AN INVESTIGATION OF SOCIO-ECONOMIC ANTECEDENTS OF HEALTH OUTCOMES IN MALAWI

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It all starts here ™

NORTH-WEST UNIVERSITY
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DECLARATION

I declare that

An investigation of socio-economic antecedents of health outcomes in Malawi

is my own work and that all the resources used or quoted have been duly acknowledged by means of complete references and that I have not previously, in its entirety, or in part, submitted it for obtaining any qualification at any university.

_____

SANDERSON SABIE KUYELI

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I give praise and honour to the Lord my God for this unprecedented journey. Your endless mercy, grace and love have kept me going and thus far, it has all been thanks to you Lord. You have made me see beyond my eyes, made my faith grow and have made my life a living testimony.

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ABSTRACT

The study investigated the socio-economic antecedents of the health outcomes in Malawi from a district level perspective. There is a gap emerging from the analysis of the key social economic factors determining health outcomes. This is mainly towards systematic linkages between the socio-economic factors and health outcomes. Therefore, there is a need to analyse practically the specific socio-economic factors on their level and nature of interaction with the ultimate health outcomes like the maternal mortality rate (MMR), infant mortality rates (IMR), under-five mortality rates and disease burden.

Considering that the country is divided into 28 districts, which have unique socio-economic features, the study considered the health outcomes trend at the district level. The underlining basis is that these health outcomes are being determined and shaped by the district socio-economic factor levels. General correlations, descriptive statistics and regression analyses were conducted and used in order to establish the nature of the relationship and effects on how the socio-economic factors at district level are shaping health outcomes, specifically in the context of maternal and childhood mortality as well as disease burden outcomes.

In investigating the socio-economic factors of education, population, poverty, employment and food security on health outcomes, the study had a number of specific objectives, both theoretical and empirical. The theoretical objectives of the study were to review the literature on health from both its determinants and their models' premises. The study has established from the literature review that socio-economic factors continue to impact the health outcomes across the globe. The role of social determinants of health (SDH) in improving the health outcomes cannot be overemphasised. In analysing the trends on health outcomes across the globe, both developed and developing countries, with special attention to the sub-Saharan region in which Malawi belongs, countries with low income, high population growth rate, high poverty levels and low literacy rates have continued to experience high burden of diseases and mortality rates. This is despite declining trends in the past decade where most of these countries have achieved slow or minimum progress.

The study considered the SDH, both in literature and implications on health systems by isolating the linkages between the critical SDH and health outcomes. In considering the limitations of the SDH, especially the differences that arise from location, level of analysis and the ever-changing environments, the study specifically focused on the district level analysis by employing a district random effect model (DREM) to establish the nature and level of impact, pathways and the socio-economic intermediaries (referred to in the study as socio-economic antecedents), on the relationship between the SDH at the district level.

The study used data from the routine studies that are conducted by the national statistical office in Malawi. These are primarily the welfare monitoring surveys from 2005 to 2011 and IHS2 and IHS3, which mainly provided the socio-economic variables. The main socio-economic variables used in the study included employment levels, education, literacy, maize output, population growth and poverty levels. Health management information system of the Ministry of Health and the demographic and health surveys informed the study on the health outcomes. The main health outcomes analysed included maternal mortality rate, infant mortality rate, malaria mortality rates disaggregated for the under-five and all ages groups, the disease burden mainly malaria and tuberculosis prevalence rates. All these outcomes measured at district level.

The results of the study have demonstrated that the distribution of social-economic factors of education, population, income levels have a random effect on the health outcomes across the country based on the district level analysis. The use of the DREM was chosen on the basis that district level data provide a more comprehensive base in terms of level and distribution of both health outcomes and socio-economic factors. The results have shown that some health outcomes, for example maternal and infant mortality rates, as well as malaria mortality in the districts can improve significantly by investing in education. This is mainly through reduction of primary school dropout rates. These health outcomes can also be improved significantly by improving general literacy levels, increased employment in the agriculture sector, as well as reduced household dependency ratio. The results have also shown that improved female literacy, primary school enrolment, general literacy rates significantly contribute to the reduced burden of diseases. However, their nature of interaction differs when considering disease caused mortality and

prevalence rates. For example, higher education attainment level contributes significantly to the reduction of malaria caused mortality and not on the malaria prevalence rate. The results have demonstrated that the district level model in improving health outcomes would bring more meaningful results considering that the country is implementing a decentralisation programme. This further implies that despite the investigated socio-economic factors being outside the realm of the health sector, these factors have had and will continue to shape both individual and population health.

A number of policy interventions have been suggested from the results of the study, in a bid to improve the health outcomes of the country. These include: enhancement of the district level leadership, strengthening the role of organisation and private companies, strengthening the role of the district health committees in the running of health services, deliberate broadening of economic activities within districts, and strengthening malaria monitoring in light of improving food security for example expansion of irrigation activities. The special contribution of the study is the significance of adopting and adapting the approach in implementing interventions. This implies that some districts' health outcomes can significantly be improved by having the initiatives toward or within the district adapted based on the key socio-economic factors in the districts. The study has therefore provided insights towards a scientific framework in improving the health outcomes amidst limited resources developing countries may face. It further calls for more district-adapted initiatives (micro-based) towards improving health outcomes as opposed to national wide (macro) mode of interventions.

Keywords: health outcomes, health determinants, poverty, employment, food security, education, antecedents, Malawi, district, disease burden, mortality

TABLE OF CONTENTS ..... **iv**
DECLARATION ..... **i**
ACKNOWLEDGEMENTS ..... **ii**
ABSTRACT ..... **iii**
LIST OF FIGURES ..... **xi**
LIST OF TABLES ..... **xiv**
LIST OF ABBREVIATIONS ..... **xvi**
CHAPTER 1 ..... **1**
INTRODUCTION AND BACKGROUND **1**
1.1 INTRODUCTION 1
1.2 PROBLEM STATEMENT 3
1.3 MALAWI - A BRIEF BACKGROUND 5
1.4 OBJECTIVES OF THE STUDY 7
1.4.1 Primary objective 7
1.4.2 Theoretical objectives 7
1.4.3 Empirical objectives 8
1.5 RESEARCH DESIGN AND METHODOLOGY 8
1.5.1 Literature Review 8
1.5.2 Empirical Study 9
1.5.2.1 General sample method from the data sources 9
1.6 STATISTICAL ANALYSIS 10
1.6.1 Empirical analysis and model 10
1.7 ETHICAL CONSIDERATIONS 10
1.8 CHAPTER CLASSIFICATION 11
CHAPTER 2 ..... **13**
THEORETICAL AND EMPIRICAL LITERATURE REVIEW **13**
2.1 INTRODUCTION 13
2.2 UNDERSTANDING HEALTH 13
2.3 DETERMINANTS OF HEALTH 18
2.3.1 Understanding the health determinants 20
2.4 MEASURING HEALTH OUTCOMES 25
2.4.1 Disease burden as a measure of health 26

2.4.2 Mortality measurement of health 27
2.5 HEALTH AT THE GLOBAL LEVEL 31
2.5.1 The global burden of diseases trends..... 33
2.5.2 Maternal and childhood mortality rates..... 36
2.6 HEALTH OUTCOMES IN DEVELOPED AND DEVELOPING..... 39
COUNTRIES..... 39
2.6.1 Disease burden in developed and developing countries 39
2.6.2 Maternal and childhood mortality in developed and developing countries... 42
2.7 CONCLUSION..... 48
CHAPTER 3..... 52
THE SOCIAL DETERMINANTS OF HEALTH..... 52
3.1 INTRODUCTION..... 52
3.2 SOCIAL DETERMINANTS OF HEALTH MODELS..... 53
3.3 MAJOR SOCIAL DETERMINANTS AND THEIR LINKAGES TO..... 61
HEALTH: MECHANISMS AND EMPIRICAL DISCOURSE..... 61
3.3.1 Poverty and health..... 64
3.3.1.1 Understanding poverty 65
3.3.1.2 The known linkages and empirical evidences..... 67
3.3.2 Education and literacy 70
3.3.2.1 Key linkages between education and health 71
3.3.3 Employment and health..... 74
3.4 CONCLUSION..... 77
CHAPTER 4..... 80
MALAWI COUNTRY: DEMOGRAPHICS AND SOCIAL ECONOMIC CHARACTERISTICS..... 80
4.1 COUNTRY PROFILE 80
4.2 ECONOMIC ACTIVITIES 83
4.3 POPULATION AND DEMOGRAPHIC TRENDS 86
4.4 POVERTY IN MALAWI..... 89
4.5 EDUCATION AND LITERACY IN MALAWI..... 92
4.6 AGRICULTURE AND FOOD SECURITY..... 98

4.7 EMPLOYMENT IN MALAWI 100
4.8 HEALTH SECTOR, OUTCOMES AND TRENDS IN MALAWI 102
4.8.1 Health outcomes in Malawi – childhood mortality 102
4.8.2 Maternal mortality 104
4.8.3 Disease burden: morbidity and prevalence 106
4.8.3.1 Malaria and tuberculosis 107
4.8.4 Health care system in Malawi 112
4.8.4.1 Health finance and investments 115
4.9 SOCIAL DETERMINANTS OF HEALTH IN MALAWI 116
4.10 CONCLUSION 117
CHAPTER 5 121
RESEARCH DESIGN AND METHODOLOGY 121
5.1 INTRODUCTION 121
5.2 EXPLAINING THE DATA SOURCES AND THE INDEPENDENT VARIABLES 121
5.3 SOURCE AND METHODOLOGIES IN MEASURING DEPENDENT VARIABLES (HEALTH OUTCOMES) 123
5.3.1 Maternal mortality 123
5.3.2 Measurement of Infant Mortality Rate (IMR) 124
5.3.3 Measurement of disease burden 124
5.4 Model specification 125
5.4.1 Model specification for the District Level Analysis 128
5.5 THE MODEL DIAGNOSTIC TESTS 129
5.5.1 The Hausman test 129
5.5.2 The Breusch-Pagan Test 130
5.6 CONCLUSION 131
CHAPTER 6 134
ANALYSIS, RESULTS AND DISCUSSION 134
6.1 INTRODUCTION 134
6.2 HEALTH OUTCOMES AND SOCIO-ECONOMIC 135

ANTECEDENTS 135
6.3 MATERNAL AND INFANT MORTALITY 135
6.3.1 Introduction 135
6.3.3 Independent Sample Test for the 2005 and 2011 IMR 143
6.3.4 Independent T-test for the regional Maternal Mortality and Infant Mortality Ratio variances 145
6.3.5 Relationship between District MMRate, IMR with socio-economic factors 147
6.3.6 Regression analysis 151
6.3.6.1 The use of Hausman Test 151
6.3.6.2 The use of Breusch-Pagan Test 153
6.4 DISEASE BURDEN: MALARIA MORTALITY 163
6.4.1 Introduction 163
6.4.2 General descriptives on Malaria Mortality Rates in Malawi 2005-2011 163
6.4.3 Independent T-test for the malaria mortality rate variances 170
6.4.4 Socio-economic factors associated with malaria mortality rates 172
6.4.5 Regression analysis 175
6.4.5.1 Hausman Test 176
6.4.5.2 Breusch-Pagan Test for malaria mortality rate Model 177
6.5 DISEASE PREVALENCE 183
6.5.1 Introduction 183
6.5.2 General descriptive analysis on malaria and TB prevalence rates 183
6.5.3 Independent T-test for the Malaria, TB Prevalence rate variances 189
6.5.4 Socio-economic factors associated with malaria and TB prevalence rates 191
6.5.5 Regression analysis 193
6.5.5.1 Hausman Test 194
6.5.5.2 Breusch-Pagan Test for Malaria and TB prevalence rate Model 195
6.6 CONCLUSION 202

CHAPTER 7 204
CONCLUSION ON THE SOCIO-ECONOMIC ANTECEDENTS OF HEALTH OUTCOMES IN MALAWI 204
7.1 INTRODUCTION 204
7.2 THEORETICAL AND EMPIRICAL UNDERPINNINGS OF THE STUDY . 205
7.3 GLOBAL HEALTH TRENDS AND SOCIO-ECONOMIC DETERMINANTS 207
7.4 MALAWI PROFILE AND ITS SOCIO-ECONOMIC..... 208
CHARACTERISTICS 208
7.5 METHODOLOGY 211
7.6 THE SOCIO-ECONOMIC ANTECEDENTS OF HEALTH OUTCOMES IN MALAWI: RESULTS SUMMARY..... 212
7.7.1 Education and literacy 212
7.7.2 Employment level and health outcomes 214
7.7.3 Population growth and health 214
7.7.4 Food security and health 215
7.8 CONCLUSION OF THE STUDY 216
7.9 POLICY IMPLICATIONS FROM THE STUDY 219
7.9.1 Enhancement of district based interventions: adopt and adapt approach . 219
7.9.2 Enhancement of the district level leadership 220
7.9.3 Strengthening the role of the private sector at district level 221
7.9.4 Strengthening the role of the District Health Committees in monitoring the health services..... 223
7.9.5 Deliberate broadening of economic activities within the districts 224
7.10 LIMITATIONS OF THE STUDY..... 225
7.11 AREAS FOR FURTHER STUDY..... 225
REFERENCES..... 226
APPENDICES..... 248

