number 23 world over among countries with the worst maternal mortality ratio (World Development Indicators 2021).

In Zimbabwe maternal health entails ensuring good health to a pregnant woman throughout the pregnancy stages, that is the pregnancy, childbirth and the post-partum periods,

(Constitutional Amendment Number 20 of 2013, hereafter referred to as the Constitution of Zimbabwe). It encompasses family planning, preconception, pre and postal-natal care designed to keep those in need of maternal services safe and health, (National Gender Policy 2017).

The Republic of Zimbabwe is a full member of the United Nations, the African Union, the Southern Africa Development Community (SADC) and many other international bodies. And by virtue of being a member of these treaty bodies, Zimbabwe is therefore bound by respective normative frameworks. These international instruments that Zimbabwe is party to include the UN's UDHR, the Convention on the Elimination of Discrimination Against Women (CEDAW), the International Covenant on Economic, Social and Cultural Rights (ECOSOC), the African Charter on Human and People's Rights, the SADC Protocol on Gender and Development among many others. In addition, Zimbabwe has its own legislative and administrative structures designed to promote and advance the right to health for all its citizens. These include the Constitution of Zimbabwe and several administrative policies such as the National Gender Policy (NGP) of 2017. It is therefore incumbent upon Zimbabwe not only to adhere to but also to show a genuine commitment to the binding principles of these local, regional and international frameworks for improving human and women rights.

Zimbabwe's health sector is divided into the private (profit-oriented) and public (non-profit-oriented) divisions which complement each other. The private division has institutions owned by individuals and/or companies and its profit oriented while the public division is made up of health institutions supported by government and Non-Governmental Organisations (NGOs) including churches and development partners. According to Dodzo (2018), Zimbabwe's public health care system has four hierarchical referral phases of escalating complexity. First is the primary level which consists of rural health care centers and clinics, municipal, council, and mission clinics. The second level is made up of district hospitals. The third level consists of provincial hospitals in which the country's 10 provinces have at-least

each provincial hospital. The fourth and last referral level consists of central hospitals which offer specialist services which are normally unavailable at the lower levels.

2.2. Academic research on MMR

There is a significantly huge body of research that has been established on maternal mortality. However, much of it has been conducted in developed countries. There remain some significant gaps in terms of research on the same in developing countries.

Mosley and Chen (1984), posits that maternal death is the cumulative result of a series of socio-economic, cultural and biological factors and not just an outcome of a single biological event. Anandlakshmy et al (1997), argue that maternal mortality is a crucial pointer of the socio-economic development of a nation, a view corroborated by the World Bank (1993). WHO (2008) also postulates that poverty and poor health are inseparable, a view expounded by Loppie and Wien (2009) who postulates that there are many dimensions of poverty including lack of basic requirements such as food, shelter, sanitation, and safe water. And these deprivations, as argued by Loppie and Wien (2009), are further compounded by low-income levels among women in developing countries.

A number of studies concur that the empowerment of women determines their access to maternal health care, (Tawiah, 2011; Mahapatro, 2012; Pandey, 2012). In a study of five sub-Saharan African countries, Tawiah (2011) found that almost half of participants interviewed said that women had no power to make decisions even those affecting their own health. It is rather their husbands who make the ultimate decision for their wives to access health care services. This scenario alludes to a huge risk for pregnant women as lack of control on decisions pertaining to their own health implies that they are less likely to access maternal health services that they need and in time that they need it.

In a study in Nepal, Acharya et al. (2010), found that women who are gainfully employed (paid work) have a relatively significant economic and/or financial power to make

decisions on matters that have implications on their personal health than women involved in unpaid work. Expressed differently, Mahapatro (2012) argue that it is highly likely that impoverished women will receive less maternal health care services than women who are economically stable. In a closely related observation, Kumar Rai et al (2013) postulates that low-income countries are less likely to invest in the medical health care systems and women are often the worst victims of a dysfunctional health care system. These studies are linked to closely to the three variables of interest in this research which includes GDP, GDP per capita and current health expenditure.

In respect of total fertility, WHO, (2012) argues that the higher the number of children that would be born to a woman if she were to live to the end of her childbearing years the higher the risk of maternal death to that woman. In other words, excessive child bearing puts women at a very high risk for maternal death.

Research on maternal mortality in Zimbabwe has followed two broad pathways, Munjanja (2010). The first school of thought is a discourse which interrogates the direct causes on maternal mortality such as hemorrhage, abortion, underlying medical conditions among pregnant women, shortages of drugs and health workers such as nurses, doctors and midwives among others. The second school of thought, covers a much wider spectrum by exploring the social, cultural and economic determinants of maternal mortality. This approach links maternal mortality to cultural issues such as child marriages, religious practices which denies women access to modern health services, obsolete health infrastructure characterized by a severe shortage of medical equipment to perform certain medical procedures, dysfunctional referral system which has often caused delays in reaching health facilities for medical services. While there has been a number of research papers from both the two pathways, none has been exhaustive. Hence the need for further research on maternal mortality in Zimbabwe.

Pregnancy in Zimbabwe is tantamount to an albatross of death to women within the

child-bearing age range as T. Nyoni (2019) bemoan in an article, *"Maternal deaths in Zimbabwe: Is it a crime to be a woman in Zimbabwe?"* And sadly, the Zimbabwean communities just like many in low-income countries accept that the risk of death during the child-bearing processes of the prenatal, birth and postnatal is normal and unavoidable for women. The most tragic and disheartening fact about maternal deaths is that many cases are either preventable or manageable, (Kwidini, 2007). The means to avert maternal death, which includes technology and medical expertise has been available and accessible to women in industrialized countries for decades now but still remains unavailable to the majority of pregnant women in developing countries. Hence maternal mortality rates have significantly decreased in the global north over the years while the situation in most if not all poor countries like Zimbabwe still remain largely unchanged.

CHAPTER 3. METHODOLOGY AND RESEARCH FRAMEWORK

3.1. Data

This is basically a quantitative study that seeks to analyse and describe maternal mortality in low-income countries in which a particular focus is given to Zimbabwe. The research is premised on secondary data obtained from World Development Indicators (WDI, 2015). This data source was preferred largely because the WDI is a renowned source of empirical data on so many countries covering different variables across several years. In other words, the data set for this study was downloaded from the World Development Indicators (2017) into an excel file upon which the data was then organized and manipulated.

The explicit period of study is between 2000 and 2017. It is conceivable that this 17year period does not only establish a reasonably comprehensive trend of maternal mortality but could also be acceptable as 2017 has the most recent data available among the countries of interest. Even though reference is often made to relevant information before or after the specific period of study, it was imperative to consider this period as it had enough data to enable a satisfactory pursuit of the research objectives.

The study selected twenty-one (21) focus countries and these countries are Burkina Faso; Cambodia; Chad; Guinea; Guinea-Bissau; Liberia; Madagascar; Mali; Mozambique; Nepal; Niger; Rwanda; Sierra-Leone; Tajikistan; Tanzania; Timor-Leste; The Gambia; Togo; Uganda and Zimbabwe. These focus countries were chosen due to their GDP which is relatively comparable to that of Zimbabwe as captured in the WDI (2015).

From a host of independent variables listed on the data source, this paper retained seven determinants that had enough data within the period under review to adequately serve the purpose of the research. MMR is the dependent variable and for the purposes of this research, it is taken as modeled estimates of maternal deaths per 100 000 live births. Listed against their respective working definitions adopted as they are from the data source, these

factors include;

1. GDP (Constant 2015 USD$) – is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.
2. GDP per capita (Constant 2015 USD$) – GDP per capita is gross domestic product divided by midyear population.
3. Current health expenditure – expenditures on health per capita in current US dollars. Estimates of current health expenditures include healthcare goods and services consumed during each year.
4. Total fertility rate – which represents the number of children that would be born to a woman if she were to live to the end of her childbearing years.
5. Adolescent fertility rate (births per 1000 women aged 15-19)
6. Women's share of population ages 15 and above living with HIV (%) – prevalence of HIV is the percentage of people who are infected with HIV. Female rate is as a percentage of the total population ages 15 and above who are living with HIV.
7. Prevalence of anemia, pregnant women – prevalence of anemia among pregnant women is expressed as a percentage of pregnant women whose hemoglobin level is less than 110 grams per liter at sea level.

3.2 Regression model

The study uses a simple linear regression model to approximate the correlation of the selected independent variables on MMR for the selected countries, (model captured below).

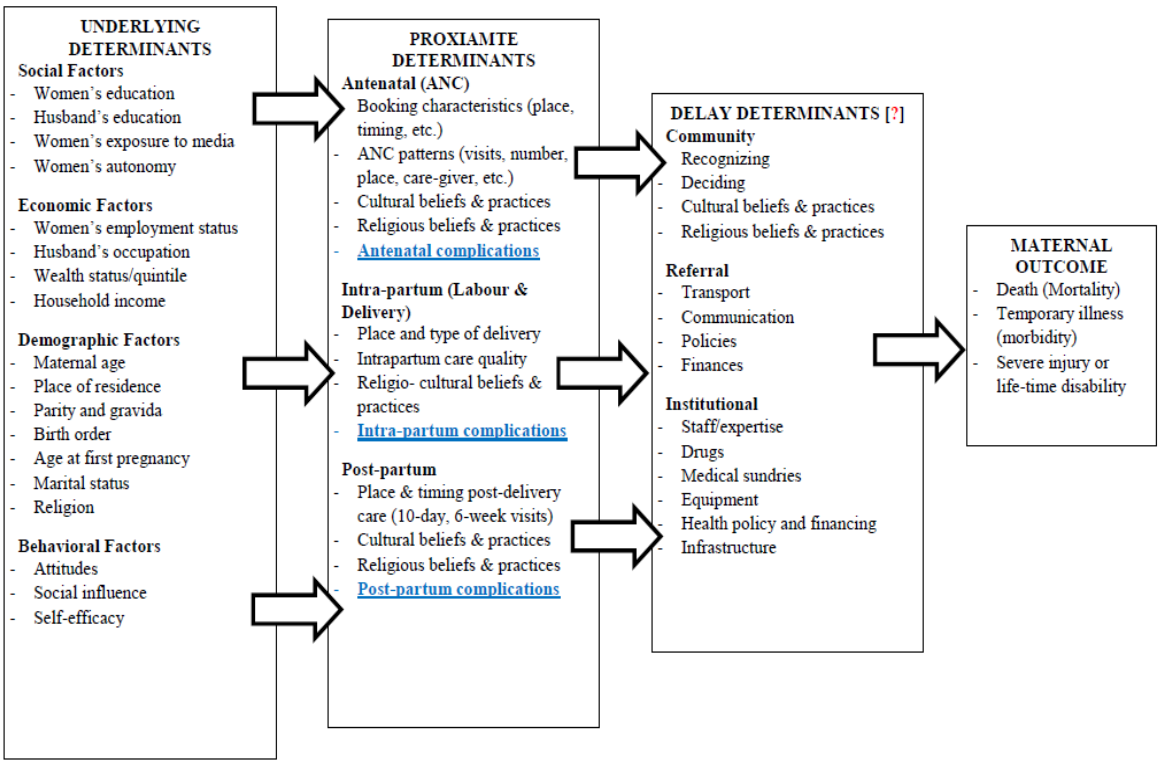
$$\Upsilon = \beta_1 \mathrm{X}_1 + \beta_0 + \varepsilon$$

Where Y is the dependent variable (MMR), β_1 is the co-efficient of X_1 which is the independent variable, β_0 is the constant and ε being the error term.

3.3 Conceptual framework

This study is guided by a research framework founded by Mosley and Chen (1984) which same framework was modified by Thaddeus and Maine (1994). The main assumption behind this research model is that variables relating to demography, social behaviors including culture, economic and biological all interact to produce maternal mortality, (as shown in the picture below). In other words, the framework posits that a woman's risk of dying during pregnancy increases as a result of several converging social, economic, behavioral, and biological factors. Depending on the extent of available data, this conceptual framework might be refined by including more variables which is what Thaddeus and Maine (1994) did in their modified version of the model.

Figure 3. 1



Source: *Mosley and Chen (1984)*

CHAPTER 4. DATA

4.1. Analysis and results

To show where Zimbabwe's MMR stands relative to other countries around the world, the researcher calculated the average MMR of high-income, upper middle-income, lower middle-income and low-income countries. And from these calculations, a graph was drawn indicating Zimbabwe's yearly MMR against the average MMR of the world with countries classified as noted above (high income countries, upper middle-income countries, lower middle-income countries and low-income countries) from 2000 to 2017.