LIST OF FIGURES

Figure 2.1: Determinants of health: factor interaction model 21
Figure 2.2: The main determinants of health 22
Figure 2.3: Health as a tetrahedron model 24
Figure 2.4: Health related Millennium Development Goals 32
Figure 2.5: Disability Adjusted Life Years (DALY) Rates by WHO and World Bank Income group (2000 and 2012). 33
Figure 2.6: Global leading causes of deaths 35
Figure 2.7: Global Maternal Mortality Trends 36
Figure 2.8: Under-five Global mortality rates 37
Figure 2.9: Top Ten causes of death in the low-income countries 40
Figure 2.10: Top Ten causes of death in the low-income countries 41
Figure 2.11: Maternal Mortality Trends in the Developed Region 43
Figure 2.12: Maternal Mortality Trends in Developing Countries 44
Figure 2.13: Under Five Mortality Trends in the Developed Countries 46
Figure 2.14: Under Five Mortality Trends in the Developing Countries 47
Figure 3.1: Social determinants of health 55
Figure 3.2 WHO model of social determinants of health 56
Figure 3.3: Globalisation and Health: basic framework 58
Figure 3.4: Life cycle of an educated girl 71
Figure 4.1: Malawi Map 80
Figure 4.2: Administrative division of the country 81
Figure 4.3: Malawi's 2012 GDP by Sector (percentage) 83
Figure 4.4: Malawi's Real GDP Growth 2004-2015 84
Figure 4.5: Population trend in Malawi (in millions) 87
Figure 4.6: Fertility rates in Malawi 88
Figure 4.7: Fertility rates by area 89
Figure 4.8: Poverty distribution between urban and rural Malawi 90
Figure 4.9: Poverty in Malawi as per regions 91
Figure 4.10: Enrolment Rate in Primary and secondary schools in Malawi 93
Figure 4.11: Primary and Secondary school Enrolment levels in Malawi 94
Figure 4.12: Dropout Rates overall and for standard 5 to 8 (2005-2014) 95

Figure 4.13: Highest qualification by regions and area 97
Figure 4.14: Food security levels by category in Malawi 98
Figure 4.15: Maize output trend in Malawi 2000-2014..... 99
Figure 4.16: Employment levels in Malawi 2005 - 2011 101
Figure 4.17: Child mortality Indicators for Malawi 1992-2014..... 103
Figure 4.18: Maternal Mortality Ratio Trends 1990 - 2015 104
Figure 4.19: Child bearing against age in Malawi..... 106
Figure 4.20: Malaria Mortality Rate (overall and U5 rates) 108
Figure 4.21: Malaria Prevalence Rate in Malawi 2005-2013 109
Figure 4.22: Malaria prevention in Malawi..... 110
Figure 4.23: Trends in tuberculosis in Malawi 111
Figure 4.24: TB prevalence (cases per 100,000 population) 2005 - 2014..... 112
Figure 6.1: MMRate/10000 reproductive age population 2011-2014 137
Figure 6.2: District IMR between 2005 and 2011 138
Figure 6.3: Maternal Mortality (per 10,000 reproductive age population) Distribution at District Level (2011-2014) 139
Figure 6.4: Infant Mortality Distribution at District Level (2005-2011)..... 140
Figure 6.5: IMR and Maternal Mortality Average Distribution at District level..... 141
Figure 6.6: MMRate regional yearly statistics (2011-2014) 142
Figure 6.7: Infant Mortality Ratio regional statistics (2005 and 2011)..... 143
Figure 6.8: Primary school dropout rates by regions 2011-2014..... 157
Figure 6.9: Reasons for primary school dropout 2011-2014 158
Figure 6.10: Districts general malaria mortality rate distribution 2005-2011..... 164
Figure 6.11: Districts Under-five malaria mortality rate distribution 2005-2011 166
Figure 6.12: Districts under-five malaria mortality rates distribution by categories 2005-2011 166
Figure 6.13: Malaria Mortality rates at regional level 2005-2011..... 167
Figure 6.14: Regional trends in under-five Malaria Mortality rate 2005-2011 168
Figure 6.15: Average malaria mortality distribution by regions and categories 2005-2011 169
Figure 6.17: Comparison on malaria morbidity rate and socio-economic factors 2005-2011 180
Figure 6.18: Regional malaria prevalence distribution 2005-2011 185
Figure 6.19: Malaria prevalence rate district distribution per category 2005-2011 . 186

Figure 6.20: Malaria categories distribution and proportion of districts 2005-2011 187
Figure 6.21: Regional TB prevalence rates 2005-2011 188
Figure 6.22: Malaria prevalence and secondary/post-secondary attainment level 2005-2011 199
Figure 7.1: Malawi social economic antecedents of health outcomes model 217
Figure 7.2: Malawi socio-economic factors/health outcomes Interactive pathways model 218

LIST OF TABLES

Table 6.1: MMRate and IMR 2011 - 2014 136
Table 6.2: Average IMR at district level for 2005 and 2011 144
Table 6.3: Independent Sample t-test for 2005 and 2011 IMR 144
Table 6.4: MMRate and IMR average regional statistics (2011-2014) 145
Table 6.5: T-test Results for the Regional Maternal Mortality and Infant Mortality Ratio (2005-2014) 146
Table 6.6: Correlations of MMRate, IMR with socio-economic factors (2005-2014) 148
Table 6.7: Results for Hausman Test 152
Table 6.8: Results of Breusch and Pagan (LM) Test on MMRate and IMR 153
Table 6.9: Regression Results Maternal Mortality Regression 155
Table 6.10: Primary school dropout means 2005-2011 159
Table 6.11: Malaria mortality rate in Malawi at district level from 2005-2011 164
Table 6.12: The regional malaria MORTALITY rate mean VARIANCES 2005-2011 170
Table 6.13: Independent T-test for the regional malaria morTALity rate variances 2005-2011 171
Table 6.14: Correlation results for Malaria Mortality rates with socio-economic factors 173
Table 6.15: Results from the Hausman Test for cross-section random effects 176
Table 6.16: Results for the Breusch and Pagan Test for malaria mortality rate model 177
Table 6.17: Regression results for the malaria mortality rate 178
Table 6.18: Independent test for the regions on socio-economic factors 181
Table 6.19: Malaria and TB incidence rates at district level 2005-2011 184
Table 6.20: Malaria and TB Incidence rates across the regions of the country 189
Table 6.21: Regional Analysis on malaria and TB incidence rates (2005-2011) 190
Table 6.22: Correlation results for malaria and TB prevalence rate and socio-economic factors 2005-2011 191
Table 6.23: Results from the Hausman Test for cross-section random effects 195
Table 6.24: Results for the Breusch and Pagan Test for malaria and TB models 196
Table 6.25: Regression Results for the malaria and TB prevalence rate 2005-2011 196

Table 7.1: Health outcomes antecedents: Education and literacy 213
Table 7.2: Health outcomes antecedents: Employment level 214
Table 7.3: Health outcomes antecedents: Population growth and Dependency Ratio 215
Table 7.4: Health outcomes antecedents: Food Security (maize output) and health outcomes 216

LIST OF ABBREVIATIONS

ADB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
ALRC/AHEC	Australian Law Reform Commission and Australian Health Ethics Committee
CHAM	Christian Health Association of Malawi
DHMT	District Health Management Team
GDP	Gross domestic product
GoM	Government of Malawi
HSSP	Health Sector Strategic Plan
HMIS	Health Management Information System
HIV	Human Immunodeficiency Virus
IHS	Integrated Household Survey
IMR	Infant mortality ratio
MDHS	Malawi Health and Demographic Survey
MDGS	Millennium Development Goals
MIS	Malaria Indicator Survey
MMR	Maternal Mortality Ratio
MMRate	Maternal mortality rate
MoE	Ministry of Education
MoH	Ministry of Health
NSO	National Statistical Office
PoW	Programme of Work

SDH	Social Determinants of Health
TA	Traditional Authority
TBA	Traditional Birth Attendants
UN	United Nations
UNICEF	United Nations International Children Emergency Fund
UNDP	United Nations Development Programme
WMS	Welfare Monitoring Survey
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Health is a human right and enjoyment of the highest achievable health standards is a fundamental human right (WHO, 2010a:12). It is with this understanding that most countries are striving to provide quality health services to their citizens despite limited resources and competing needs. Is not surprising though that three of the Millennium Development Goals (MGDs), namely reduction of child mortality, improvement of maternal health, and combating of diseases by 2015, relate to improved health outcomes (UN, 2012:35). Improved health outcomes and its determinants such as poverty levels, education, lifestyles and general social economic factors, remain a focus not only for governments, but also international and national organisations as to how they affect people's health (WHO, 2013:12).

Health outcomes are defined in several ways. They entail change of health status of an individual or a group of people after an intervention or ill health (Nutbeam, 1998:357). The change in health status, however, does not only result from an intervention but also from its lack thereof (Paterson *et al.*, 2009:18). This understanding also agrees with Lohr (2000:1208), who discussed the health outcomes not only in relation to the issue of cure, but also the perspective on control of illness or patient rehabilitation. Health outcomes as the ultimate impact of health care can be both negative and positive (Wang, 2002:4; Verhoef *et al.*, 2010:14). The commonality in these definitions or understanding is ultimately the issue of change in the state of the individual's health. Health outcomes therefore denote the ultimate impact of an intervention or the lack thereof on individual's health status for the better, where there are improvements or for worse, where there are negative results, or still static where there is no change at all (Wang, 2002:4).

In line with the concept of impact, health outcomes ought to reveal the impact of the health investments directly or indirectly (WHO, 2003). These investments are both at the micro (household) level where households invest in their health for instance in health insurances and lifestyles or at the macro level where governments invest in their health care systems. An example of government investments may include

training of its human resources working in the health sector and medical infrastructure development such as the construction of hospitals, in trying to improve health care systems (Krupp & Madhivanan, 2009:18).

In understanding the health outcomes, however, it is important to note that there are factors that are critical in determining them. These factors are personal, social, economic and environmental which are at play in determining the health status of an individual or population, and are commonly referred to as determinants of health (Nutbeam, 1998:357). All these factors are important in their form of interaction with the health outcomes. However, the social and economic environment in which people live or work is one of the key elements in determining the health status of people. Factors in this environment are what are termed as the social determinants of health (SDH) (WHO, 2010b:2). These factors include poverty levels, education, food security, political and demographic factors. There is a dearth of literature in discussing these determinants of health. This is specifically related to the analysis of how these factors interact with the ultimate health outcomes especially where people are categorised, either by their poverty levels, area or other demographic factors. In other words, the mechanisms or sometimes referred to as intermediary determinants that reveal the causal effect on health outcomes (WHO, 2010c:45). These are the pathways and those being significant for the country are being referred to as the antecedents of health outcomes for the country in this study.

This study therefore has investigated and determined how the socio-economic factors of poverty, education, employment, food security, population and other demographic factors link with health outcomes at district level of the country. A meaningful analysis of health outcomes does require a wider perspective analysis by way of looking at the distribution of health outcomes across different categories of people, for instance social economic groups (WHO, 2013:12). Furthermore, an analysis from one differentiating category of factors to another (Kawachi *et al.*, 2002:649) to establish a better intermediate form of interaction. The study has considered, in its analysis, the relationship between the district levels and distribution of income, education, food security, and other household demographic characteristics against the health outcomes of childhood mortality, maternal mortality, disease morbidity, and disease prevalence rates.

1.2 PROBLEM STATEMENT

In a number of studies and reviews that have been done for Malawi in the area of SDH (Wang, 2002; Conticini, 2004; Chin, 2010; Bowie & Geubbels, 2013; Kandala & Ghilagaber, 2014), there is a gap emerging in the analysis of the key socio-economic factors determining health outcomes mainly in systematic intermediate linkages between them. There has been a focus on the interaction of socio-economic factors and health outcomes such as the maternal and infant mortality rates and disease burden, without a systematic analysis on the differences in the nature and mode of relationship as determined by differences in the socio-economic factors. For example, a study by Chin (2010) on the impact of income on the health status and wellbeing of the rural population of Malawi revealed income levels having significant impact on individual health. However, the study based much of its findings on subjective poverty rather than the reported household income or expenditure data in categorising the poverty levels (Chin, 2010:997–1030).

A study by Conticini (2004) on health outcomes and poverty revealed that the poorest quintiles on income levels were generally being characterised with poor health status and nutrition. The study further established different trends for infant and under five mortality rates, which were better in lower quintiles as compared to the middle and higher ones. The study also showed that poverty levels have stronger link with health outcomes of child survival, child nutrition status and morbidity and immunisation coverage (Conticini, 2004:29). There is also high correlation between income, health expenditure and the health outcome of infant mortality rates and under five mortality rates (Wang, 2002:11). The study, however, did not manage to use the disaggregated data for the country for further analysis of the nature of the relationship and any distributional characteristics. The study by Bowie (2013), in analysing the effect of wealth on maternal mortality using the familial method where an asset score categorises the wealth of the sister and not the women who died, reveals reduced maternal mortality levels with increased level of education and wealth. However, the systematic analysis and nature of this relationship can further be investigated and analysed as further acknowledged in the study that improved socio-economic factors may not always mean improved health outcomes (Bowie & Geubbels, 2013:53). In employing economic modelling and multinomial modelling, the study considered the geographical distribution by comparing the role of social

economic status (SES). The study considered mainly diarrhoea, fever, stunting and underweight and their patterns of spatial correlation (Kandala & Ghilagaber, 2014:85). However, the study has a limited scope, as only household SES factor and childhood mortality risk factors but provides important insights for this study. The study by Kandala and Ghilagaber (2014) showed that, despite the overlapping of socio-economic effects towards health indicators, there are still differences in pattern of the health indicators from one geographical condition to another. The current study further investigated such patterns and their significance by not only including more factors and health outcomes, but also by considering nation-wide data for a more meaningful analysis.