Figure 4. 1 Average Maternal Mortality Ratio (2000-2017)

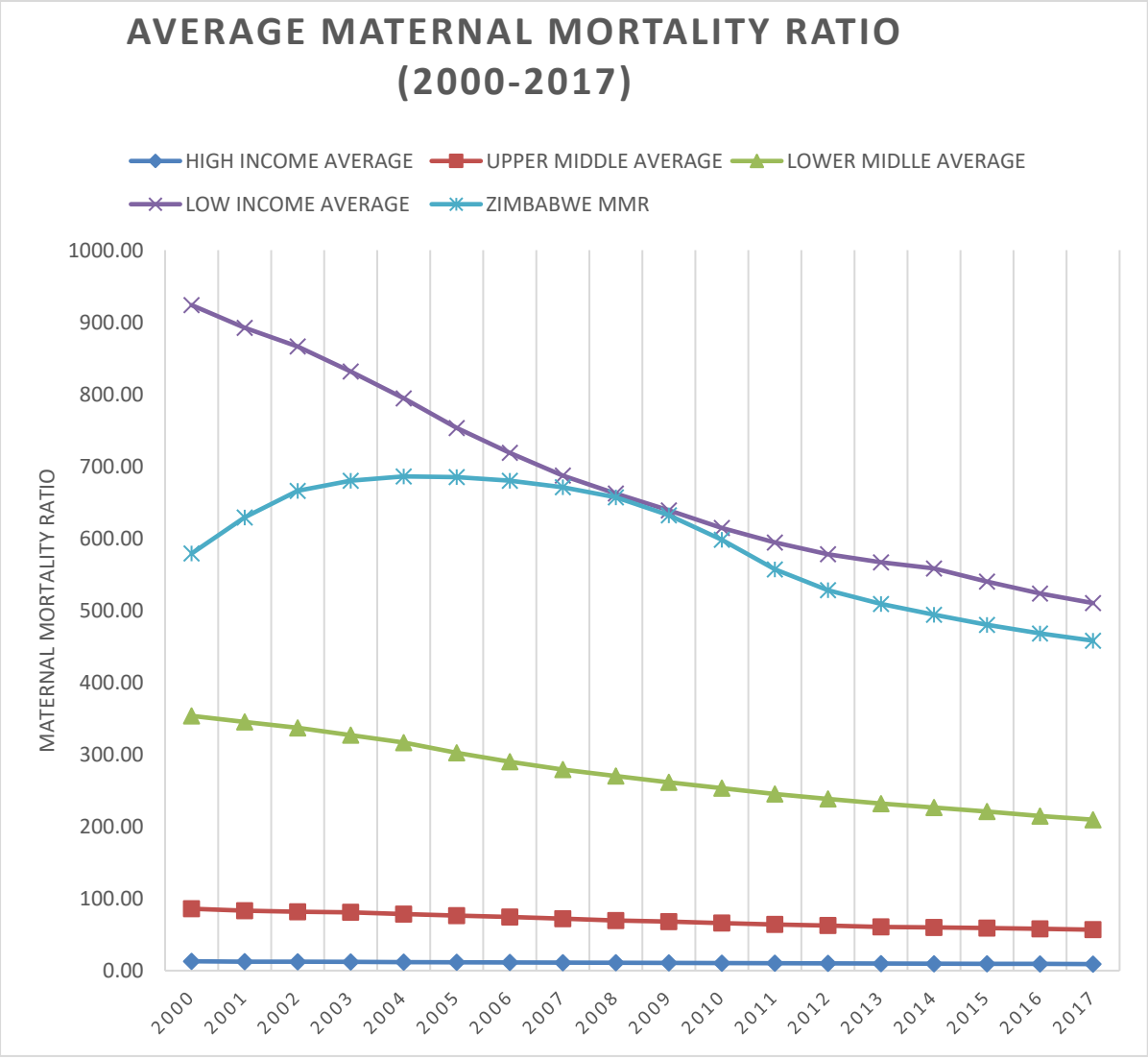


Figure 4. 2 Total average Maternal Mortality Ratio (2000- 2017)

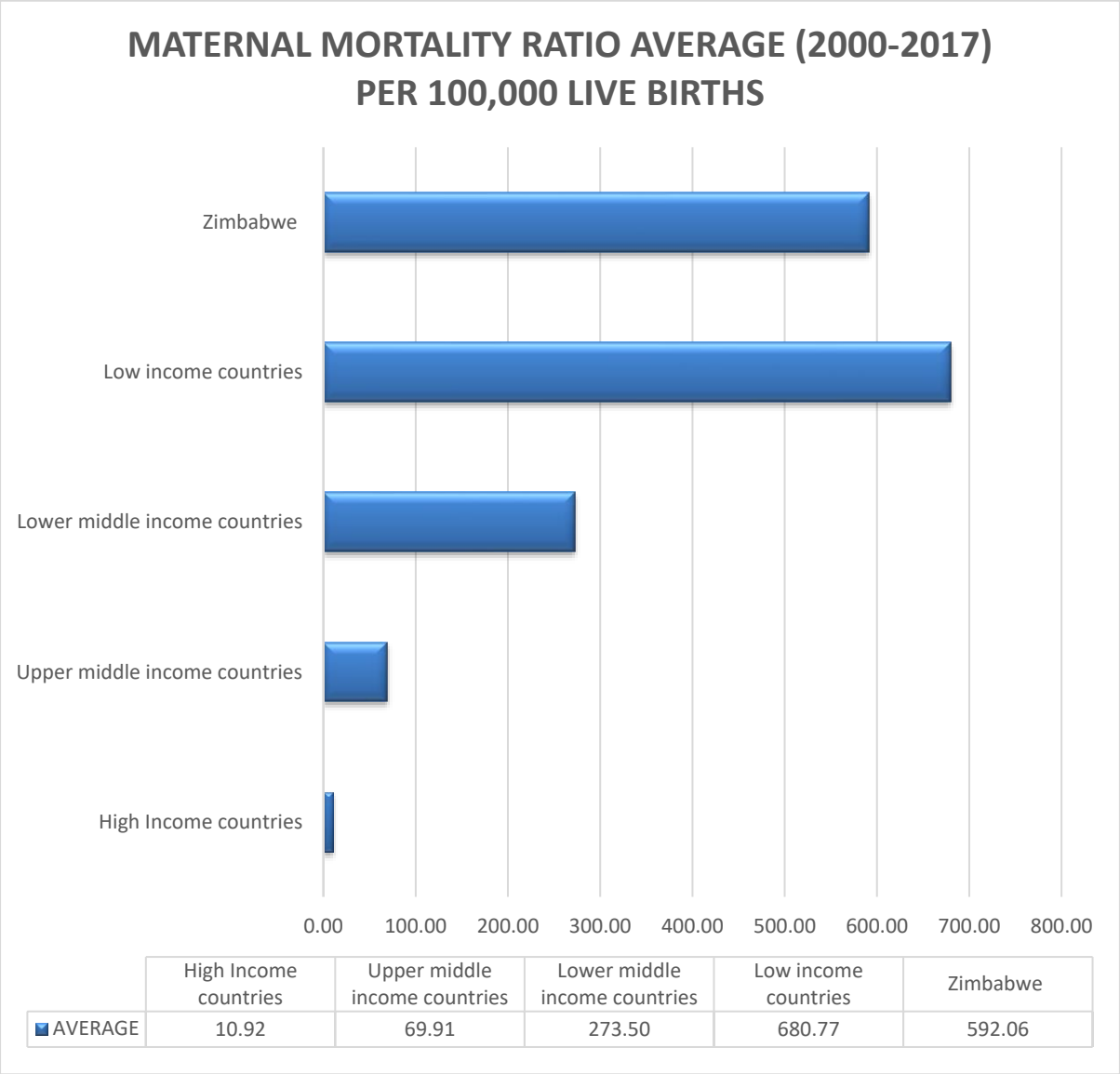


Fig 4.2 above shows total average MMR for Zimbabwe from 2000 to 2017 juxtaposed to the total average MMRs for low-income countries, lower-middle income countries, upper-middle income countries and high-income countries. The graph shows where Zimbabwe stands relative to country classifications around the world. For the period under review (2000-2017), the total average MMR for Zimbabwe stood at 592.06 which is slightly lower that the total average MMR for low-income countries (680.77) but much higher than lower-middle income countries (273.50), upper-middle income countries (69.91) and high-income countries (10.92).

The table 4.1 below shows the R-square for the seven variables considered in this study.

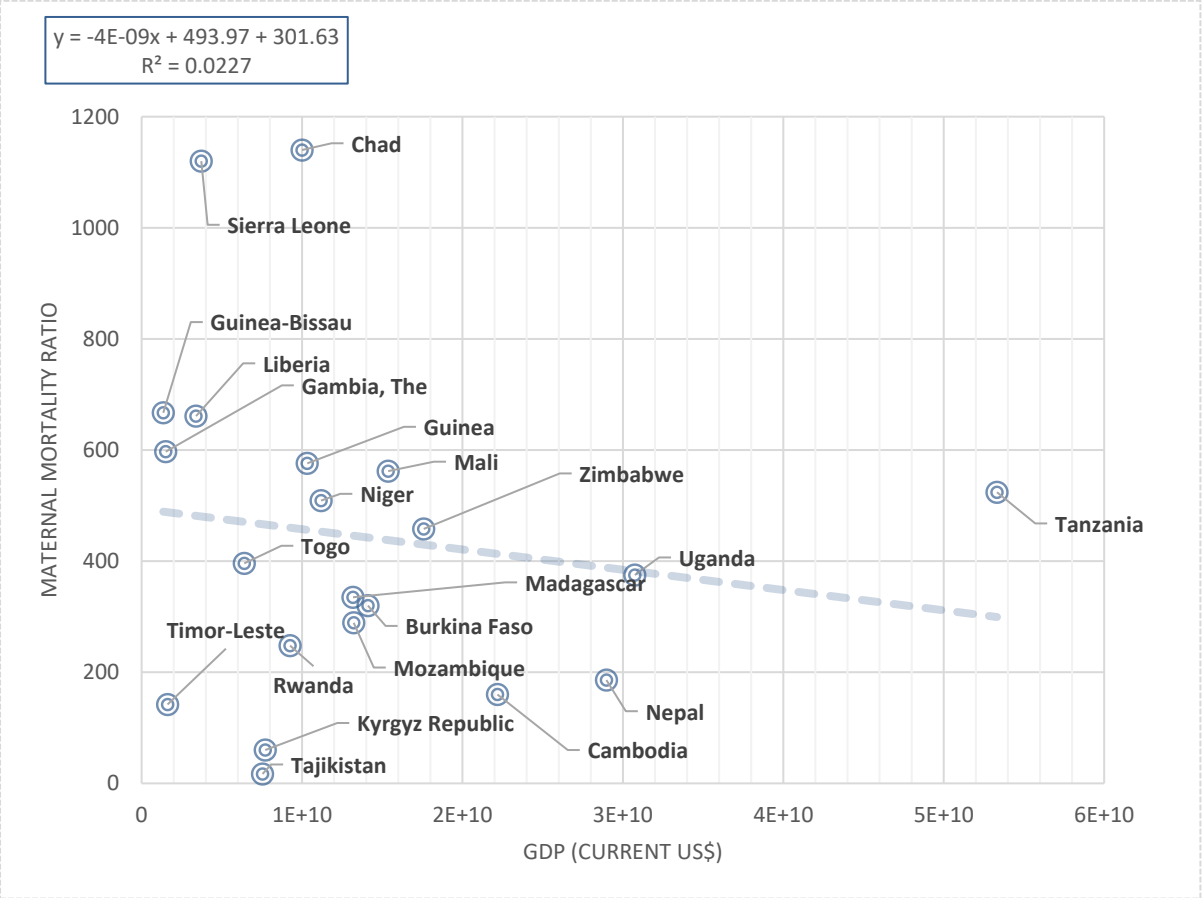
Table 4. 1 R-squared of MMR vs 7 independent variables (2017)

R-SQUARED OF MMR vs 7 INDEPENDENT VARIABLES (2017)	
INDEPENDENT VARIABLES	**R SQUARE'S**
GDP (current US$)	0.0227
GDP per capita (current US$)	0.2493
Current Health Expenditure Per Capita (current US$)	0.1138
Total Fertility Rate (births per woman)	0.2688
Adolescent fertility	0.3810
Women's share of population ages 15+ living with HIV (%)	0.3702
Prevalence of Anemia among pregnant women (%)	0.2188

4.2.Variables.

For each variable affecting maternal mortality, a graph is drawn to show the correlation that particular determinant has on MMR. In the graph, MMR which is the dependent variable, is on the y-axis while each factor is on the x-axis. Graphs show the most recent year of the study (2017). Ten (10) of the selected countries had MMR higher than that of Zimbabwe.

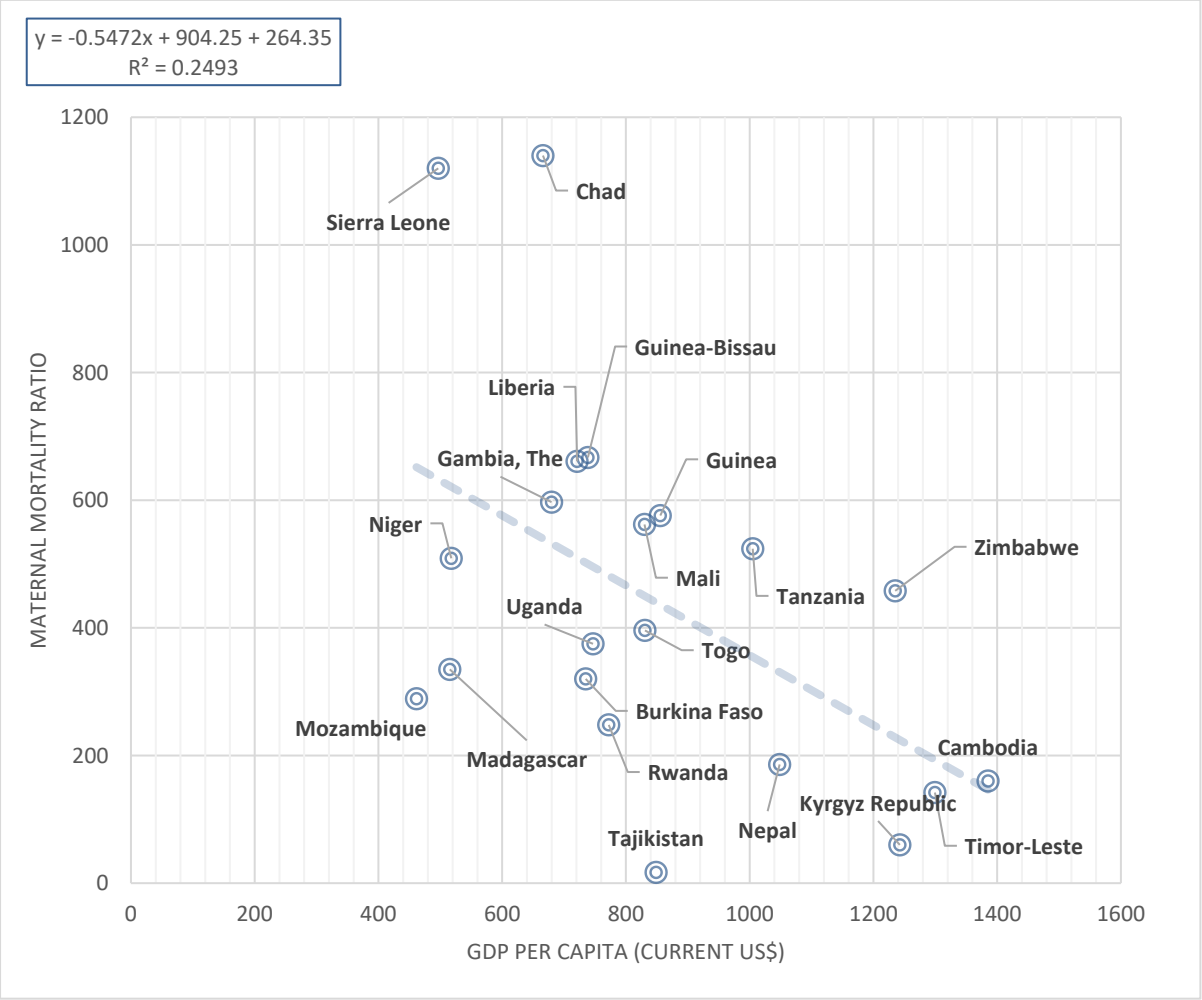
4.2.1. MMR and GDP (Current US$) – 2017



GDP is one of the three factors out of the seven variables that have shown a negative correlation with MMR. GDP for Zimbabwe was just over US$17 billion in 2017. The R-square for the selected countries in respect of this variable was at 0.227 in 2017. And this seem to suggest that GDP is equally significant. Among the selected countries, Chad and Sierra-Leone show very high MMR and lower GDP while Tanzania has the highest GDP against MMR reminiscent of fellow low-income countries.

The regression model equation for this graph is $\Upsilon = (-4E-09)x + 493.97 + 301.63$. In this case, the coefficient (β_1) of X is $(-4E-09)$, the constant (β_0) is 493.97 and the standard error (ε) is 301.63. This equation suggests that an increase in GDP will lead to a reduction in MMR which implication is in tandem with correlation of the two variables as already established above.

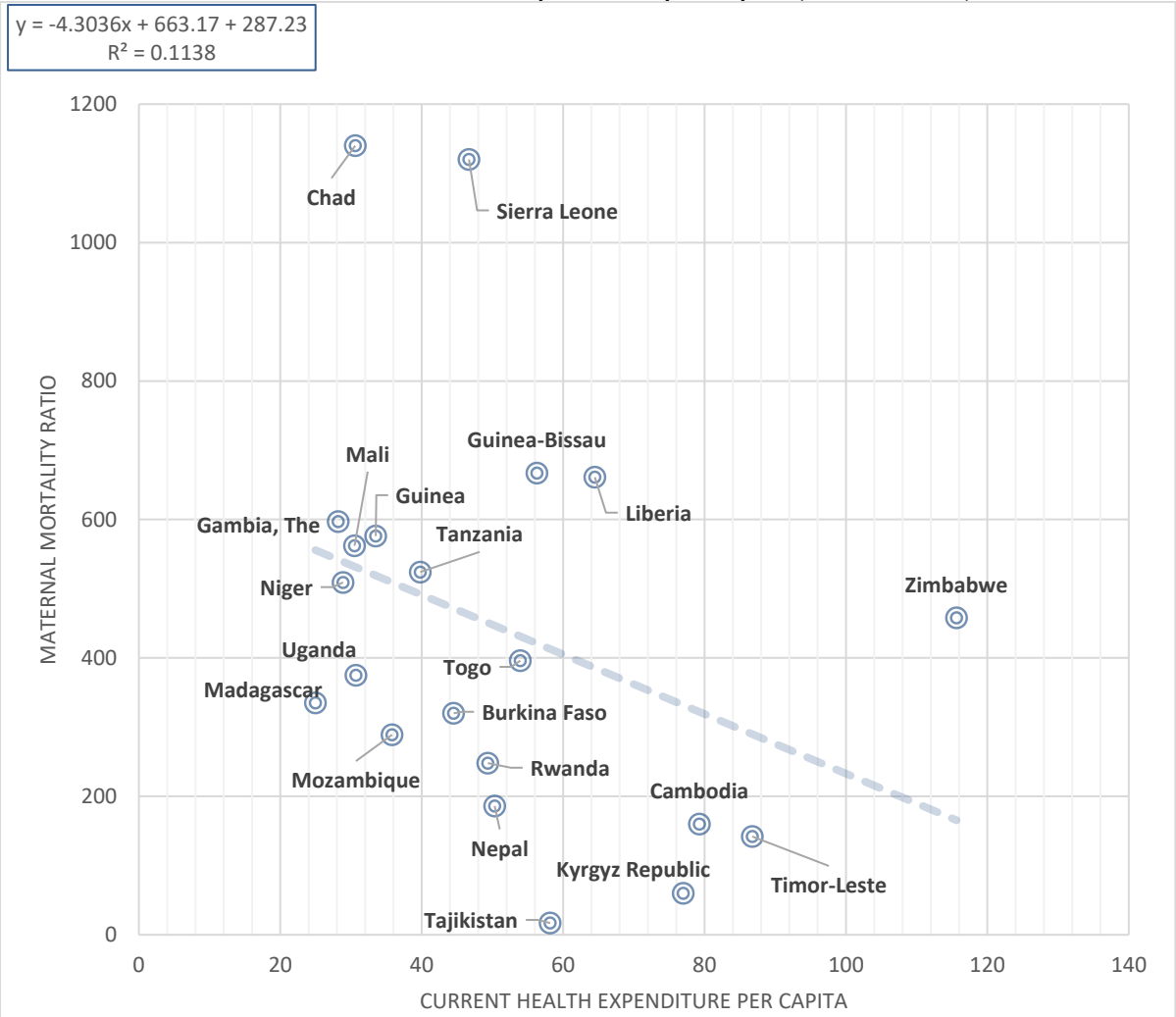
4.2.2. MMR and GDP per capita (Current US$) – 2017



In respect of GDP per capita, there is a negative correlation with MMR. For Zimbabwe, GDP per capita was at US$1235.19 in 2017. The R-square for GDP per capita was at 0.249 in 2017. This seem to suggest that GDP per capita is equally significant. Again, Chad and Sierra Leone are outliers with very high MMR and lower GDP per capita than most of the selected countries.

The regression model equation for this graph is $\Upsilon = (0.5472)x + 904.25 + 264.35$ In this case, the coefficient (β_1) of X is (0.5472), the constant (β_0) is 904.25 and the standard error (ε) is 264.35. This equation implies that an increase in GDP per capita will lead to a reduction in MMR which assumption agrees with the negative correlation of the two variables as already established above.

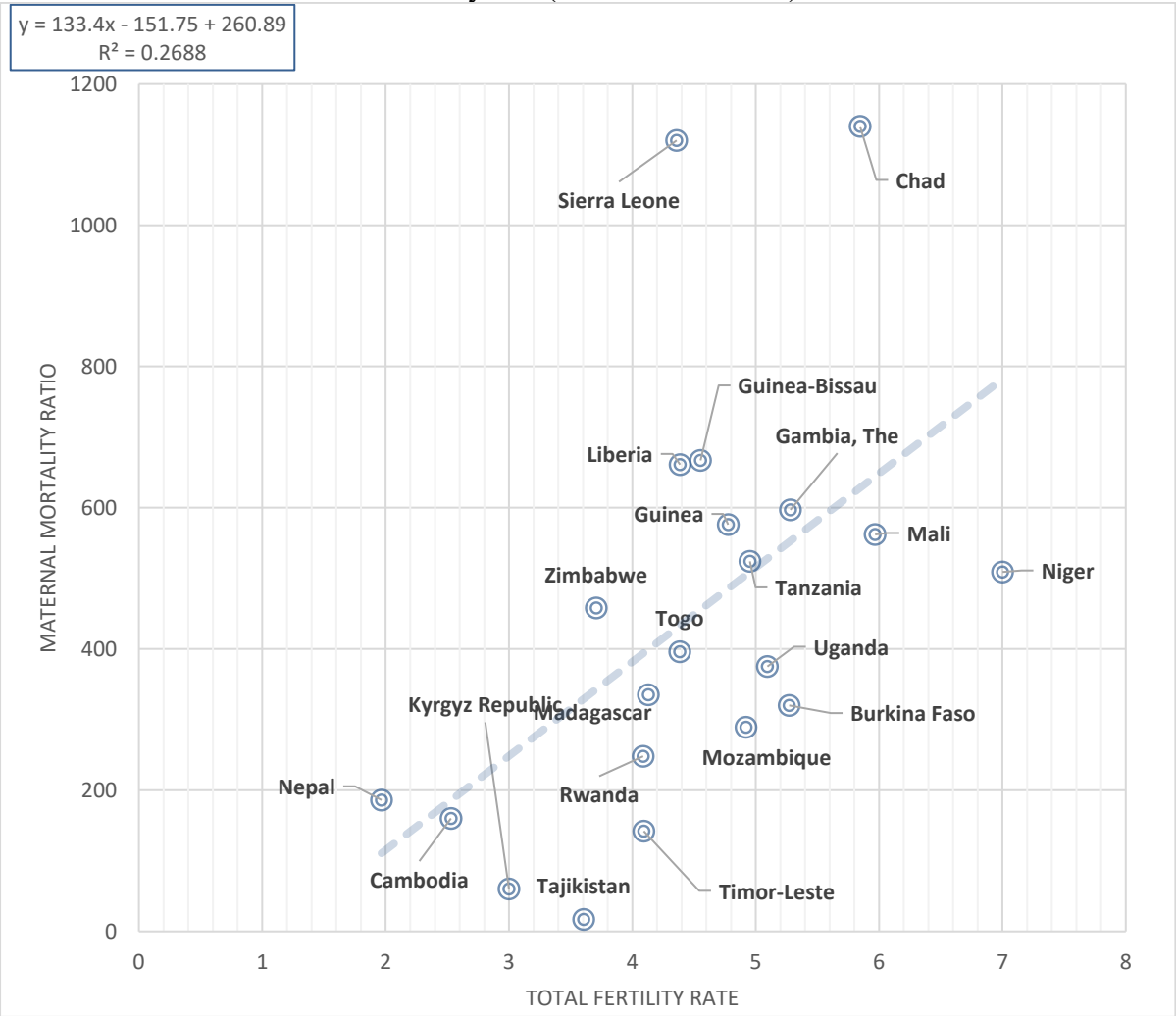
4.2.3. MMR and current health expenditure per capita (Current US$) – 2017



Current health expenditure per capita (current US$) is the third determinant that shows a negative correlation with MMR. As for Zimbabwe, current health expenditure per capita was at US$115.65 in 2017. The R-square for the determinant is 0.114 in 2017. This seem to suggest that GDP per capita is less significant.