Studies in other countries on the role of education and food security on health have also indicated that these factors play a significant role in determining health outcomes (WHO, 2011). For instance, studies in most WHO partner countries show that education of a mother positively contributes to the reduction of child mortality rates (WHO, 2003). Other studies in the sub Saharan region focusing on disease burden for instance human immunodeficiency virus and acquired immune deficiency syndrome (HIV/AIDS) have also revealed the poor being more vulnerable (Behrman *et al.*, 2009:109). The gap, however, is in demonstrating the significance of such linkages. Such significance may vary from one region, country or category of people to another and this study will contribute to such analysis.

The study has investigated both at the micro (household) and macro (district and national) level, the pathways through which poverty, education, food security and demographic factors shape some health outcomes. There are no studies to this effect for the country by applying the national wide data disaggregating at district level. Such analysis will provide policy or intervention guidance, which will contribute to Malawi's efforts in improving its health outcome indicators emanating from the district level, as Malawi is implementing the decentralisation programme. Indicators like maternal mortality rate of about 675 per 100, 000 live births, infant mortality rate, which is the death of a child before one year of age is around 66 per 1000, under five mortality rate, which is death of a child before the age of five is around 112 per 1000 (MoH, 2012a). These include the disease burden of the country, for example, incidences of major diseases like malaria, are generally poor as compared to most of the sub-Saharan countries despite the country making some strides over the past

ten years in improving them (MoH, 2014a). For example, Zambia, Mozambique and Zimbabwe, which have their MMR at 280, 470 and 480 respectively (World Bank, 2014).

1.3 MALAWI - A BRIEF BACKGROUND

Malawi is a sub-Saharan African country bordered to the north and northeast by the United Republic of Tanzania; to the east, south, and southwest by Mozambique; and to the west and northwest by Zambia. It is divided administratively into 28 districts, which fall under three regions of the south, central and north. The country has a population of about 16.4 million people, according to the 2014 United Development Programme (UNDP) Human Development report, and a population growth rate of around 3.1 percent with 85 percent of its population living in the rural areas and with high illiteracy levels (NSO, 2012:12). Malawi ranks 174 out of 187 on the Human Development Index (HDI) with the world's lowest reported GNI per capita of $250 (World Bank, 2015). Regarding the socio-economic factors, Malawi's economy has experienced GDP growth since 2006 with an average real GDP growth rate of seven percent between 2006 and 2010 and a later slump in 2012 of about two percent followed by a rebound of five percent in 2013 (African Development Bank, 2014:3).

The district division of the country also entails the distribution of the health services, as each district is served by a respective district hospital with several community hospitals and health facilities under them. The country's health statistics are characterised mainly by a heavy burden of disease, which is evidenced by the high levels of child and adulthood mortality rates and a high prevalence of diseases such as tuberculosis, malaria, HIV/AIDS, and other tropical diseases (MoH, 2014a:1).

On population growth rate, the population of the country continues to be growing rapidly, and in just over 40 years, the country's population, from the national population census figures, has increased from 4 million people in 1966 to 13.1 million in 2008 (NSO, 2012:2). The main reason for the rapid growth rate is the high fertility rate, which is at 5.7 births per woman. The high population growth rate challenges the country's quality life as not many of the sectors of the country are growing to accommodate such population growth rate.

On education, by 2012, the country had almost 20 percent of its population complete primary school as the highest level of education, about 30 percent with junior

certificate of education (JCE), less that 20 percent with Malawi School Certificate of Education (MSCE which is O-level equivalent) and about 10 percent with tertiary education (NSO, 2012:25). The country has higher qualifications skewed towards the urban population and still has over 50 percent of its population with no qualification. As regards to general literacy level, 6.8 million people in the country are literate, representing a 64 percent literacy rate, with urban 85 percent while rural 15 percent (MoE, 2014:7).

The food security levels, especially considering the years of interest for this study, show that a third of the country's population had experienced food insecurity. That is, about one in every three people were living in severe low food security, 8 percent experiencing low food security and about 2 percent in the marginally food secure category while about 58 percent of the population could be considered as food secure (NSO, 2012:188). In Malawi, food security cannot be divorced from crop enterprise of which maize is the main food crop; therefore, it is synonymous with food security (Chirwa, 2008). The agricultural enterprise also defines the employment levels of the country as most people in the country are employed in the agricultural industry (NSO, 2014:26). Most people in Malawi are engaged in informal employment, which has 89 percent of the people working and predominantly higher in rural areas, while the formal employment is higher in the urban areas as compared to the rural areas (NSO, 2014:26).

As the study considered the systematic nature of the relationship between these socio-economic factors and health outcomes, the health care system in the country also provided a fundamental basis in understanding the context from which such interaction is advanced. The country's health services are provided at different levels namely: primary, secondary and tertiary. The primary level is where community health facilities are the main providers, the secondary level services are mainly at district headquarter, and the tertiary level, is provided by the central or referral hospitals (MoH, 2014a). The country's health outcomes have mainly shown gains with declined levels of childhood mortalities, maternal mortality rate, the disease morbidity and prevalence despite the increased disease burden (MoH, 2014a:1). The financial and human resource constraints have been some of the major challenges facing the country's health sector. This is mainly due to the country's health system dependency on development partners as 68 percent of the health budget is funded

by the development partners (MoH, 2014b) hence its volatility to external economic shocks. The high donor dependency challenge has been heavily felt in the country during the suspension of most of traditional donors to the country's budget support in 2013 (MoH, 2014a:18). The health sector has been one of those sectors adversely affected considering the sector's over-dependency on development partners. The human resource challenge emanating from the high vacancy rate in the health sector (MoH, 2012a:30) has led to increase in the population being underserved.

1.4 OBJECTIVES OF THE STUDY

The following objectives were formulated for the study:

1.4.1 Primary objective

The primary objective of the study was to investigate the antecedents of socio-economic factors on health outcomes with more focus on poverty, education, food security and population. The study, without neglecting other equally critical factors, analyses the linkages and their significance at national, regional, district and household level.

1.4.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives were formulated for the study:

- Provide a background of Malawi's demographics and health outcome characteristics and trends.
- Review the literature on health systems and socio-determinants of health, including global and regional trends on health outcomes performance.
- Review the literature on the known links between the socio-economic factors of poverty (level), education, food security and population to health outcomes.
- Discuss the implication of such linkages in respect of the country's trends at district level.

1.4.3 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives were formulated:

- Investigate if there has been a significant change in the health outcomes of maternal mortality rate (MMRate), infant mortality rate (IMR), Malaria and TB morbidity and prevalence rates between 2005 and 2014 in Malawi.
- Investigate linkages of poverty, education, food security and population to specified health outcomes of MMRate, IMR, and disease burden, specifically for malaria and TB morbidity and prevalence in the country at district level.
- Analyse health outcome distribution and nature in relation to income, education, food security and demographic factors changes.
- Conduct an analysis on the implications from the nature of the established relationship between the health outcomes and the corresponding socio-economic factors.
- Formulate a policy and intervention guidance from the results and discussion.

1.5 RESEARCH DESIGN AND METHODOLOGY

The study comprised a literature review and empirical studies from Malawi on the socio-economic determinants of health as well as from other countries. The study will mainly use data from the Ministry of Health Management Information System (HMIS), the Welfare Monitoring Surveys (WMS) and the Malawi Intergraded Household Survey (IHS2 & IHS3) for its analysis.

1.5.1 Literature Review

The study conducted a literature review from journal papers, research papers, conference papers, government reports and documents, relevant textbooks, and newspaper articles. Information on Malawi was sourced from the 2008-2012 Integrated Household Surveys (IHS), Health Sector Management Information System, Health Sector Strategic Plans and Assessment Reports, National Statistical Office (NSO) data and Malawi National Health Accounts (NHA 2008-12). International policy documents such as World Bank's Millennium Development Goals, International Monetary Fund reports, African Development Bank reports, the

development agenda of SADC and the African Union, and the World Health Organisation were also reviewed.

1.5.2 Empirical Study

The study has used secondary data from the Health Management Information System, which compiles health related data from hospital-based surveys, the Welfare Monitoring Surveys as conducted by the National Statistical Office (NSO). The target population for these surveys included individual households and persons living in those households within all the districts of Malawi except for the population living in institutions, such as hospitals, prisons and military barracks. The study further used the Integrated Household Surveys (IHS2 & IHS3) as conducted by the same National Statistical Office, which is collected from all the districts of the country but in every five years to triangulate some of the information and trends. Three of these surveys have been conducted in the past, namely Integrated Household Survey 1 (IHS1) conducted in 1997/98, the IHS2 which was conducted in 2003/04 and recently, the IHS3 with 2010/11 data.

1.5.2.1 General sample method from the data sources

In general terms, the stratified two-stage sample design is used for both the Welfare Monitoring and the Integrated Household Surveys. The surveys use the primary sampling units (PSUs) which are grouped as the census enumerations areas (EAs) which are established from the Malawi Population and Housing Census. The households sampling provides the second stage sampling and households are systematically selected from each EAs. Some districts are always oversampled in order to accommodate those districts with smaller populations to be represented in the sample clusters (NSO, 2012:2 & NSO, 2012:14). The Health Management Information System on the other hand provided the health indicators based on the hospital registers within the facilities under the district. The Ministry of Health HMIS provides health data as collected from the facilities (MoH, 2012a:94) hence acts as a hospital based survey (Cameron Bowie & Geubbels, 2013:53) and the data are aggregated both at district and national level. However, though it may under or overestimate some of the indicators, the hospital based survey data for Malawi provides useful information when investigating the health outcomes influencing factors (Bowie & Geubbels, 2013:4) and, in this study, the socio-economic factors.

1.6 STATISTICAL ANALYSIS

The captured data was analysed using STATA and the Statistical Package for Social Sciences (SPSS version 22). The study will use the descriptive and econometric methods of analysis on the empirical data sets.

1.6.1 Empirical analysis and model

The first three empirical objectives were addressed using a descriptive analysis where district data characteristics were investigated in terms of level and distribution. This provides the basis for further analysis where general relationships were thereafter drawn from the specified socio-economic factors before establishing the nature and effect of the relationship from the regression models.

The regressions that were used in addressing objective four are of the following form:

$$\mathbf{HO}_{it} = \boldsymbol{\beta_0} + \cdots \sum_i^n \boldsymbol{\beta}_i \mathbf{X}_{it} + \boldsymbol{\varepsilon}_{it} \qquad \textbf{(1)}$$

Where $\mathbf{HO_{it}}$ is a specific health outcome under investigation (district level maternal mortality, infant mortality rate, malaria and TB morbidity and prevalence rates), β_0 is the model intercept and $\beta_{2\ldots n}$ are coefficients of independent variables $X_{2\ldots n}$ measured at district level and ε_{it} is the composite error term consisting of both the specific district error term and the combined time series and cross-sectional error terms.

In considering these regressions, the model may differ on the socio-economic factors as they depend on the priori expectations form their relationship with the health outcomes. The regression models were also subjected to diagnostic testing in order to establish the nature of the relationship between the health outcomes and socio-economic factors, hence further addressing objective four. The fifth objective was addressed from the model results leading to policy guidance and recommendations.

1.7 ETHICAL CONSIDERATIONS

Since the data used is from a secondary source, there was no need to seek further permission other than that sought from the National Statistics Office. This also

include the HMIS data which is also a public source of information and are available as monthly, quarterly and annual bulletins.

1.8 CHAPTER CLASSIFICATION

This study is comprised of the following chapters:

Chapter 1: Introduction and background to the study. This chapter has presented the background to the study, the problem statement, the research objectives and research questions, and a brief overview of the methodology that was used in the study.

Chapter 2: Theoretical literature review. This chapter reviewed the literature on the definition of health, healthy systems and determinants of health models, health outcomes definition and measurements, the global and regional trends of health outcomes of maternal mortality, infant mortality, disease burden in terms of morbidity and prevalence.

Chapter 3: Social determinants of health. This chapter isolated and analysed among the determinants of health, the role of socio-economic factors, reviewing the models, the empirical literature and known linkages of the socio-economic factors of poverty, education, food security, and population aspects in relation to the health outcomes.

Chapter 4: Detailed profile of the study country (Malawi). This provided a detailed profile of Malawi with focus on the health sector, economy, education, employment, population, and food security. The chapter further presented trends on both the dependent and independent variables as setting the priori expectations form the available literature and country survey reports.

Chapter 5: Research design and methodology. The chapter has presented the methodology that was used in the study and its justification. The chapter also discussed the data format that was used and, further, the specific model design and its underlying assumptions.

Chapter 6: Results and findings. The chapter presented the results of the study and corresponding discussions, which have been based on the models used as, stipulated in Chapter 5. The results are presented both from descriptive data, which provides background as well as interpretation from the model coefficients while relating to the empirical literature.

Chapter 7: Conclusions and recommendations: This chapter presented the summary of the study, both from the theoretical and empirical perspectives. The chapter has also presented the summary of the results and its implications. Broader and specific policy recommendations, conclusions, limitations of the study, as well as areas for further research, have been presented in this chapter.

CHAPTER 2

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.1 INTRODUCTION

It is an established practice to review what is already known and other conventional practices when beginning a project or contributing to the body of knowledge (Bazeley, 2007:41). This process is conducted by reviewing relevant theories, literature and methods previously used in investigating the topic of interest. Reviewing the literature, provides a basis for imploring multiple dimensions of the topic and further deepens understanding of the contents of the research at hand (Holy *et al*., 2005:263).

The concept of health mean different things to different people as it is much based on individual perception and experience health, ill health and wellbeing (Liamputtong *et al*, 2012:2). Furthermore, in understanding the notion of health, it becomes impractical to isolate the whole definition from the nature of its determinants and point of their interaction. This chapter reviews the literature on health and its social determinants and, in particular, poverty, education, food security, population and other demographic factors. The chapter also discusses health measures before analysing the past trends in both developed and developing countries.

2.2 UNDERSTANDING HEALTH

Health is defined by complexity more especially in the era of globalisation (WHO, 2010:4). It is hence impossible to find a universal applicable definition of health to all individuals with their locations and time (Keleher & MacDoougall, 2011). In other words, the meaning of health is contextual from individual to individual, household to household, and one social-cultural scenario to another. The concept of health can be termed as both socially and culturally constructed (Taylor, 2008:5). Emanating from such complexity, the health phenomenon, over the past years, has seen the focusing and refocusing in its interventional approaches and models in trying to promote maximum value and gains. On the international agenda, these have been inclined

towards medical based technological advancement, and inter-sectoral policy actions in the understanding of health as a social phenomenon (WHO, 2010a:11).

However, despite the lack a definitive definition of health for all individuals, location, time and culture, the study considers a number of definitions in understanding health and its subsequent determinants. The study briefly examines three definitions, first the definition by the World Health Organisation (WHO) including its shortfalls and related suggested adaptations. The study also looks at both biological and biomedical definitions in enhancing the understanding of the notion of defining health and its premises as well as in light of providing a background to the main categories of the determinants of health, which will also form part of the main discussion.

The 1948 World Health Organisation's constitution defines health as: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." (WHO, 1948:100). The definition emanated from the World War aftermath and did indeed serve the purpose and in that context, the WHO notion of health articulated a helpful ambition where mostly the main burden of illness was from the acute diseases and that early deaths were mainly due to the chronic (Huber *et al.*, 2011:1). However, since 1948, as further argued by Huber *et al*. (2011), the nature of population demographic features and the pattern of disease as well as technologies in detecting abnormalities which might have not reached the levels of being regarded as ill-health (sugar levels high blood pressure), have considerably changed. The definitions shortfall in respect to the measure of standard of health, thus brings a debate as to whether it can provide a working definition of today's world measure of wellbeing, happiness and policy orientation (Bok, 2008:590–597).

The definition is also considered as proposing a mere ideal situation free of obstacles which is idealistic to the life of any human being (Killewo *et al.*, 2010:134). The word complete in the definition also brings another controversy, as use of physical completeness measure is different from social completeness and social well-being completeness to the point that the definition proposes medicalisation of all the human being experiences (Bok, 2008:593). In other words, the complete well-being may mean different things altogether from one category of people to another for example from the rich to the poor.

In proposing to adapt the WHO definition, Nordenfelt (2001) proposed an alternative definition of the notion of complete health, where the terms social and well-being, are contextualised to provide flexibility in relation to the term complete:

> a person is in a state of complete health, if and only if this person is in a physical and mental state such that he or she is able to realize all his or her vital goals, given a set of accepted circumstances (Nordenfelt, 2001:72).

Callahan (2003:8), agrees with the issue of the ability in pursuing vitals goals in the social and work context by looking at health as a personal experience of wellbeing with the integrity of both the mind and the body and not only absence of pain or suffering as a significant factor. In analysing the premises of the definitions by Nordenfelt (2001) and Callahan (2003), it is clear that the definition still makes reference to mental and physical well-being despite the inclusion of the 'vital goals' in the definition. The principle behind the definition is that an individual can still be considered to be healthy in spite of being in a state of "complete physical, mental, and social well-being'' without however ignoring some minimal level of health. The definition, in a way, accepts that there are a variety of influencing factors, including hereditary and environmental ones, which contribute to person's health status without necessarily defining it. Most critics agree with Nordenfelt's (2001) definition of leaving out the notion of 'social well-being' in defining health, though however acknowledge that factors like supportive family, community, and work-related social networks strongly contribute to individual and population health (Bok, 2008:595). The question is whether one cannot be considered healthy without possessing the proper functioning of body and mind? Furthermore, the concept of 'vital goals' is also subjective as pursuance of these 'vital goals' need their own definition and also that they may depend on factors like age of the person, circumstances surrounding the family and finances.

In bringing the notion of understanding of the physical, social and mental domains of health, Boers *et al*. (2015) considers health as a pure tetrahedron in promoting resilience and coping up with the wellbeing and integrity.

Individual health is considered as being supported by three primary pillars of physical, social, mental health and ill health is defined as a process of strengthening or weakening (frailty) of the pillars. In other words, the weakening of one or more of the pillar can become weakened, and this can be partially compensated by the secondary supporting structures (Boers & Jentoft, 2015:2). A case of ill or adverse health may only manifest where the structure is stressed beyond a point and collapses (adverse health outcome). This understanding of health mainly provides the process of acquiring health or losing it as well as role of the stressors in weakening the health equilibrium status. However, the model defines more of the process towards health or ill health hence an extension of the definition on health as a physical, social and mental state.

Health can also be defined from the biological perspective where health is considered as marginal tolerance of the individual's environment inconsistencies where it is mainly the physiological aspect of health and genes play an important role in the underlined biological differences between individuals (Liamputtong, *et al*., 2012:11). It is the imbalance in the genetic and physiological systems within the body (Swinburn & Cameron-Smith, 2009:248). This definition is also similar to the definition by Dubos (1996) which depicts the ability of the organism withstanding the characteristics of its environment. The genes may indeed play a vital role in causing diseases; however, it is the environment that defines most causes of diseases (Keleher & Joss, 2009:370). The implication to this assertion is that the concept of resilience and environment become also fundamental and applicable in defining the individual's ability to preserve and recover from any adverse situations.

Health, from the biomedical premise, is defined as absence of disease (Boorse, 1977:524). Taylor (2008:10) extends the same premises of definition as meaning not only the absence of disease but also pathology denoting that health and ill health are two sides of the same coin, one is either health or ill. In elaborating further, Kass (1981:18) considers health as revealing an attainable standard of physical fitness or excellence among any species of individuals. This means that health implies some form of organism normality while ill health means deficiency or abnormality (Taylor, 2008:10). The definition concurs with critics of the use of well-being as misleading on the premise that the concept is subjective and hence means different things to

different people and that people tend to possess sense of personal well-being even in difficult situations for example stressful life events and chronic sickness (Liamputtong, 2012:5). The biomedical definition has also been criticised mainly that it provides a very narrow view of health as health ought to be a credible and holistic condition (Levin & Brown, 2005; Taylor, 2008:10).

There has also been a spiritual dimension being suggested as a valuable component in looking at the notion of health, hence the definition by Sen (2002) as a dynamic state of complete physical, mental, spiritual and social well-being and not merely the absence of disease and infirmity. The definition is based on the shortfalls of the discussed utilitarian models, which mostly fall short on not accounting for the separateness and diversity of persons and the failure of such models to account for distributional inequalities (Sen, 1999:202; Alkire, 2002:2). The capability approach is mainly about what a person is able to be and do as defined by the background social context, the endowments of the individual and further by the opportunities and choices at the individual disposal (Law & Widdows, 2008:309). The approach, therefore, considers health as freedom from any ill health, not just controlling it or as a matter of choice. In other words, in discussing Sen's (2002) example of freedom from, for example, malaria, the approach implies that accorded a choice, one would choose to live in an environment that is free from malaria, even if it means draining all malaria-infected ponds as long it enhances freedom from malaria, otherwise the freedom to live in a malaria-free environment is compromised (Alkire, 2002:7). The capability approach looks at health as one of the functionings, which make up the person's capability. In other words, it considers health not as a single or individual functioning but as part of the composite capability built from various possible functionings like being adequately nourished (Law & Widdows, 2008:311).

All the six health definitions discussed in this section, provides a clear sense about the complexity of health and provides a historical understanding and basis to consider a dimension from which can be measured. As argued by Bok (2008:590), that one may not need any inspirational definition of health in order to measure its outcomes, for instance, infant mortality or to project life expectancies but from the perspective they are being measured from. The definition of health in this study is based on the complete state of physical, mental and social wellbeing however with emphasis on the ability to adapt and self-manage with regards to the challenges that

may be social, physical or emotional (Huber *et al.*, 2011:1;Boers & Cruz Jentoft, 2015:2).

2.3 DETERMINANTS OF HEALTH

As health is considered, in this study, to be a social, physical and emotional related state, the definition intrinsically provides the basis for its determinants. Determinants of health can be defined as factors, which are the helm of defining the individual or population health. They are individual, socio-economic, environmental and cultural factors or elements, which bring about changes in the health or illness of individuals, communities or the population (Taylor, 2008). These are conditions, which can either improve or hinder the possibilities for good and better physical, mental, social and emotional state (Liamputtong *et al*., 2012:9). The determinants of health can be classified as biological and genetic health behaviours such as risky lifestyles; socio-cultural and socio-economic factors such as gender, income and education; and the environmental conditions for example social connection, housing, geographical position and climate. The key and major determinants for further discussion are the biological, environmental and social determinants.

The biological determinants of health are the inner physiological aspects of health and disease where genes play a critical role in the peoples underlying biological and genetic make-up. Genes are basic units of health and heredity in the body and in terms of genetic pattern; traits that can trigger ill health are passed on from a parent (AIHW, 2010). However, there is always an interconnection between the genetic and psychological systems, which is similar to the process of the social and environmental system operating outside the physical body of a human being (Swinburn & Cameron-Smith, 2009:248). The importance of one's genetic make-up as a determinant of one's health has been acknowledged in past decades where genes have been portrayed as being essentially the spinning factor for people's health and behaviour through genetics determinism (Liamputtong *et al*., 2012:59). The genetic determinism assumes that every individual is a collection of their genes and that their health, well-being and behaviour dominantly emanates from their genetic make-up while social and other factors exerts less or minimal influence (ALRC/AHE, 2003).

The approach, however, has several limitations. One of it being that such assertions calls also for a genetic focus in providing solutions to any health issues hence aligning entire research, practice, policy and interventions towards genetic underpinnings for example controlled breeding of desired characteristics in order to improve human population health (Liamputtong *et al*., 2012:59). The approach can also lead to stigmatisation and discrimination, especially where some characteristics are not socially or politically desirable as the human identity is embodied in their genetic characteristics. To some extent, ill health would then always be considered as a fate. However, despite the role of genes in people's health, much has not been touted about genes when considering the determinants of health, mostly due to its intertwining and dependency on social and environmental factors (WHO, 2003:7; Marmot, 2008:420; Liamputtong *et al*., 2012:59). The genetic characteristics that would lead to ill health vanish far more quickly than the slow pace of the genetic change, mainly because of the way people live and they do reflect the changes. This explains why a health outcome, for example of life expectance, has improved dramatically in the recent generations, and also explanations why other countries have improved their population health while others not and why different economic groups exhibits different health levels (Wilkinson & Marmot, 2003:7).

The second category of the determinants of health is the environmental factors. These are factors within which individuals live and their health and wellbeing have long been observed (WHO, 1986; Griffith et al. 2010). They represent the physical environmental factors such as geographical location and climate for example global climate changes, which can always influence the people's health. The physical environment does also relate to factors such as water quality, the absence of sanitation and housing, which are critical among the vulnerable people in the developed countries as well as in the poor countries (Nicholson & Stephenson, 2009). Human beings have always strived to change their environment to suit them and meet their needs, making the environment or surrounding conducive for their survival (Liamputtong *et al*., 2012:126).

The environment and changed environment has an impact on health as it provides opportunities for diseases to spread as people continuously change their lifestyles and habits and in the process become more and more vulnerable to diseases. This

encompasses an environment where urbanisation and population density are associated conditions, and the social environment including social networks, social structure and culture are among some of the critical factors. All these have potential in affecting people's feelings, perceptions, and state and can therefore have an effect on individual mental and emotional health. An example in the social environment is social capital which refers to the intangible factors that create relationships and networks creating trust, sense of support and inclusion and their support have proved to promote better health towards individuals, groups and communities (LeBlanc & Kelloway, 2003; Barling *et al*., 2009).