The regression model equation for this graph is $Y = (-4.3036)x + 663.17 + 287.23$ In this case, the coefficient (β_1) of X is (-4.3036), the constant (β_0) is 663.17 and the standard error (ε) is 287.23. again, this equation suggests that an increase in health expenditure leads to a reduction in MMR. This equation concurs with negative correlation between health expenditure and MMR established above.

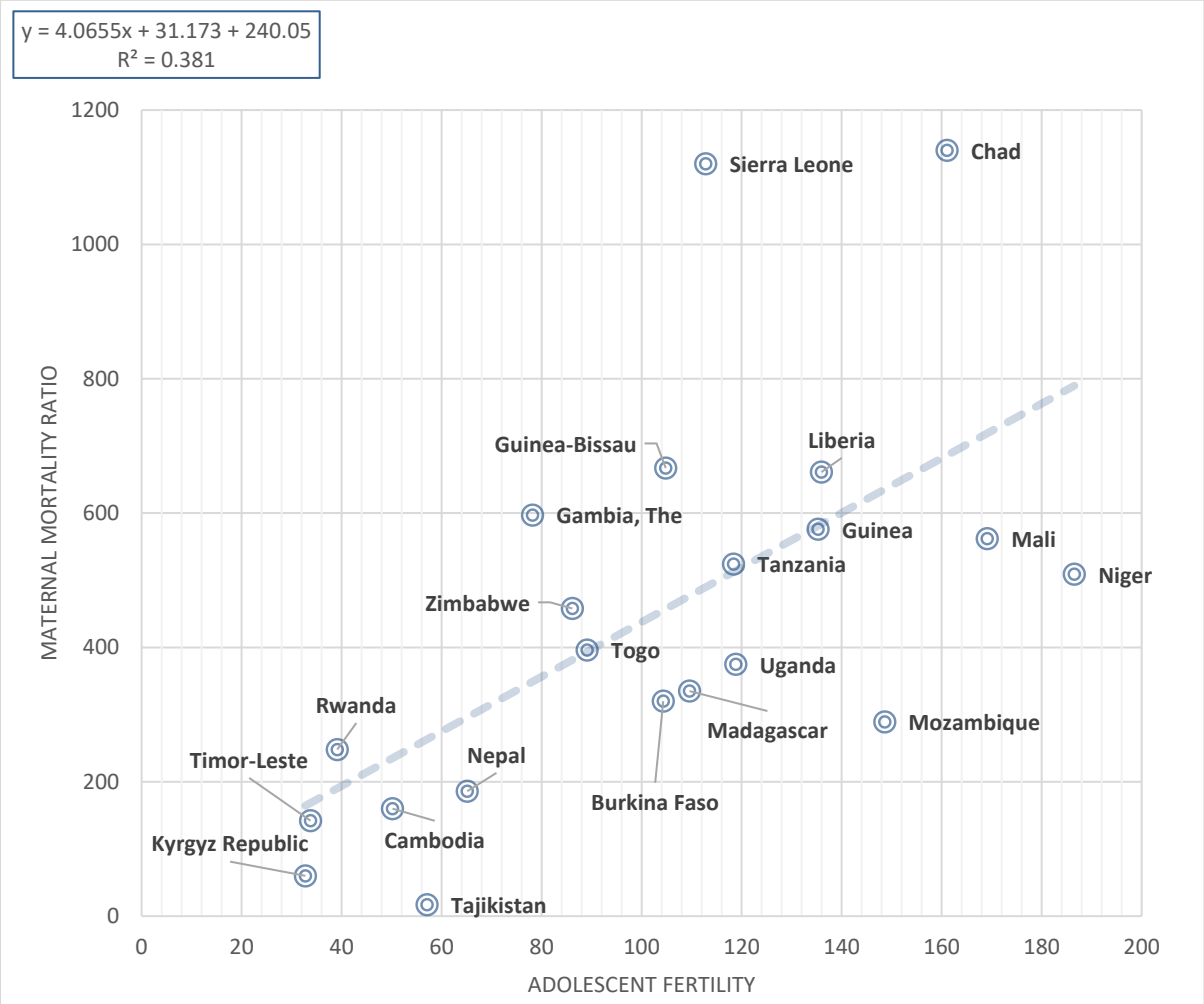
4.2.4. MMR and total fertility rate (Births Per Woman) – 2017



Total fertility rate (births per woman) shows a positive correlation with MMR among the selected countries. In Zimbabwe, total fertility rate was at 3.71 in 2017. With the R-square at 0.269 in 2017 and this seem to suggest that the impact of total fertility on MMR is equally significant.

The regression model equation for this graph is $\Upsilon = (133.40)x + 151.75 + 260.89$. In this case, the coefficient (β_1) of X is (133.40), the constant (β_0) is 151.75 and the standard error (ε) is 260.89. This equation suggests that an increase in fertility rate will lead to an increase in MMR. In any case the graph above show that fertility rate has a positive correlation with MMR.

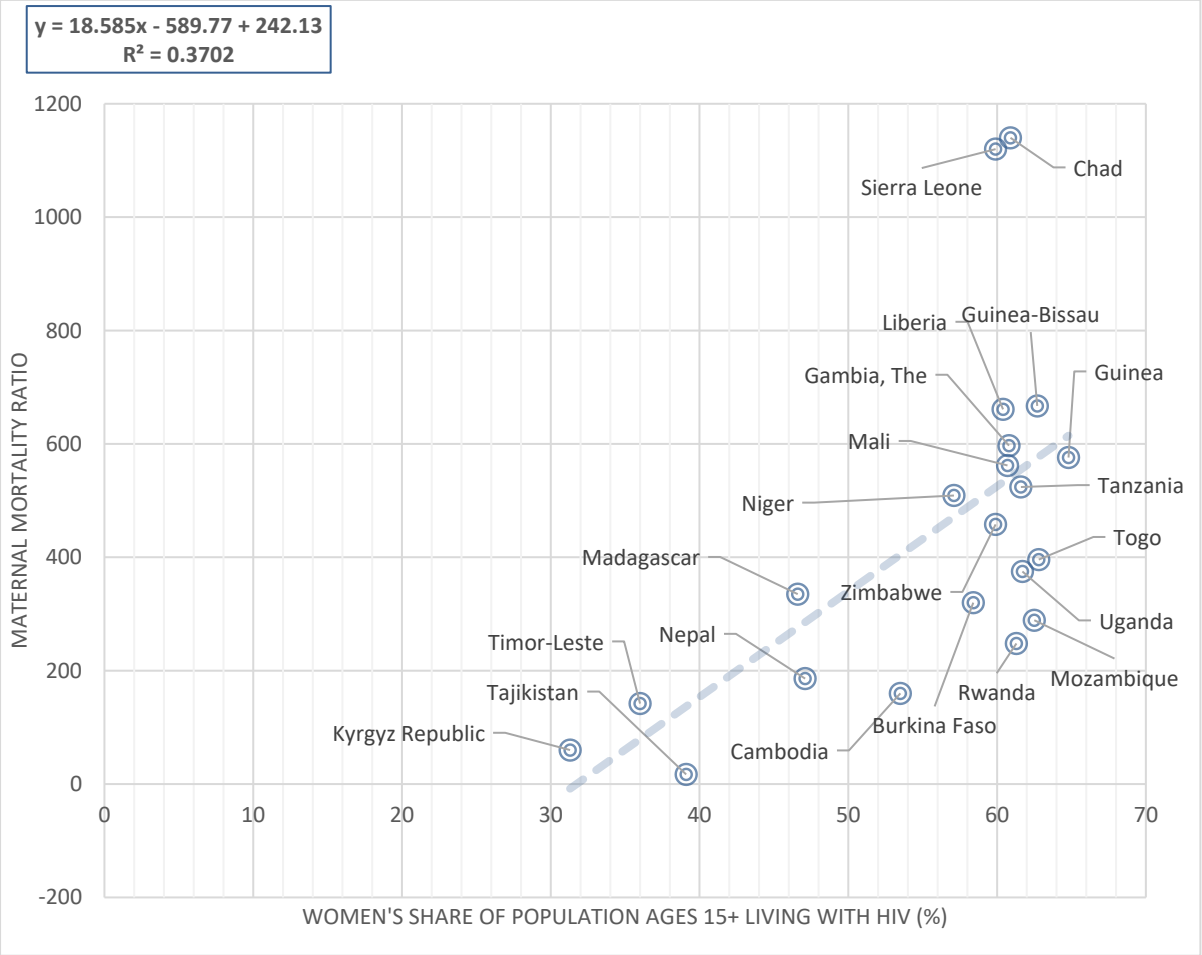
4.2.5. MMR and adolescent fertility rate – 2017



Adolescent fertility rate (births per 1,000 women ages 15-19) also shows a positive correlation with MMR among the selected countries. For Zimbabwe, it stood at 86.14 in 2017. With the R-square 0.381 in 2017, it seems to suggest that the effects of adolescent fertility on MMR are significant. Sierra Leone and Chad are clear outliers with very high MMR and adolescent fertility.

The regression model equation for this graph is $\Upsilon = (4.0655)x + 31.173 + 240.05$. In this case, the coefficient (β_1) of X is (4.0655), the constant (β_0) is 31.173 and the standard error (ε) is 240.05. This equation suggests that as adolescent fertility rate increases, so does MMR. The equation reiterates the positive correlation between the two variables in question as already suggested in the graph above.

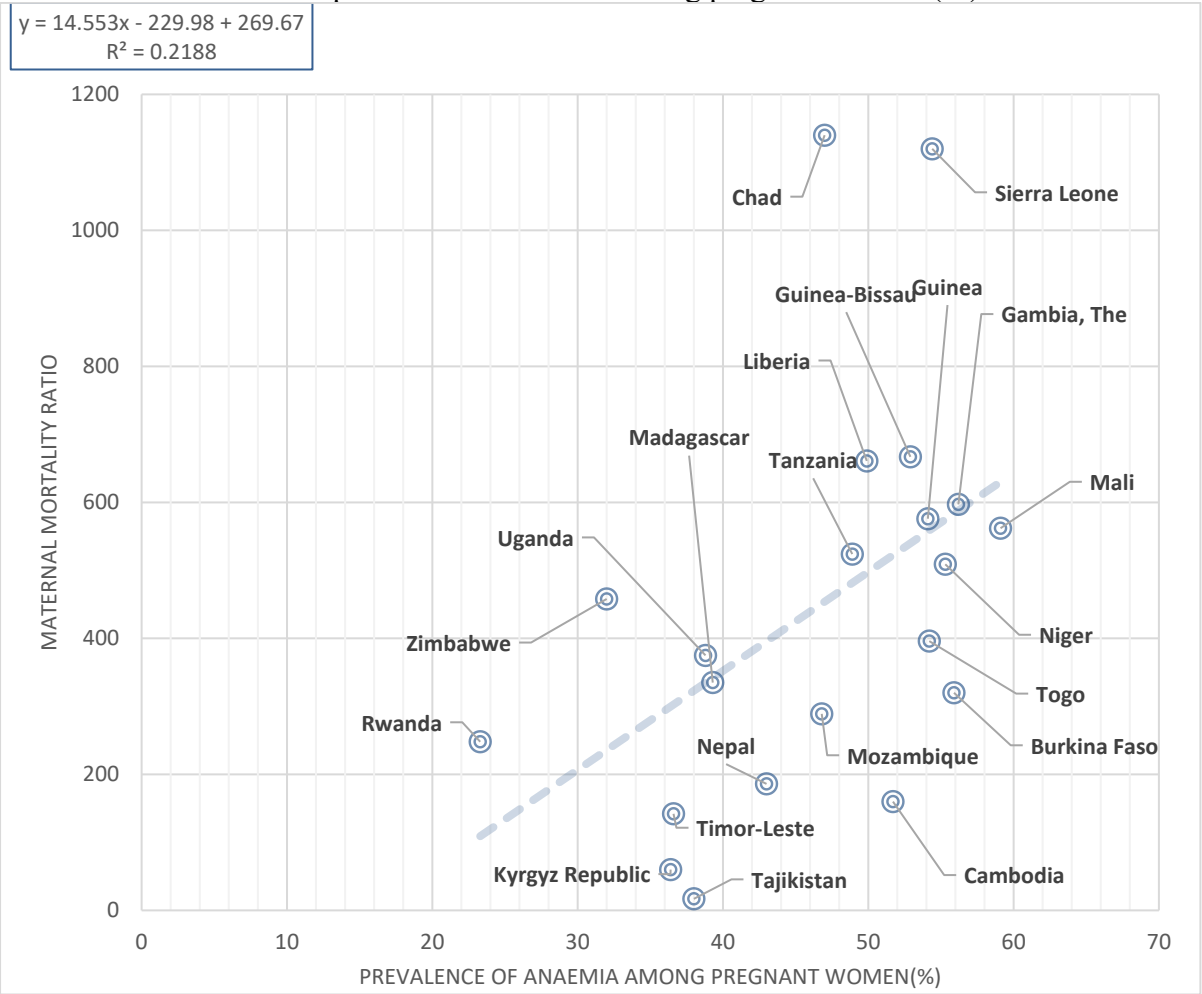
4.2.6 MMR and women's share of population aged 15+ living with HIV – 2017



Prevalence of HIV among women (women's share of population living with HIV aged 15years and above) is another factor that shows a positive correlation with MMR. For Zimbabwe, prevalence of HIV among women aged 15years and above was at 59.9% in 2017. The R-square for the factor was at 0.370 in 2017, it seems to suggest that prevalence of HIV among women is equally significant.