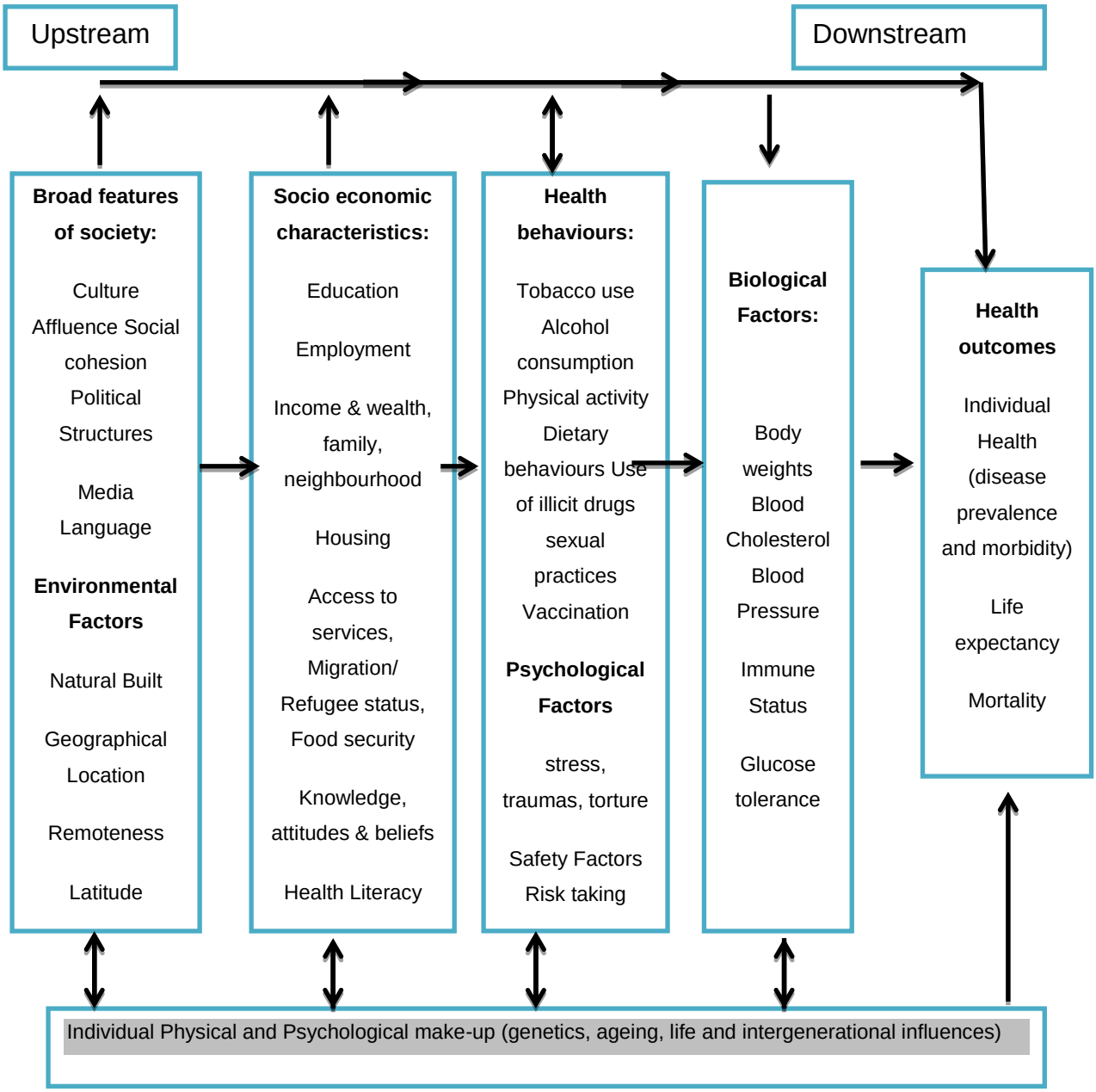
The final category of the determinants of health for the study is the SDH, discussed in chapter three, as it informs the main discussion of the direction of the study. These determinants further build on the environmental factor analysis on the basis that while illnesses have biological causes and pathways, the social causes are bound to explain better why there are disparities in the distribution of illness both within and between populations (Krumeich & Meershoek, 2014:1). These factors are critical in explaining why some people do have a higher risk of disease and consequential disability than others do, and why illness or disability consequences differ in impact between the vulnerable individuals or groups than those not, for example, between the poor and the wealthy. The SDH underpins the fact that not all illnesses or poor health is as a result of biological and environmental factors but to a larger extent, the social and economic aspect of people (Marmot, 2011:2).

2.3.1 Understanding the health determinants

The critical aspect in understanding the determinants of health is that these factors do not work in isolation in determining health; they operate in a dynamic interconnectedness, a cobweb like interface in influencing the people's health (AIHW, 2010:64). In analysing how the health determinants operate, some models have been examined to prove operational framework through which these determinants affect people's health. The study has considered three models, namely the factor interaction model, the Whitehead (1991) model, and the tetrahedron model.

The factor interaction model, as demonstrated in Figure 2.1, shows how in broader terms these determinants of health factors relate to each other and how another set of factors determine the nature of the other factors in turn.

Figure 2.1: Determinants of health: factor interaction model



Source: Adapted from Australia Institute of Health and Wellness, 2014:5

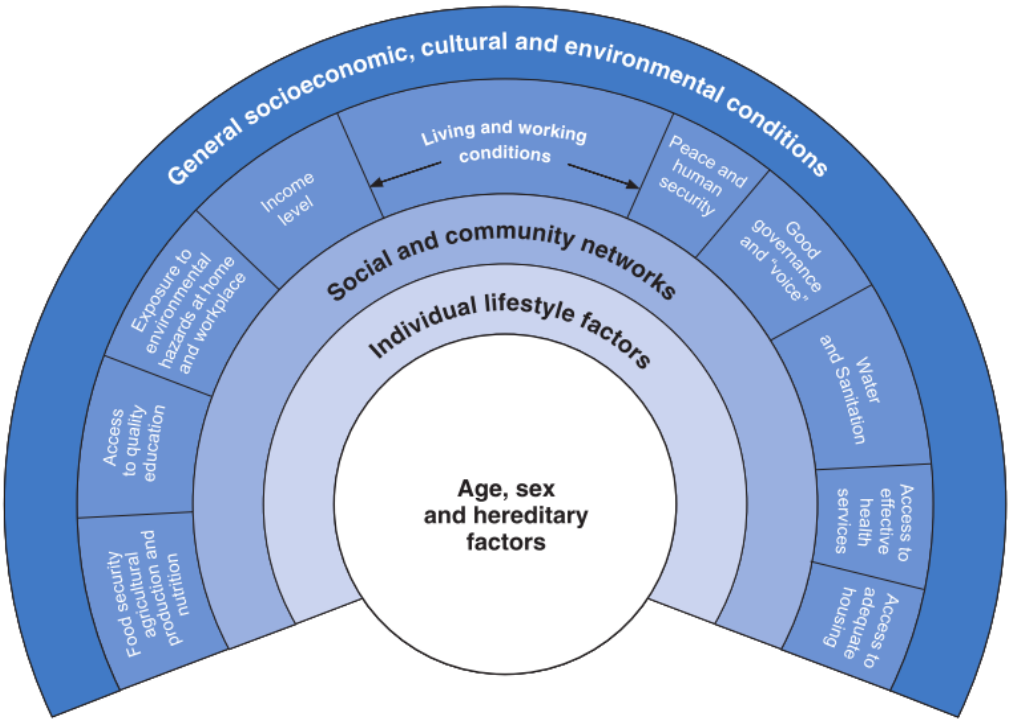
In Figure 2.1, category of individual's socio-economic characteristics such as employment and level of education are illustrated how they are influenced by broad

category of society and environmental factors. These in turn impact the individual's health and behaviours, psychological state and safety. The process then further affects biomedical components such as body weight and blood pressure, which affects the health of people in other pathways. This direction also occurs in reverse as individual's health has also impact on the level of their physical activity, employment and wealth (Liamputtong et. al, 2012:10).

In summary, the framework in Figure 2.1 categorises the determinants of health into major groups, which are operating and influencing the health outcome from left side, also called the upper stream to the right side, the lower stream. This implies that the influence emanates from the background factors (such as culture and affluence) through to those factors that may a have a more immediate influence (such as blood pressure) (Liamputtong *et al*., 2012:10; AIWH, 2014:5).

These determinants of health are also categorised differently, as shown in Figure 2.2 in the health determinants model by Dahlgren and Whitehead (1991), where the main determinants of health are seen as a product of multi-sectoral influence.

Figure 2.2: The main determinants of health



Source: Adopted from Dahlgren and Whitehead (1991)

The model captures the individual sectoral policies' contribution towards heath objectives, which are seen through their interactive effects from either a beneficial or an adverse perspective. The determinants, which have a greater impact on health, are those operating from the core and those with less impact are considered to be operating from the outer layers. Factors in the inner circle are factors upon which not much control can be averted, as they are individual based factors like age and sex, and are largely determinants with which people are born. The rest of the outer factors come from individual basis to the community and further to the broader environment. This approach gives a holistic way of handling when handling certain intervention as it helps answer questions on why certain forces may have particular potential in affecting health and wellbeing and their subsequent remedies (Liamputtong *et al*., 2012:110)

The determinants' categorisation under the Whitehead (1991) model has both approach and mediation suggestion. The models suggest the need and significance of organising those factors that have a noteworthy effect on health and poverty reduction, and assess the degree to which strategies advance or undermine both health and more extensive poverty reduction targets. This prioritisation focuses on the significance of capacity enhancement within these sectors contributing to the fulfilment of health related goals. The implication is that the development agencies ought to or can still support improvement of health through activity in these concerned sectors as illustrated in the model (WHO, 2003:53).

In bringing the notion of understanding of the physical, social and mental domains of health, Boers *et al*. (2015) considers health as resting on three pillars, hence a pure tetrahedron in promoting resilience and coping up with the wellbeing and integrity. The three pillars of physical, social and mental support individual health.

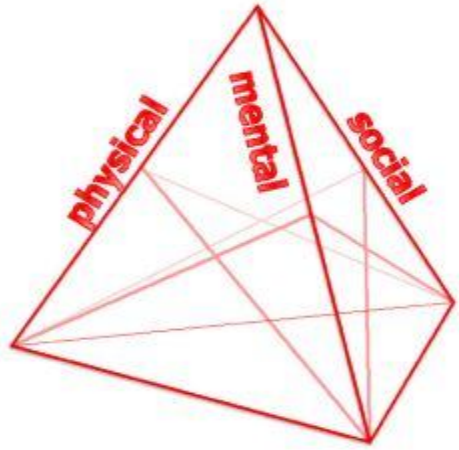
The physical pillar of looks at health as in-built capability of an organism in both maintaining its physiological normal state or as it is called homoeostasis and also the stable change it adopts, allostatic response, through changing circumstances (Schulkin, 2004:18). This means that in the face of any physiological stress, a protective response is provided by an organism to minimise any harm and where it is infringed, the organism is able to restore to its equilibrium or adapted state. (Huber *et*

al., 2011:2). However, if this strategy fails, then the damage or harm caused leads to illness.

On the other hand, the social pillar of health entails the capacity of individuals to fulfil their obligations and to ably manage their independence including their participation in work or any other social activities (Huber *et al.*, 2011:2). The social factor pillar is an important factor more especially in the early years of development as it critical supports the physical and emotion health and forms that basis of individuals biological, psychological and human capital (Marmot, 2012:47). Consequently, as argued further by Marmot (2012:47), in managing their external conditions such as work and social activities, people are able to feel health despite their limitations and are able to develop successful strategies in coping up with challenges within their social environment.

The final pillar of mental health describes the capacity of people that contributes to the successful recovering from any psychological stress and prevents any disorder. Mental health is the embodiment of social, emotional, and spiritual well-being and provides the vitality for active living (VicHealth, 1999:4). This pillar of health where one is able to adapt and manage oneself, provides a more subjective wellbeing and interfacing for positive results between the mind and body (Huber *et al.*, 2011:2). These three pillars of health hence can be demonstrated as a tetrahedron presented in Figure 2.3.

Figure 2.3: Health as a tetrahedron model



Source: Boers *et al*. (2015:2)

In this model, supported by the discussed three primary pillars of physical, social and mental health and ill health hence is considered a product of a process of strengthening or weakening (frailty) of the pillars. The weakening of one or more of the pillars is partially compensated by the secondary supporting structures (Boers & Jentoft, 2015:2). A case of ill or adverse health may only manifest where the structure is stressed beyond a point where and collapses (adverse health outcome). Health in the model would mean impairment (Taylor, 2008:10). The model provides the process of acquiring health or losing it as well as role of the stressors in weakening the health equilibrium status. However, the model defines more of the process towards health or ill health hence an extension of the definition on health as a physical, social and mental state.

The understanding of health from the definition point of view and the associated determinants, only provides a broader framework, however, the measuring of health further allows isolating specific links on how health can be analysed. The measurements of health do not only enhance its understanding but also shape the nature and type of interventions to maintain it or recover when it is lost.

2.4 MEASURING HEALTH OUTCOMES

Health outcomes are measured in different ways for different purposes despite a general agreement in the need for measuring quality of life in the context of health (Cairns, 1996:6). These measurements are either condition specific where the measure is based on different aspects of health, or the generic measures which irrespective of the condition, they capture the underlining state of health of the individual. The study dwells on the generic measurement of health as mostly used in measuring global health trends, which mainly based on national figures and analyses. These measurements include the disease burden, which encompasses disease prevalence and morbidity, and further the measure of deaths as captured under mortality measurements. Measurement of health enhances the development and adaptation of health frameworks for various systematic operational needs (Huber *et al.*, 2011:2). In differentiating health status either on the basis of individual or population or between objective or subjective indicators, any operation measure of health provides a basis for unique research and policy implementation. This has led to organisations concerned with global health like WHO to developed further several

classification systems in measuring gradations of health in aspects of mortality, morbidity, disability, functioning, and perceived quality of life as well as wellbeing under the Internal Classification of Diseases (ICD-10) (WHO, 2010:3).

2.4.1 Disease burden as a measure of health

Disease burden is an indicator of health outcome (WHO, 2013). The disease burden signifies the impact of a health problem and is expressed by for example, mortality levels, financial costs, morbidity levels or other indicators. According to World Health Organisation Health statistics definitions, the disease burden can be measured and expressed further in a number of ways, some of which include the number of diseases cases calculated as incidence or prevalence rates. It can also be expressed as deaths or disability-adjusted life years lost (DALYs) which quantify the number of years lost due to disease or a given condition. The disability years are also expressed as Years Lived with Disability (YLD) which captures years lived with diseases or injury (Vos & Flaxman, 2014:2165). The prevalence rate measure captures a number of people with a disease or condition in relation to number of people in the population at risk at a specified time. The prevalence rate is often expressed as cases per a specified population for example 1,000 or 100, 000 population base. This can be expressed as a point prevalence where a specific point of time is concerned of period prevalence where there is a time period being considered (NSO, 2012:26).

The term disability refers to any short-term or long-term health loss (WHO, 2011). Many other definitions of disability are in use, such as those in the WHO (World Report on Disabilities). These definitions often stress moderate to severe health loss and the role of the environment in the loss of individuals' wellbeing (WHO, 2011). This time-based measure combines years of life lost due to premature mortality and years of life lost due to time lived in states of less than full health. The DALY metric measure was developed in the original Global Burden of Disease 1990 study in a bid to assess the burden of disease to ensure consistency across various diseases, risk factors and regions (Mathers *et al.*, 2006:47). To ensure that the causes of the burden of diseases are properly accounted, for especially where there is limited information and if ignored would mean the area has zero burden (and hence ignored by the makers of health policy), most burden of disease studies have developed

methods and approaches to make estimates where there is limited data and considerable uncertainty (Murray *et al*., 2003). This helps to provide guidance and planning for health status as it is based upon accepted and defensible epidemiological methods (Lopez & Mathers, 2006:481).

The basic philosophy in guiding the burden of disease health outcome measuring approach is that there is always a descriptive epidemiology of health conditions and this has remained central in the methods developed and being developed (Lopez & Mathers, 2006:481; Salomon *et al.*, 2012:2129; Vos *et al.*, 2014:2165).

2.4.2 Mortality measurement of health

Mortality as a measure of health outcome measures deaths as associated on a large scale from different causes (Lozano, 2013:2096). With such basis, different causes of deaths would be grouped according to a specific mortality measure for example deaths of pregnant women in the course of giving birth, for example, maternal deaths is referred to as maternal mortality irrespective of what caused the deaths. The study considered maternal and childhood mortality as some of the mortality measurement of health for further discussion as they form part of the analysis.

Maternal death is defined by World Health Organisation as 'the death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accident or by accidental causes (WHO, 2014:4). These maternal deaths can be expressed as maternal mortality ratio (MMR) or maternal mortality rate (MMRate). The MMR captures the number of maternal deaths during a given time period per 100000 live births during the same period (WHO, 2013:6). The WHO-ICD 10 refers to the 'live birth' as:

> the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born (WHO, 2010:151).

The MMR expresses the risk which comes about with each pregnancy, i.e. the obstetric risk and was one of the health indicators in the MDGs (UN, 2012:35). On the other hand, MMRate per number of women of reproductive age for example 1000 women in the reproductive age for example between ages 15-49 (WHO, 2014:6) or 10, 000 women of reproductive age depending on the size of a population (Bowie & Geubbels, 2013:53). The maternal deaths can also be measured in terms of the adult lifetime risk of maternal death which is the probability that a 15-year-old women will die eventually from a maternal cause or the proportion of deaths among women of reproductive age that are due to maternal causes (PM) and is expressed as a number of maternal deaths in a given time period divided by the total deaths among women aged 15–49 years (WHO, 2014:6).

The maternal mortality ratio is the most widely used measure mainly because it depends on the risk of dying once a woman is pregnant, which is the risk of developing a complication multiplied by the risk of dying from that complication (Bowie & Geubbels, 2013:53). The maternal mortality rate however provides a comprehensive rate as it takes into account the annual probability of becoming pregnant for women of a defined reproductive age. The lifetime risk, however, is more of a cumulative incidence measure and provides a comprehensive maternal mortality measurement as it incorporates both the annual probability to become pregnant, the length of the reproductive period and the associated risk of dying from the pregnancy (WHO, 2014:6).

There a number of ways and techniques used to measure maternal mortality. Measuring maternal mortality accurately is difficult as maternal death is, from an epidemiological perspective, which is mostly a relatively rare event and measuring maternal mortality accurately becomes subsequently difficult (WHO, 2015:1). In many low-income countries, the accurate measure is further more challenging and inconsistent due to the limited data collecting systems and mostly modelling is used to obtain a national estimate except where comprehensive registration of deaths and of causes of death exists. In some instances population or hospital-based census, surveys or models have to be applied in order to come up with reliable estimates (WHO, 2015). In using surveys, as commonly used in Demographic and Health Surveys (DHS) and Multiple Indicator Cluster, the approach employ the direct ‘sisterhood’ method using household survey data (WHO, 2014:8). This technique

gathers information by interviewing a sample of respondents, which is representative, pertaining to their siblings survival of all their siblings. The method collects details on siblings' ages, recording those still alive or dead and from the sisters who had reached a reproductive age in terms of any pregnancy-related death. This approach however has several limitations. The method only identifies pregnancy-related deaths, rather than maternal deaths (Hill, *et al*. 2006:84). The approach however as argued further by Hill, *et al.,* (2006:84), produces estimates with wide confidence intervals, and in this regard it compromises on trend analysis. The method also provides a historical rather than a current maternal deaths estimate as it mainly has approximately a five years prior to the survey as a reference point.

The other approach is the use of reproductive-age mortality studies (RAMOS) which makes use of the triangulation of various data sources of maternal deaths for a specific reproductive age group to identify maternal deaths coupled with review records including civil register, health facilities and/or verbal autopsy (WHO, 2014:9). This method is an economical way of measuring maternal death as compared to population based surveys provided as long as it traces the deaths in women of reproductive age (Bowie & Geubbels, 2013:53) . Estimates derived from household surveys are also subjected to wider confidence intervals and long period rates (often for 10-year periods). Despite the wider confidence intervals, the use of multiple sources triangulation renders the RAMOS approach as the best way to estimate levels of maternal mortality (WHO, 2015:1). In some cases, also the global and regional estimates of maternal mortality are developed and modelled every five years. Community-based surveillance systems are also used in providing maternal mortality levels. These are basically longitudinal studies and do provide current estimates, and insight into the determinants of maternal deaths however the approach has proven to be costly (Bowie & Geubbels, 2013:53).

Childhood mortality captures the permanent disappearance of evidence of life of children under the age of five (WHO, 2010:155). These childhood mortality rates are defined and measured according to ages. For example the under-five mortality rate measures the probability of dying between birth and fifth birthday; neonatal mortality rate which is the probability of dying within the first month of life; infant mortality rate defined as the probability of dying between exact ages one and the fifth birthday; and

the post neonatal mortality rate which is the difference between infant and neonatal mortality (United Nations, 2013:6). All these rates are expressed as deaths per 1,000 live births, except child mortality, which is expressed as deaths per 1,000 children surviving to the first birthday. In some cases however, for example in Malawi, it is rare to come across 1,000 births on the same day and follow their death pattern until their first birthday. The child mortality rate is therefore estimated using statistical and/ or demographic techniques (NSO, 2012:21).

The representative child mortality estimates can be derived from several sources, among which are civil registration, censuses and sample surveys. The use of demographic surveillance sites and hospital data are mostly not included as they rarely provided representative estimates (UNICEF, 2014:5). The preferred source of childhood mortality data is the civil registration system, which normally account for the births and deaths on a continuous basis and covers entire population hence accurate and timely. However, this is on assumption of a complete and efficient registration coverage systems function efficiently, which is a challenge in most developing countries, as many countries do not have viable or fully functioning vital registration systems that accurately record all births and deaths. It is estimated by UNICEF that only around 60 countries across globe have such fully functioning systems.

Therefore, household surveys, such as the Multiple Indicator Cluster Survey (MICS) which ask women about their children survival information, the HIV/AIDS and Reproductive Health Survey are increasingly being used to provide comparative assessments of childhood mortality levels as a health outcome for most developing countries (UNICEF, 2014:5). These surveys mostly use stratified multistage cluster sampling designs, with over-sampling of smaller domains such as urban areas or certain regions of a country to minimise errors (Kandala & Ghilagaber, 2014:2). As in many demographic data using the hierarchical or clustered structure, the childhood mortality analysis involves a natural hierarchy where children are grouped within mothers or families, and into communities.

These methods of using history data, collected by censuses and many household surveys, and use the age of the woman have inherent limitations among which are higher fluctuations over time especially where there are low fertility and mortalities,

the age group adequacy where there are increasing (UNICEF, 2014:5). This has led to the global estimates techniques being further adjusted by comparing with the estimates derived from based on classification of women by the time that has passed since their first birth to minimise errors and adjust for fluctuations.

The fundamental principle in measuring health outcomes is not only in the role of providing understanding health but also that accurate data in measuring these health outcomes helps in providing a proper basis for setting goals and interventions. As the millennium development goals expire and the dawn of sustainable development goals (SDGs) set in (UN, 2012:35), the health outcomes trend across the globe are not only critical for measuring success of these goals, proper measure of these health outcomes cannot be divorced from its success.

2.5 HEALTH AT THE GLOBAL LEVEL

In further understanding the concept of health, global trend analysis of health outcomes provides a further illustration in looking at how countries have and continues to perform in health status of their population. The analysis of these health outcomes as related to diseases burden and mortality levels, does not only portray a higher level picture of health outcomes but rather acknowledges that health is an issue that cuts across the board and as individuals make up communities, nations and a global village, health or ill health individuals also entails health or ill health households, community, nation and health or ill health people across the globe. It is not surprising then that the Millennium Development Goals of the United Nations (UN) as indicated in Figure 2.4 has both the revealed and unrevealed targets on health outcomes across its goals.

Figure 2.4: Health related Millennium Development Goals

Goal 4: Reduce child mortality	
Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	• Under-five mortality rate • Infant mortality rate • Proportion of one-year-old children immunised against measles
Goal 5: Improve maternal health	
Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	• Maternal mortality ratio • Proportion of births attended by skilled health personnel
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	• HIV prevalence among 15/24 year-old pregnant women • Condom use rate of the contraceptive prevalence rate* • Number of children orphaned by HIV/AIDS
Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	• Prevalence and death rates associated with malaria • Proportion of population in malaria risk areas using effective measures for malaria prevention and treatment • Prevalence and death rates associated with tuberculosis • Proportion of tuberculosis cases detected and cured under directly observed treatment, short-course (DOTS)
Goal 8: Develop a Global Partnership for Development	
Target 17: In co-operation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	• Proportion of population with access to affordable, essential drugs on a sustainable basis

Source: United Nation (2002)

The revealed targets are encompassed in the three health related goals, namely the reduction by two thirds of the under-five mortality rate by 2015 under goal number three on reduced child mortality; reduction by three quarters the maternal mortality ratio by 2015 under goal number five on the improved maternal health; and the sixth goal on combat HIV/AIDS, malaria and other diseases with a target of halting them and begin to reverse the spread of HIV/AIDS and the incidences of malaria and other diseases (UN, 2012:35). The unrevealed targets on health comes into the picture as a result of the relationship population health has with the targets on eradication of extreme poverty and hunger, universal primary education, promotion of gender equality and women empowerment, environmental sustainability and the development of global partnerships. These have the notion of health development directly or indirectly in terms of the role of health in achieving the underlined goals or how health is affected in turn. For instance poverty, education and global partnerships, which are discussed in details in the subsequent chapter, can never be divorced from the health development circle both at micro and macro levels.