The regression model equation for this graph is $\Upsilon = (18.585)x + (-589.77) + 242.13$. In this case, the coefficient (β_1) of X is (18.585), the constant (β_0) is –589.77 and the standard error (ε) is 242.13. This equation suggests that as the women's share of the population above 15year living with HIV increases, so does MMR. This position supports the positive correlation already was established in the graph above.

4.2.7. MMR and prevalence of anemia among pregnant women (%) – 2017



Prevalence of anemia among women of reproductive age (% of women ages 15-49) shows a positive correlation with MMR. For Zimbabwe it was at 32% in 2017. The R-square for the factor was at 0.219 in 2017. This seem to suggest that prevalence of anemia among women of reproductive age has been quite significant.

The regression model equation for this graph is $\Upsilon = (14.553)x + 229.98 + 269.67$. In this case, the coefficient (β_1) of X is (14.553), the constant (β_0) is 229.98 and the standard error (ε) is 269.67. This equation suggests that as anemia among pregnant women increases so does MMR. The equation reiterates the positive correlation between the two variables in question as already suggested in the graph above.

CHAPTER 5. ROBUSTNESS TEST.

To test the robustness of the data, the researcher repeated the results model (done for 2017 only) for the year 2000 and 2008. The exercise is performed on same countries using the same determinants. The idea is to understand the behavior of MMR when tested against the very same factors but in different years. For each variable, a graph is drawn to show the correlation that particular determinant has on MMR for 2000 and for 2008. In the graphs, (see Appendix) MMR, which is the dependent variable, is on the y-axis while each factor is on the x-axis. A summary of the results is captured in table 5.1 below.

Table 5. 1 R-square for the 7 independent variables (2000 and 2008)

R-Square for the 7 Independent Variables (2000 And 2008)		
INDEPENDENT VARIABLES	**R-Square (2000)**	**R-Square (2008)**
GDP (current US$)	0.0336	0.0042
GDP per capita (current US$)	0.0276	0.0184
Current Health Expenditure Per capita (current US$)	0.0501	0.0028
Total Fertility Rate (Births Per Woman)	0.2720	0.2959
Adolescent Fertility	0.1933	0.4179
Women's Share of Population Ages 15+ Living with HIV (%)	0.2311	0.3144
Prevalence Of Anaemia Among Pregnant Women (%)	0.0786	0.2230

Results of the robustness test shows a trend similar to that of 2017 among the selected countries. Sierra Leone and Chad continue to show up as outliers in basically all the variables. In 2000 and 2008, average MMR for low-income countries was 924 and 661 respectively. And for Zimbabwe, MMR was at 579 in 2000 and 657 in 2008.

Among the group of three variables that have a negative correlation with MMR in 2017, – GDP and GDP per capita show a similar correlation with MMR in 2000 and 2008. However, current health expenditure shows a positive correlation in 2000 before showing a negative correlation in 2008. The trend among selected countries in respect of these variables shows a slight increase in their respective effects to MMR. But the overall R-squares of the same variables show that they are less significant in all the years in question (2000; 2008 and in 2017).

Again, just like the results in the case of 2017, a group of four variables MMR – total fertility rate; adolescent fertility; prevalence of HIV among women above 15years and prevalence of anemia among pregnant women – all show a positive correlation with MMR. The trend among selected countries in respect of these variables show an increase in their respective effects to MMR between 2000 and 2008. The respective R-squares of the variables were less significant in 2000 but all became quite significant in 2008.

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This paper presents a cross-country comparative study of the trends of maternal mortality among low-income countries. Average MMR for lower-middle, upper-middle and high in-come countries are also captured to give a global context of the study. On the basis of the classification given by the GDI (2015), the researcher selected 21 countries that had a GDP comparable to Zimbabwe which is the country of interest in this research. In the process, the paper examines the correlation between MMR and the selected seven determinants affecting the same.

And the findings separate the variables into two sets in which the first group captures three factors with a negative correlation with maternal mortality. And factors these include GDP; GDP per capita and current health expenditure. The R-Square of these three variables show that they generally have less effect on MMR. The second group consists of four factors showing a positive correlation with MMR and these include total fertility rate, adolescent fertility, prevalence of HIV among women above 15years and prevalence of anemia among pregnant women. As previously captured in other researches, the second group of variables is associated with high rates of maternal mortality. And indeed, the R-Square of these four factors show quite a significant effect on MMR.

While this it remained difficult to make a conclusive observation in terms of the impact that the selected variables have on MMR, the association between the independent variables within this study and MMR have been clearly established. To cover this gap, further research into maternal mortality in low-income countries is needed. The high rates of MMR among poor countries viewed against the low rates of the same in developed countries is a sufficient call for more research into the challenge of maternal mortality.

6.2 Recommendations

There are a number of recommendations towards reducing maternal mortality among low-income countries like Zimbabwe which can be derived from this research. While other recommendations could generally relate to the economic, social and medical matters, this paper focuses more on those specific recommendations that have been established by this research.

The research paper showed that that GDP and GDP per capita have a relationship with MMR. These three are predominantly economic variable. This therefore implies that have to improve the general economy of their respective countries and regions in order to reduce MMR. Another perspective, as suggested by Nyoni and Bonga (2017) is that improving maternal mortality will also improve the economy of developing countries. Closely related is the need not only to reform the heath sectors in low-income countries but also to significantly increase health expenditure as well.

Perhaps one of the most effective ways of addressing maternal challenges associated with high fertility rate, adolescent fertility, HIV among women of reproductive ages, anemia among pregnant women and other related problems is through raising awareness on the risks inherent to the same. In other words, it is very crucial for both women and men to know the extent of maternal risks directly linked to high fertility, adolescent fertility and the prevalence of other illnesses among pregnant women. Therefore, developing countries like Zimbabwe should conduct mass information and education on these issues by all means necessary.

It is also imperative to improve women's agency as this will empower women to make decision about access to health care including reproductive health services for family planning. The idea is that women's agency improves women's ability and capacity to make decisions that protects their wellbeing including the number of children they want to have as well as the time to visit health care facilities for regular check-ups especially for pregnant women among others.

The study has established the relationship between GDP per capita and MMR. The argument is that pregnant women often struggle to meet the financial costs inherent to maternal health services. In low-income countries where GDP per capita is also low, it is advisable for governments and other stakeholders to ensure that pregnant women are cushioned from expenses relating to maternal health care. This can be done through subsidies and scrapping of all forms of user-fees for pregnant women in public health institutions for instance. Creation of waiting homes for pregnant women may also cut on transport cost for example.

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국문 초록

저소득 국가의 산모 사망률의 최근 동향: 짐바브웨의 사례 연구

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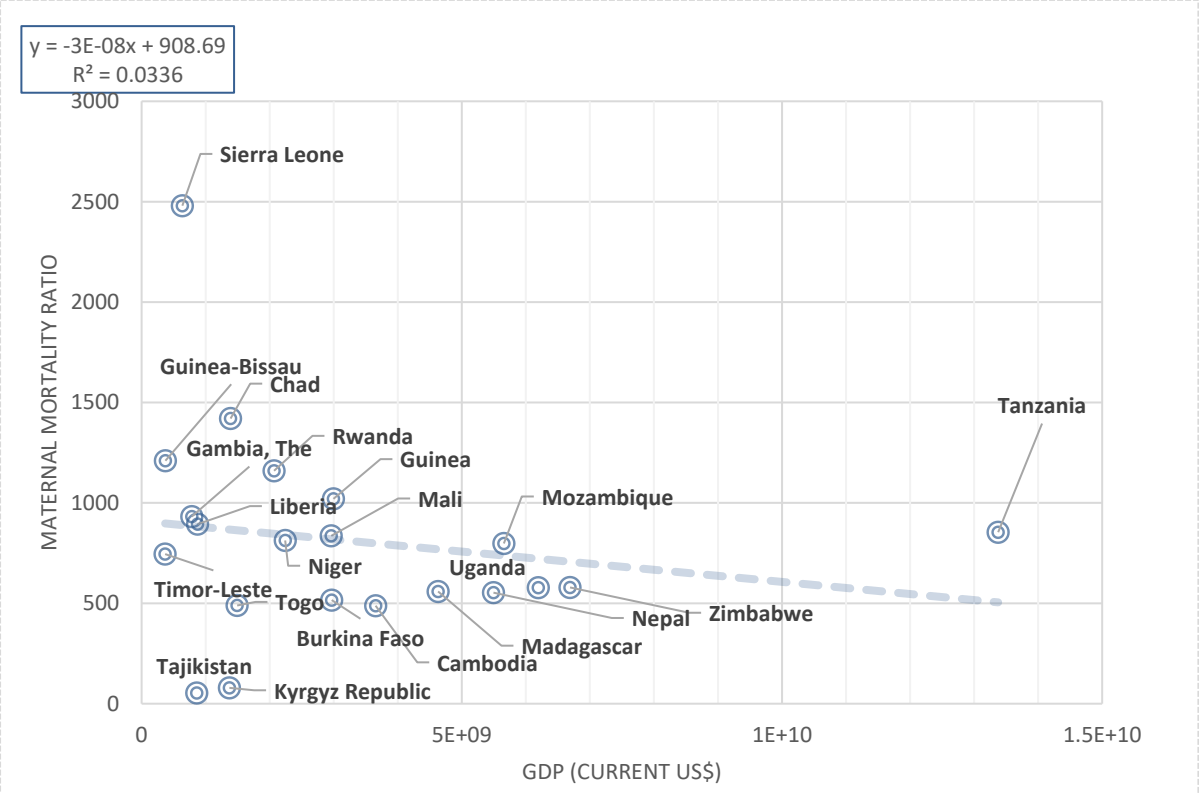
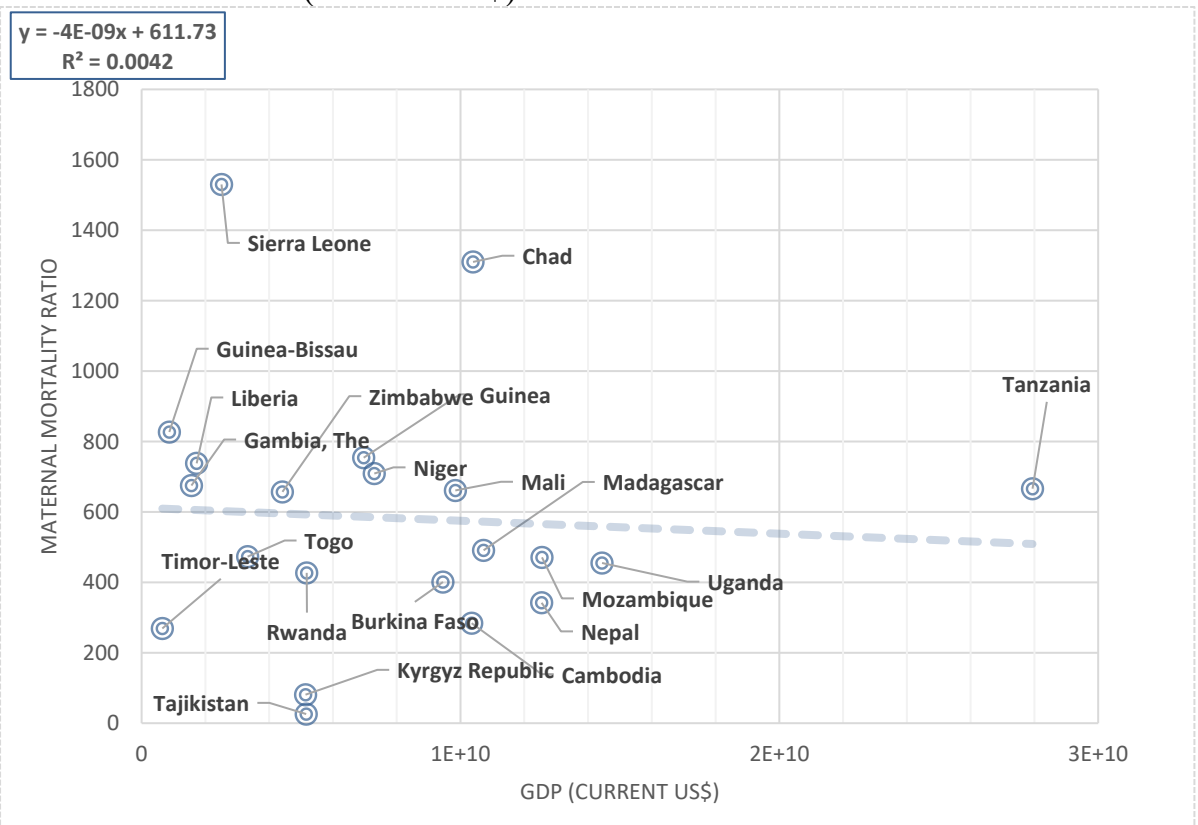
이 논문은 짐바브웨를 초점으로 저소득 국가의 산모 사망률 동향에 대한 조사이다. 저소득 국가의 산모 사망률에 영향을 미치는 7가지 요인을 조사하여 각 변수의 의미를 파악하는 데에 초점을 두었다. 조사된 7가지 요소는 총 출산율, 청소년 출산율, 15세 이상 여성의 HIV 유병률, 임산부의 빈혈 유병률, 1인당 현재 의료비, 1인당 국내총생산 (GDP) 및 국내총생산 (GDP)으로 구성되어 있다. 본 연구는 17년 (2000~2017) 동안 21개의 저소득 국가에서 각 변수에 대한 행동을 조사한 것이다. 21개 국가는 논문의 초점인 짐바브웨와 상대적으로 유사한 GDP를 가진 국가 기준으로 선정했다. 결과적으로 크게 두 개의 그룹으로 나뉘어진다. 첫 번째 그룹은 산모 사망률과 양의 상관관계를 보이고 두 번째 그룹은 산모 사망률과 음의 상관관계를 보인다. 본 연구는 개발도상국의 정책 입안자들이 산모 사망률에 영향을 미치는 특정 요인들과 각 요인들의 중요성을 이해하는 데에 도움이 될 것으로 본다.