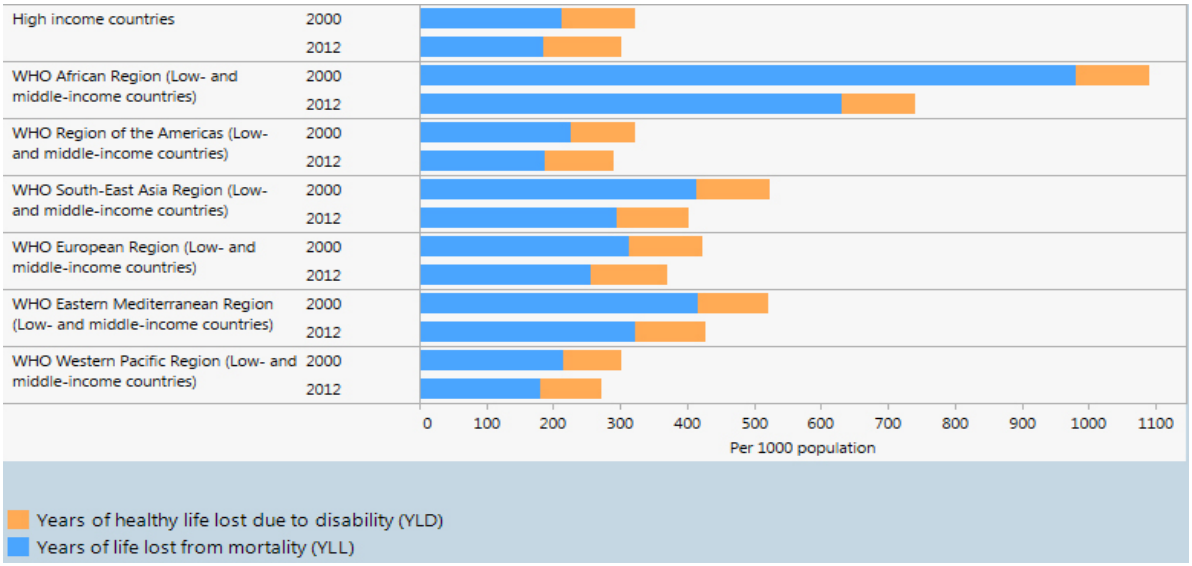
With reference to the global disease burden and mortality indicators between 1990 and 2013, and also from the Millennium Development Goals health related indicators performance, an objective conclusion is that there has been a mixed outlook in peoples' health performance across the globe (United Nations, 2013:3; Lozano *et al.*,

2013:2096; United Nations, 2015:5–6). Based on the 2015 MDG report, some health outcome indicators across countries have shown substantial progress for example reduction and decline in under five and maternal mortality rates however with some indicators like HIV disease burden achieving insufficiently against their targets (United Nations, 2015). The selected global health outcomes trends being analysed in this section are the disease burden especially on HIV/AIDS, malaria and tuberculosis, childhood and maternal mortality rates. These have been selected as the critical health outcomes that the study has based its analysis on. The analysis provides first global level trends followed by a comparison between developed and developing countries with an aim of providing a background to the socio-economic factors role in shaping health outcomes.

2.5.1 The global burden of diseases trends

One of the population health outcome indicators is the burden of disease (WHO, 2013). The global burden of disease as measured by the Disability Life Years (DALYs) shows that between the year 2000 and 2012, there has been a reduction in the DALYs in terms of the years of healthy life lost due to disability (YLD) and years of life lost from mortality (YLL) as presented in Figure 2.5:

Figure 2.5: Disability Adjusted Life Years (DALY) Rates by WHO and World Bank Income group (2000 and 2012).



Source: World Health Organisation (2013)

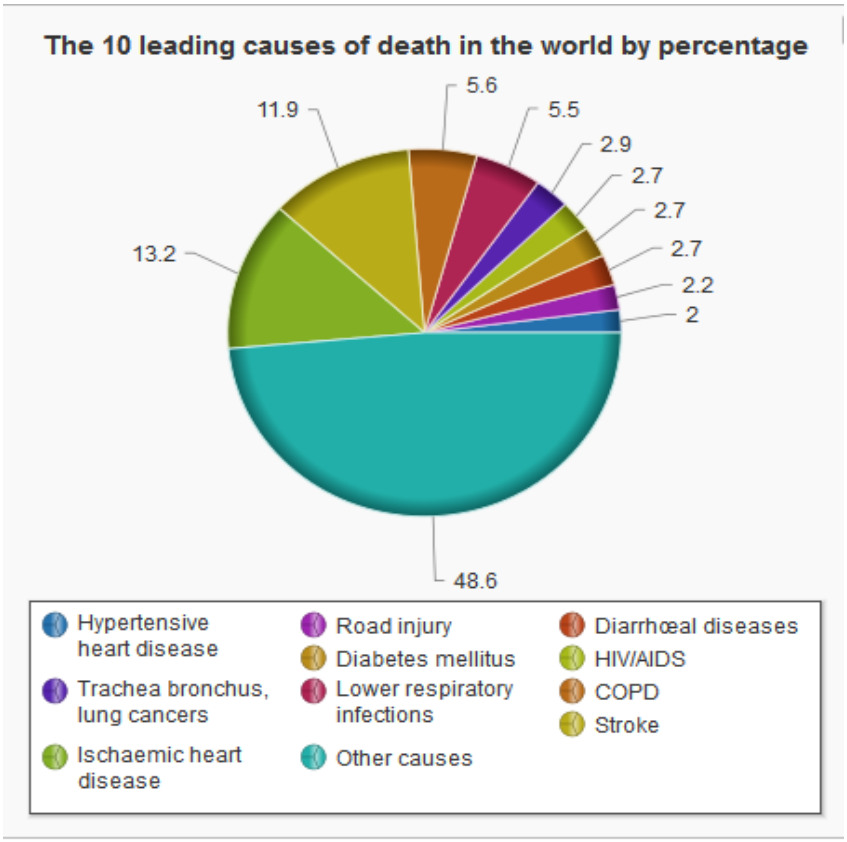
The global estimates show that HIV continues to be increasing the burden of disease as 2011 estimates show that 34 million people were living with HIV, which is definitely higher as compared to the preceding years. It is expected that the population living with HIV will continue to grow as fewer people die from AIDS-related causes with the improvement in access to the antiretroviral therapy. However, during the same year of 2011, an estimated 1.7 million people died from AIDS-related causes worldwide – an estimation of 24 percent less than in 2005 (WHO, 2013).

The 2013, World Health Statistics report further indicates that worldwide, between 2000 and 2012, malaria has also been a source of disease burden. However, the malaria mortality has been declining between 2000 and 2012 as estimated malaria mortality rates fell by 42 percent in all age groups and by 48 percent in children under 5 years of age. This trend had provided a basis in projecting a decrease by 52 percent in all ages and by 60 percent in children under 5 years of age by 2015: this represents a substantial progress in the WHO target of reducing the malaria mortality rates by 75 percent by 2015 (WHO, 2013). By 2015, malaria mortality has shown to have declined by 60 percent and achieving the MDG target of halting and reversing the malaria incidence trend (UNICEF, 2015:1). Tuberculosis (TB) which now ranks alongside HIV as a leading cause of death worldwide (WHO, 2015:1) has shown to have been responsible for the deaths of 1.5 million people in 2014 (1.1 million HIV-negative and 0.4 million HIV-positive). The HIV's death toll in 2014 was estimated at 1.2 million, which included the 0.4 million TB deaths among HIV positive people. The disease in 2012, killed over 900 000 people although was not being accounted among the 10 leading causes of death in 2012.

During the same period also, the main contributors to high burden of disease have been Ischaemic heart disease, stroke, lower respiratory infections and chronic obstructive lung diseases. The non-communicable diseases (NCDs) have also been responsible for 68 percent (38 million) of all deaths globally in 2012, which as compared to the year 2000, represents a 60 percent (31 million) increase. One such disease among the NCDs is cardiovascular diseases, which killed 2.6 million more people in 2012 than in the year 2000. The diarrhoea diseases, which are mostly considered poverty related (Marmot, 2012:9), although no longer being considered

among the 5 leading causes of death (WHO, 2014:1), still remained among the top ten, killing 1.5 million people in 2012. The other contributors to the lives lost hence under burden of disease included injuries which in 2012 claimed 5 million people each year with specifically the road traffic injuries claiming nearly 3500 lives each day in 2012 – more than 600 more than in the year 2000 – making it among the ten leading causes of deaths in 2012 (WHO, 2014:1). The global leading causes of deaths are summarised in Figure 2.6.

Figure 2.6: Global leading causes of deaths



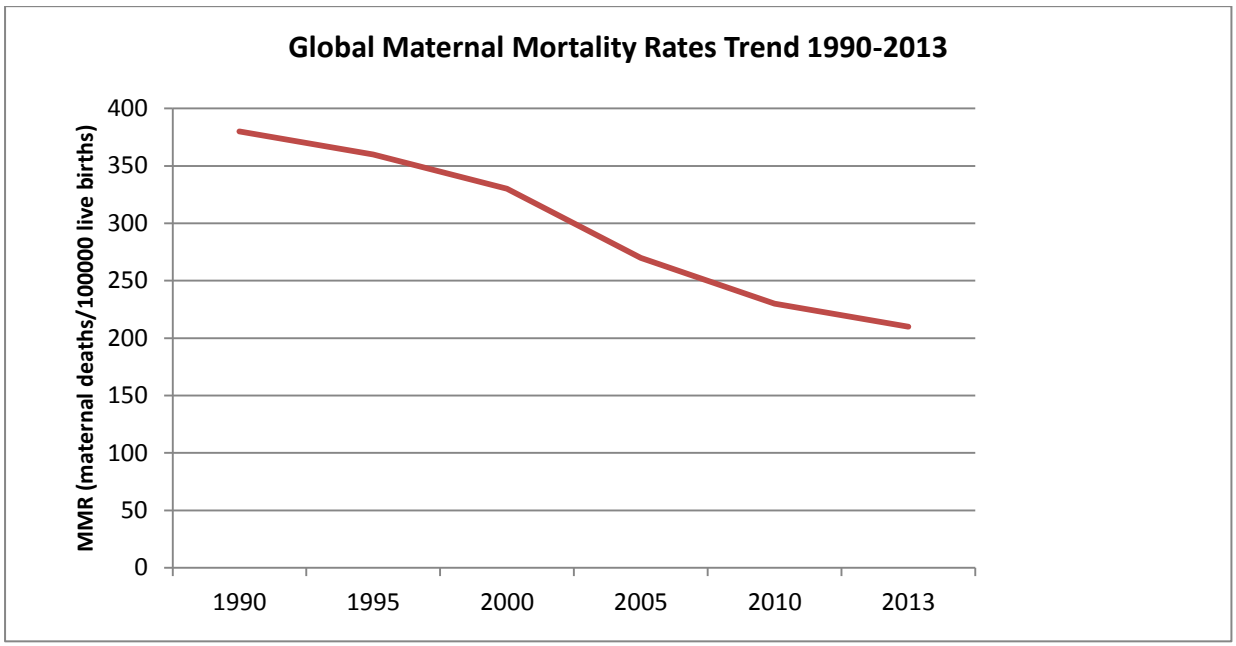
Source: WHO (2014)

As summarised in Figure 2.6, chronic diseases cause increasing numbers of deaths worldwide. Lung cancers (along with trachea and bronchus cancers) caused 1.6 million (2.9 percent) deaths in 2012, up from 1.2 million (2.2 percent) deaths in 2000. Similarly, diabetes caused 1.5 million (2.7 percent) deaths in 2012, up from 1.0 million (2.0 percent) deaths in 2000. The Figure 2.6 statistics can be summarised in one sentence about global health in terms of disease burden. The world at large still has an ill health burden that requires systematic offloading.

2.5.2 Maternal and childhood mortality rates

Apart from the disease burden as a measure signalling a heavy burden of ill health, the maternal and childhood mortality do also provide another dimension on the same. According to the WHO Global Health Observatory (2014), every day in 2013, about 800 women died due to complications of pregnancy and child birth (WHO, 2014:4). Despite such an alarming figure however, there has been a decreasing trend in the maternal deaths as shown in the Figure 2.7. A substantial reduction in maternal deaths has been achieved across the globe from 543 000 deaths in 1990 to an estimated 287 000 by 2010, with a global rate of decline in the maternal mortality ratio of 3.1 percent per annum over the same period (WHO, 2013:14).