APPENDIX

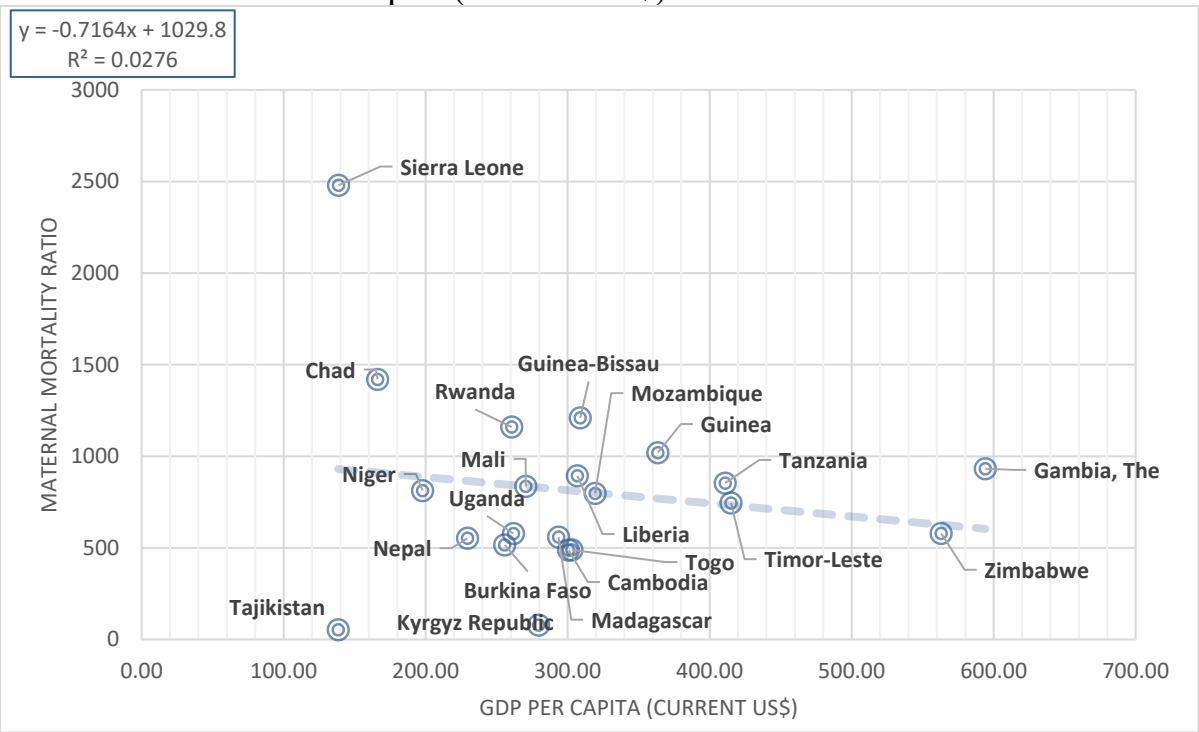
1 - MMR and GDP (Current US$) – 2000



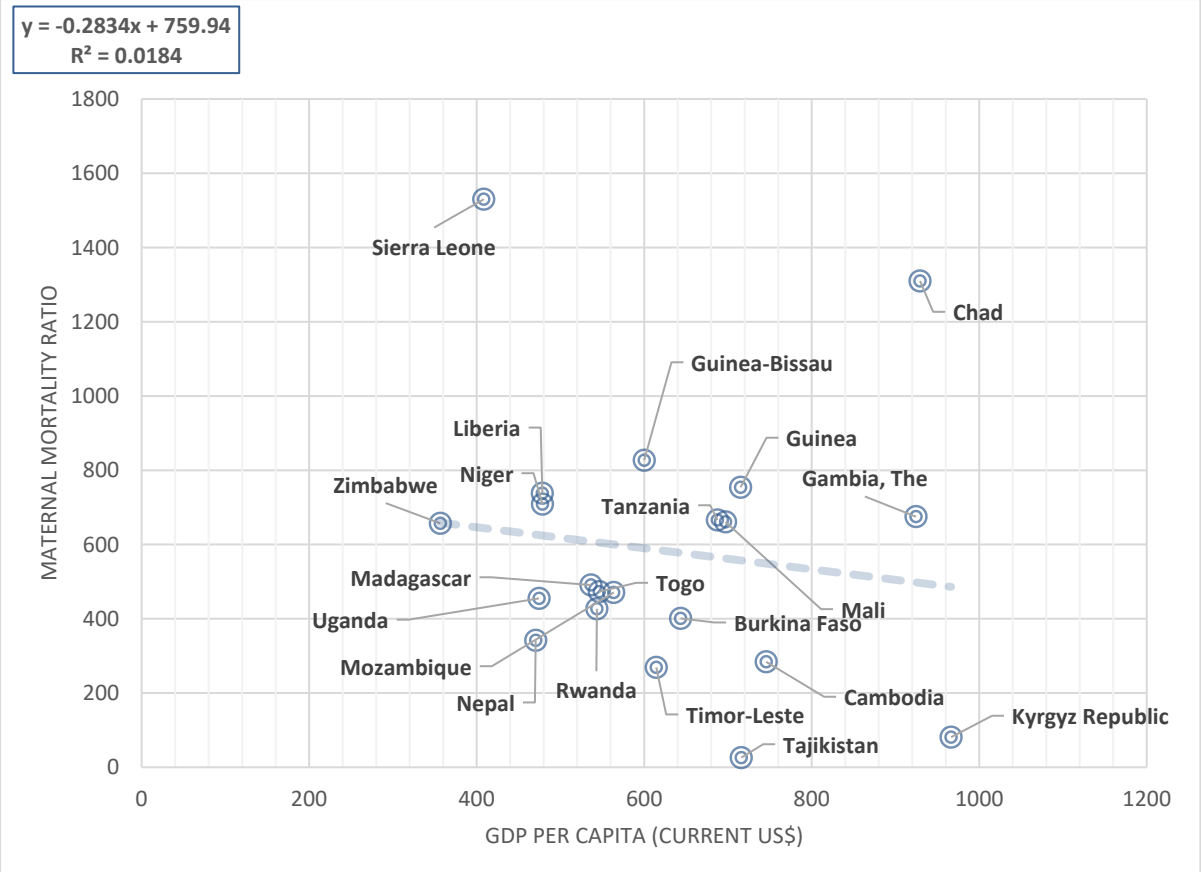
2 – MMR and GDP (Current US$) – 2008



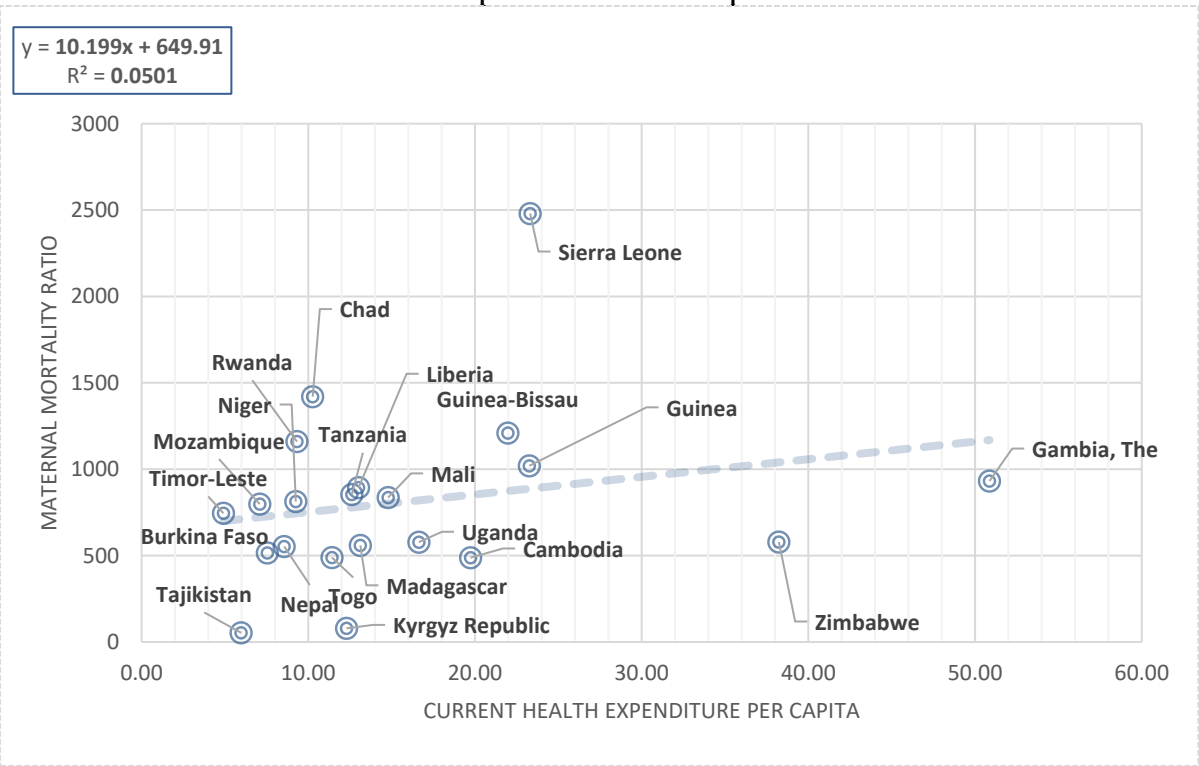
3- MMR and GDP Per Capita (Current US$) – 2000



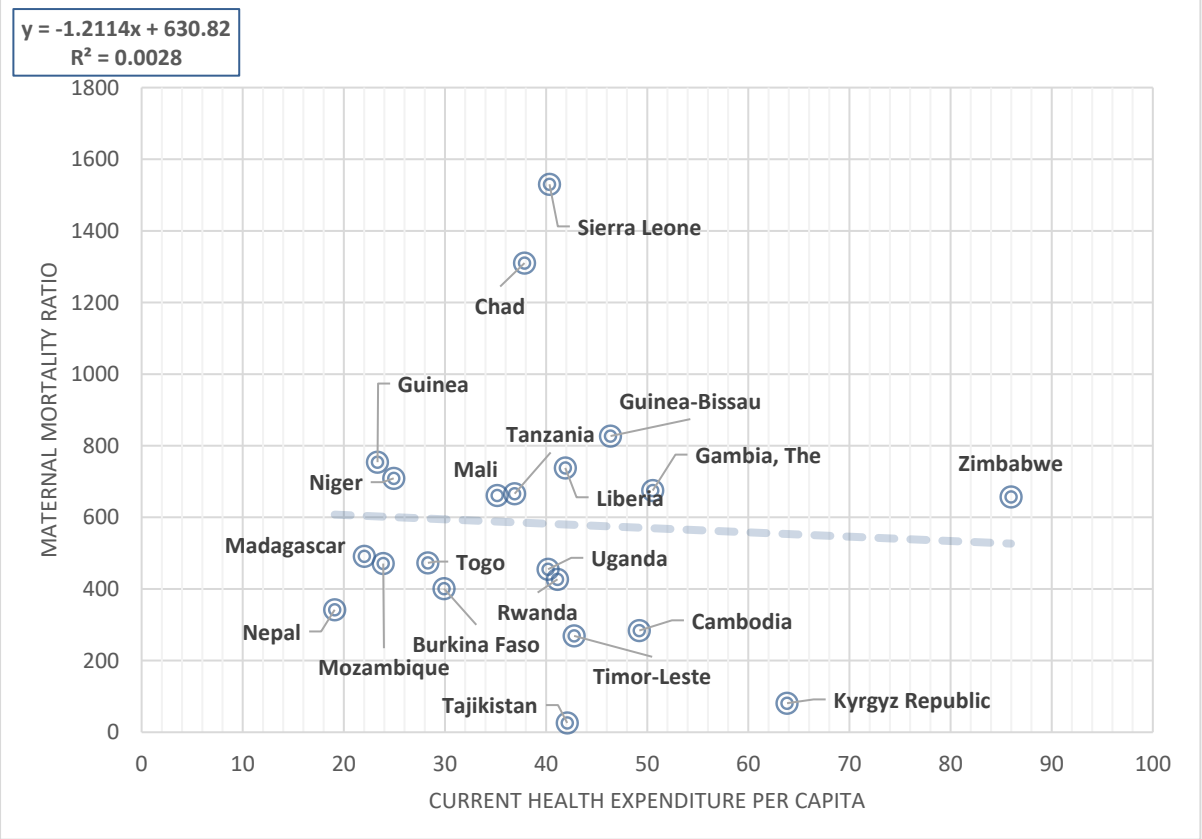
4- MMR and GDP Per Capita (Current US$) – 2008



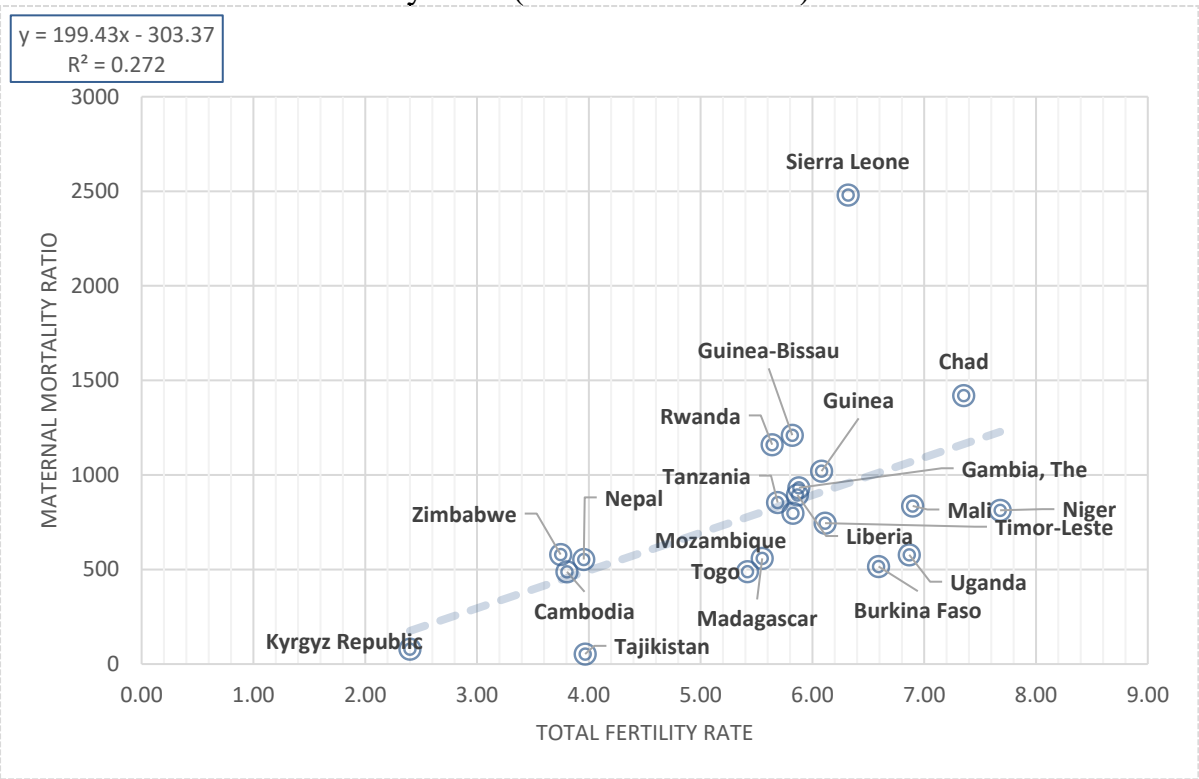
5- MMR and Current Health Expenditure Per Capita – 2000



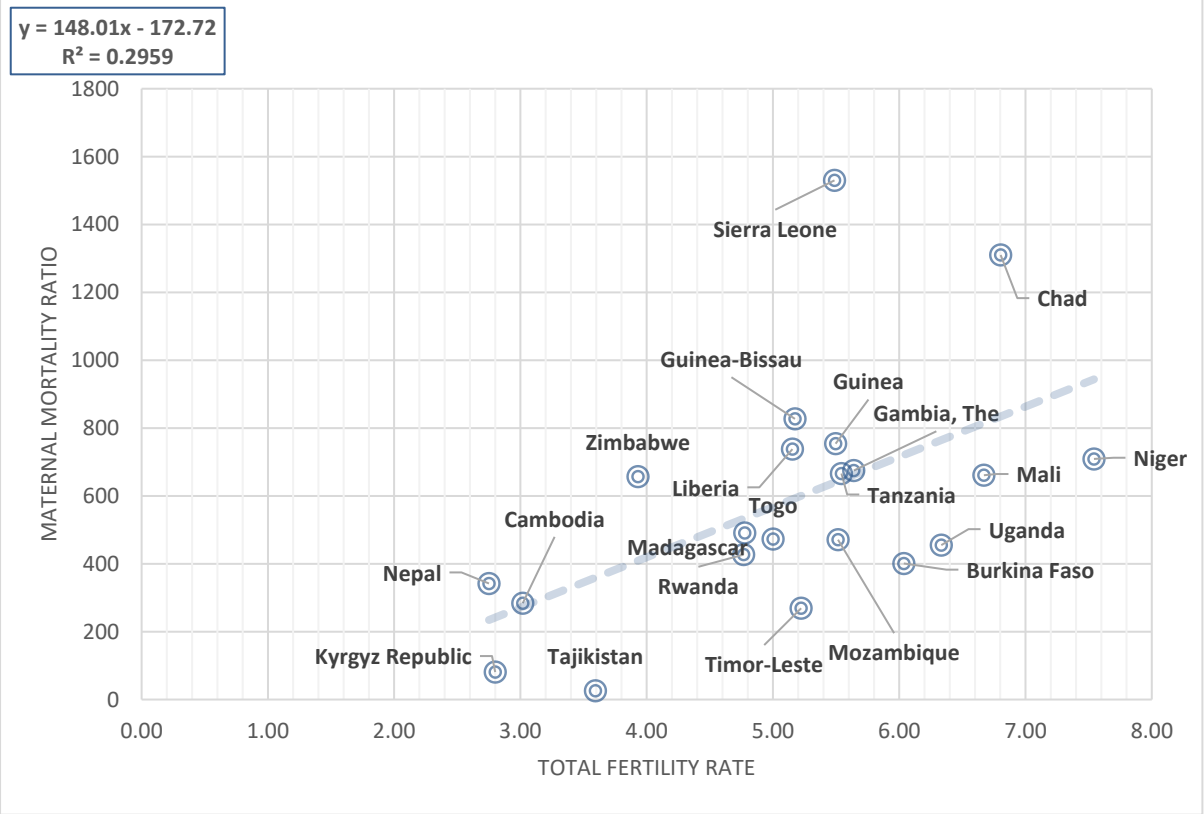
6–MMR and Current Health Expenditure Per Capita – 2008



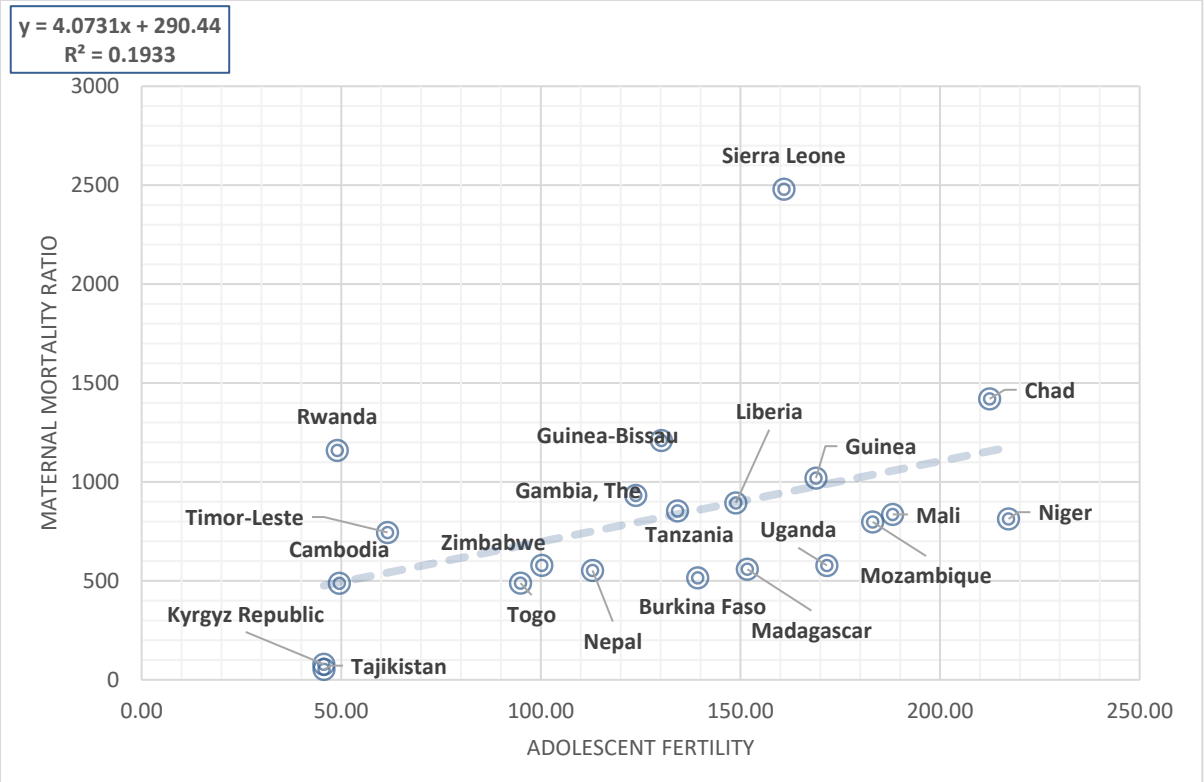
7 – MMR and Total Fertility Rate (Births Per Woman) 2000



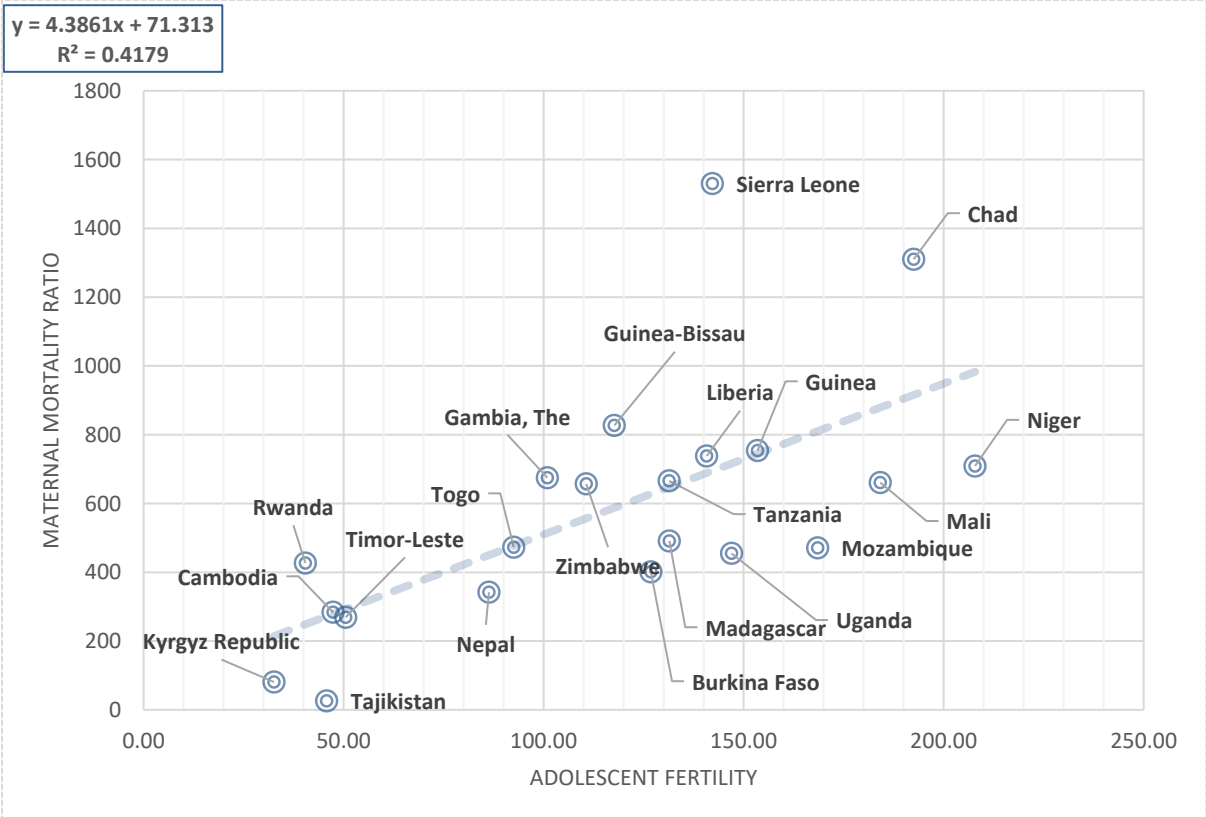
8 – MMR and Total Fertility Rate (Births Per Woman) 2008



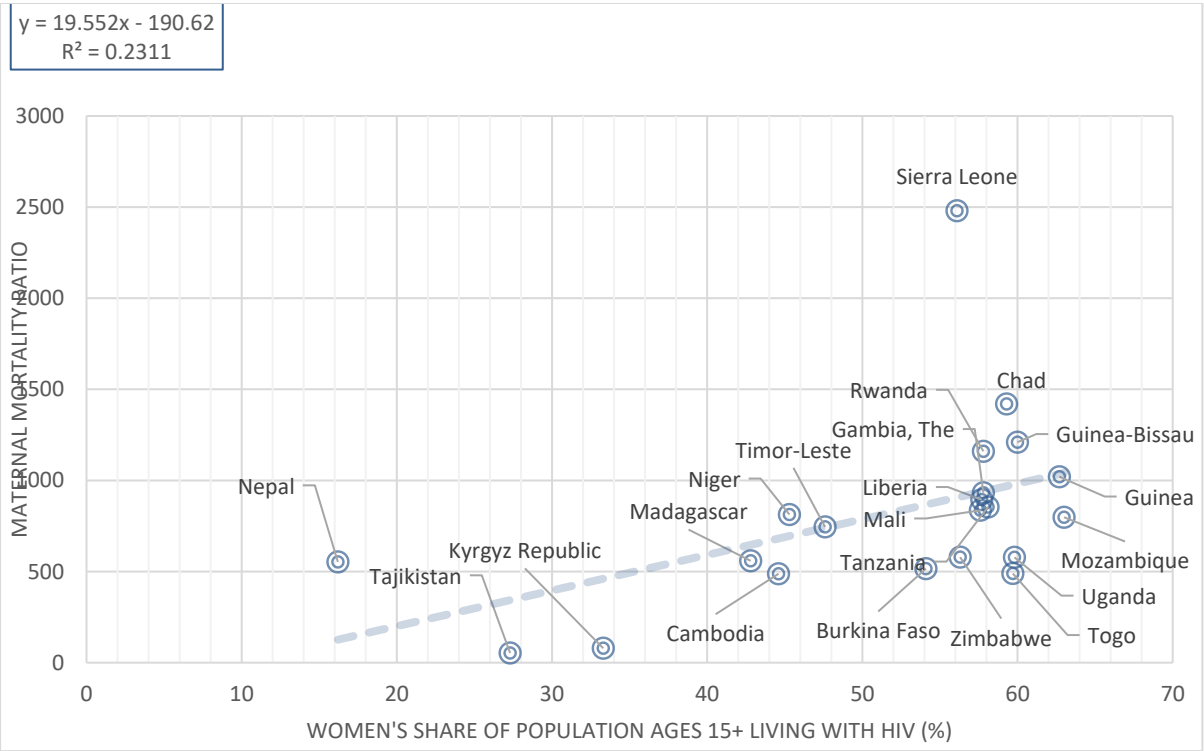
9 – MMR and adolescent Fertility Rate 2000



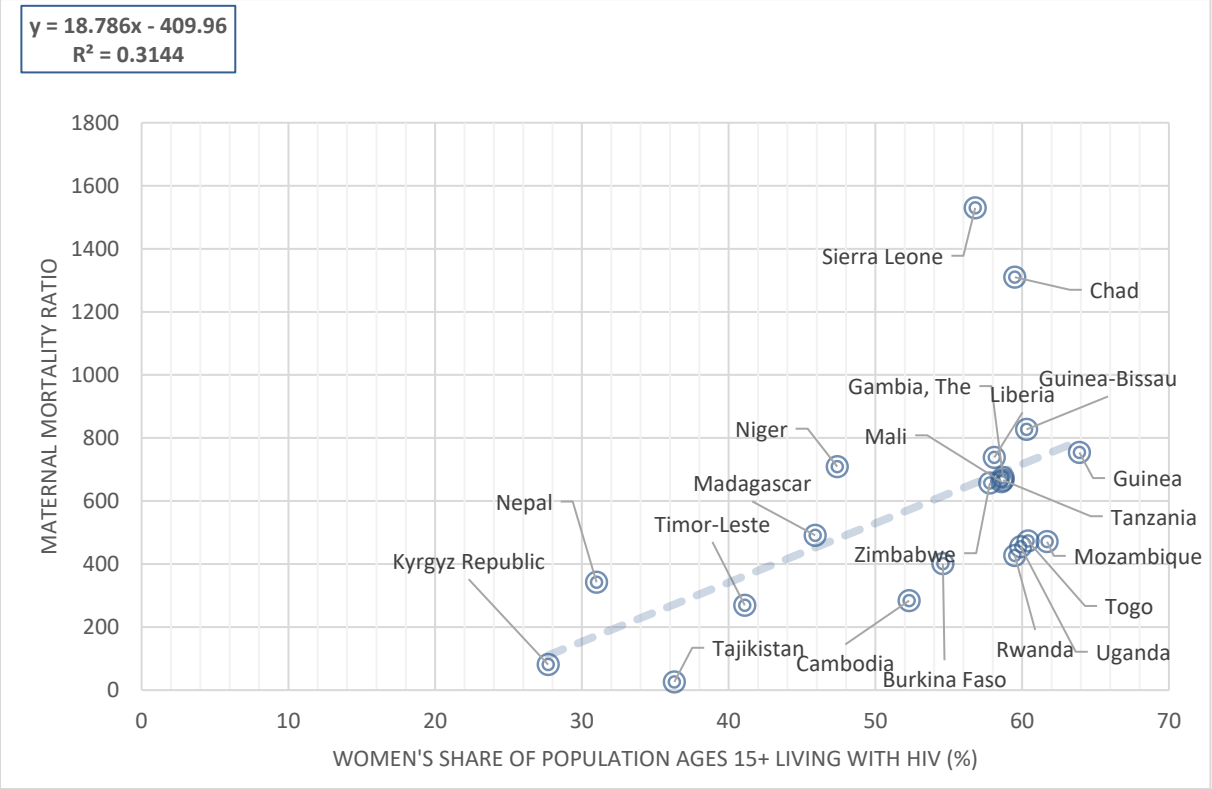
10 – MMR and adolescent Fertility Rate 2008



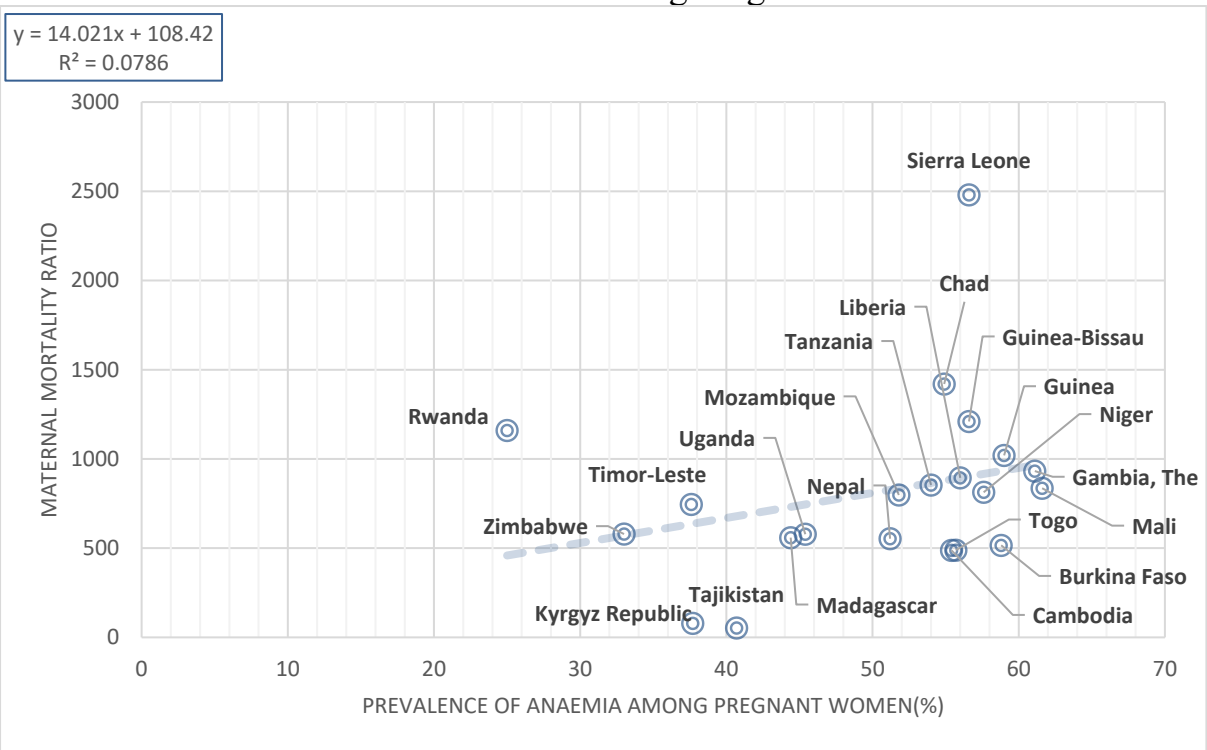
11 – MMR and Women's Share of the Population Aged 15 and Above Living with HIV – 2000



12 – MMR and Women's Share of the Population Aged 15 and Above Living with HIV – 2008.



13 – MMR and Prevalence of Anemia Among Pregnant Women – 2000.



14 – MMR and Prevalence of Anemia Among Pregnant Women – 2008.