Figure 2.7: Global Maternal Mortality Trends



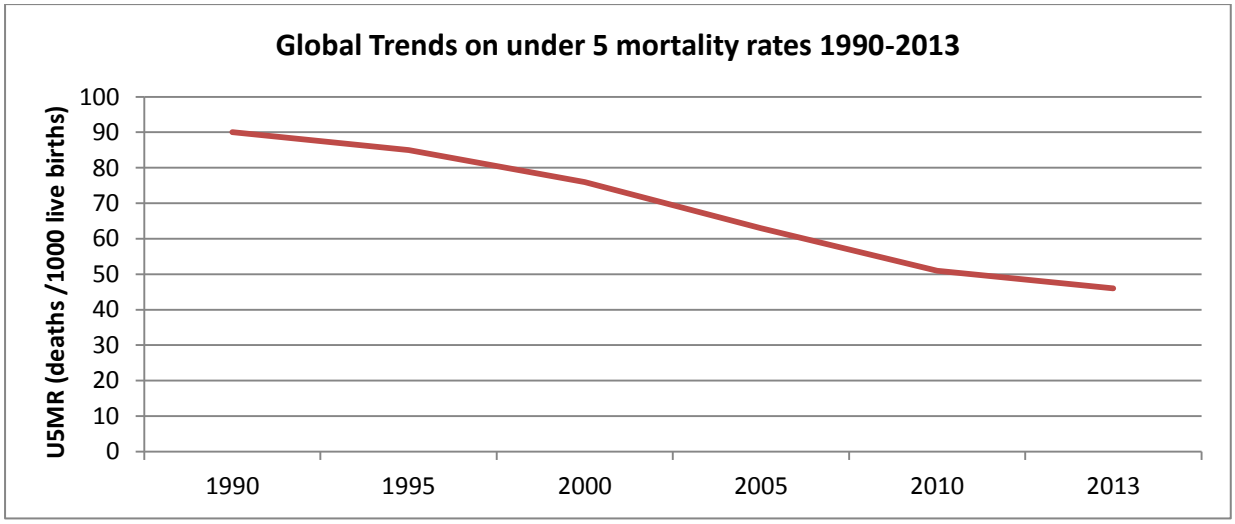
Source: WHO (2014)

In Figure 2.7, the maternal deaths' trend shows that the number of deaths from 1990 to 2011 from direct and indirect obstetric causes (excluding HIV), and HIV-related deaths during pregnancy have been declining. Worldwide the trend shows that the maternal deaths on average have been declining at 1.9 percent per year from 1990 to 2011 (WHO, 2014:4). The subset of maternal deaths due to direct and indirect obstetric maternal deaths declined steadily at an annual pace of 2.8 percent, from 1990 to 2011. Furthermore over the same period, the number of HIV-related deaths

during pregnancy, which contributes significantly to the maternal deaths, registered its peak levels, however through the scale-up of antiretroviral drugs and the natural epidemic curve for HIV has since declined as also reported by Lozano *et al*. (2011). It is worth noting that a number of countries in the world, including China, India, and some countries of sub-Saharan Africa (such as Kenya, Swaziland, Zimbabwe, and Botswana), have seen acceleration in the past 10 years, whereas others, including South Africa, Mexico, and Brazil, have experienced a reduced pace of decline (Lozano *et al.*, 2011:1142; WHO, 2014:4).

Global childhood mortality can be shown in general terms by for example the under-five mortality rate which is measured by the number of deaths in children before the age of five per 1000 dropped from 87 per 1000 live births in 1990 to 51 in 2011 representing a 41 percent decrease (United Nations, 2013:6). Globally, by 2010, 7·6 million children died before reaching their fifth birthday (Liu *et al.*, 2012:2151). This number decreased from 9·6 million in 2000 and the mortality rate per 1000 live births in children younger than 5 years decreased from 73 to 57.1 signifying improved child survival in the past decade at the global level. In other words, despite such deaths, the trends globally have continued to steadily decline in comparison between 1990-1995 which was 1.2 percent to 4 percent decline between 2005 and 2013 (UNICEF, 2014:2) as shown in Figure 2.8.

Figure 2.8: Under-five Global mortality rates



Source: UNICEF (2014)

The worldwide mortality rate for children younger than 5 years, according to the United Nations International Children Emergency Fund (UNICEF) 2014 report, declined continuously from the MDG baseline in 1990 to present at an annualised rate of 2·2 percent. The decline in the under-five mortality rate is composed of the an annual decline of early neonatal deaths of 1.7 percent, late neonatal deaths of 2.7 percent, post neonatal deaths of 2.4 percent and childhood (ages 1-4 years) of 2.4 percent. Worldwide, early neonatal death rates have been the slowest to decline despite registering progress. The distribution of under-five mortality across countries has kept showing a substantial shift to lower levels of under-5 mortality supporting a view that there is steady, albeit slow, convergence of countries towards lower and more equally distributed levels of child mortality across countries (Lozano *et al.*, 2011:1140; UNICEF, 2015:58).

On global maternal and childhood mortality rates, it is observed within the years of 1990 to 2013 that many aspects of health systems, for example financial and human resource limitations, slow down the scale-up of child and maternal interventions (UNICEF, 2014:2). Nevertheless, some intervention strategies for children, such as vaccination, distribution of insecticide-treated bed nets, vitamin A supplementation, and deworming can be delivered without a health system that has the capacity for referral and emergency management have been key towards registering the decline (Lozano *et al.*, 2011:1139; WHO, 2014:4). Further, the worldwide rate of decline in under-5 mortality rates and the maternal mortality ratio have been declining faster in most countries than the worldwide rate (WHO, 2014:4). This has been because of the concentration of births and child deaths in key sub-Saharan African countries with slow rates of decline an aspect that has been discussed in details on account of analysing further the mortality rates in developing countries.

However, it is worth noting that in comparing the maternal mortality trends and child mortality trends over the years, there has been a substantial variation in the rate of decline in the maternal mortality ratio at the same rate of decline in under-5 mortality and according to a study by Lozano *et al*. (2011). The results of the study show the correlation coefficient between the rates of progress for children and mothers is only 0·42. The trend pattern is also being reflected in the maternal and childhood mortality progress 1990 to 2013 by WHO (WHO, 2014:4). In most of the countries,

with a pace of decline in the maternal mortality ratio between one percent and three percent per year, decline in under-5 mortality has been ranging from under one percent to over seven percent per year. in other words most countries have made faster progress in reducing child mortality compared with maternal mortality (Lozano *et al.*, 2011:1142).

2.6 HEALTH OUTCOMES IN DEVELOPED AND DEVELOPING COUNTRIES

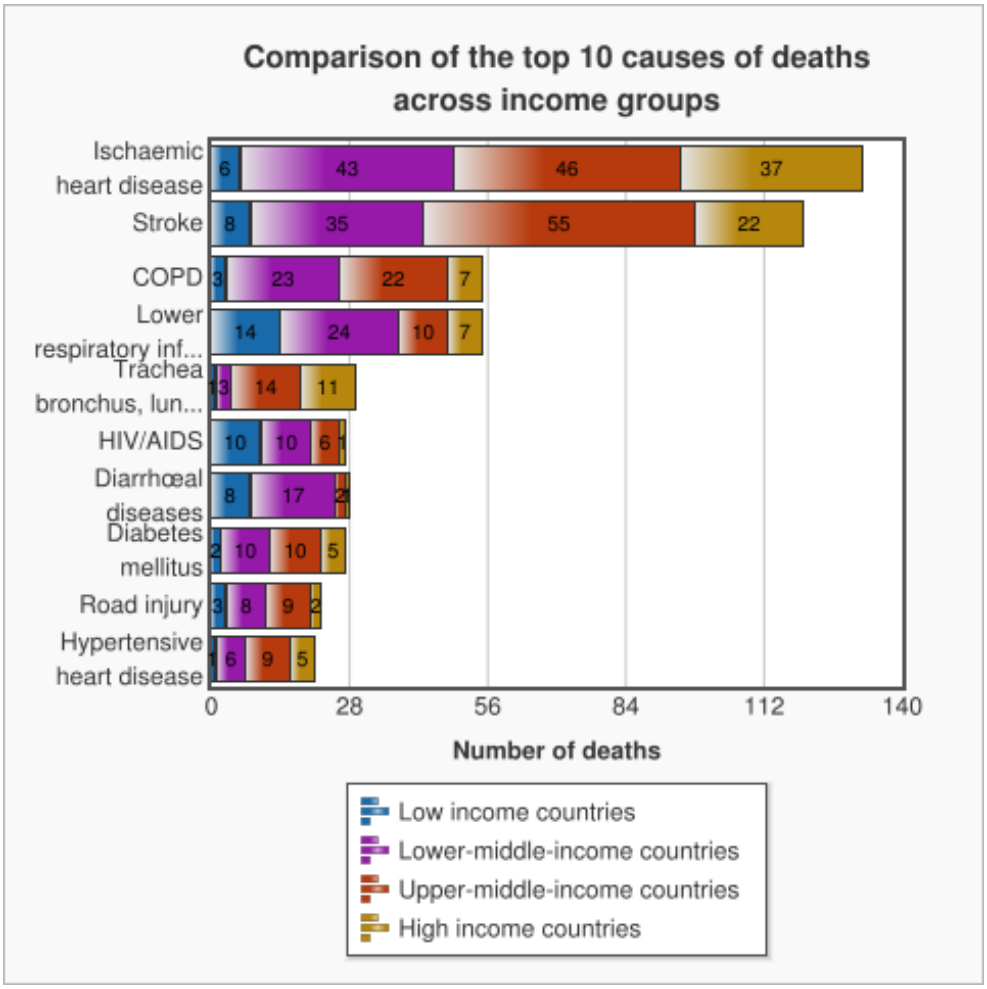
In analysing the health outcomes trend, there is a clear line of difference in how progress in improving health outcomes, both between and within developed and developing countries, is being achieved. It can be observed in the literature that these disparities between regions as well as between countries continue to play a greater role in health outcome disparities across the globe (Lozano *et al.*, 2013:2096; Amouzou *et al.*, 2014:2) as the poor and vulnerable are being left behind (United Nations, 2015:8). This section discusses the levels and trend in the health outcomes on the disease burden and mortality trends.

2.6.1 Disease burden in developed and developing countries

The burden of disease across the globe is shown to be higher amongst developing countries especially in the low-income category in contrast to developed countries. For example, in high-income countries, only one in every 100 deaths is among children under 15 years and that seven in every 10 deaths are among people aged 70 years and older. People predominantly die of chronic diseases: cardiovascular diseases, cancers, dementia, chronic obstructive lung disease or diabetes (WHO, 2014:1). Lower respiratory infections remain the only leading infectious cause of death. This is further noted in the report especially with the developing countries particularly among the low-income countries where, nearly four in every 10 deaths are amongst children under 15 years, and only two in every 10 deaths are among people aged 70 years and older. In these countries, people predominantly die of infectious diseases: lower respiratory infections, HIV/AIDS, diarrhoeal diseases, malaria and tuberculosis collectively are responsible for one third of all deaths in these countries. Amongst the leading causes of deaths are complications of childbirth due to prematurity, and birth asphyxia and birth trauma, which claims the

lives of many new-borns and infants. Figure 2.9 summarises the major causes of deaths across the globe categorised by income regions.

Figure 2.9: Top Ten causes of death in the low-income countries



Source: WHO, (2015).

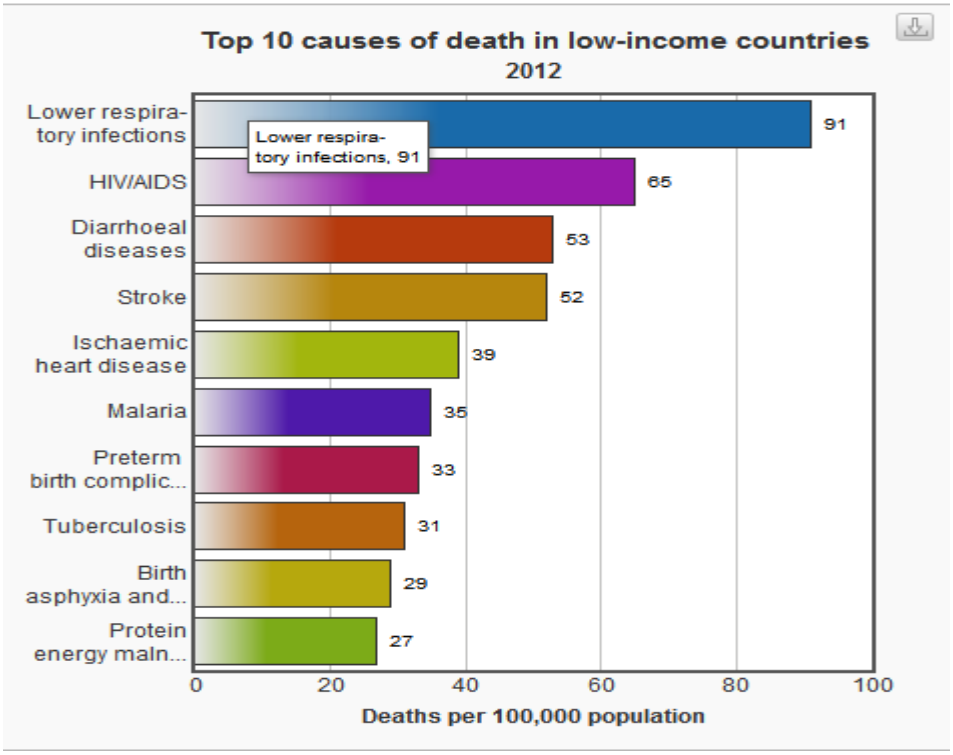
As can be observed in Figure 2.9, the major causes of deaths in the low-income countries were communicable and non-communicable diseases as a general pattern despite differences that can be observed from the regional or national patterns. The eastern and southern sub-Saharan Africa as part of the low-income countries has had its burden of disease been largely affected by the HIV epidemic.

With such statistics, what it means is that if a diverse international group of 1000 individuals was to be analysed being represented by women, men and children from all over the globe their deaths would have mean that 133 would have come from low-

income countries, 356 from lower-middle-income countries, 302 from upper-middle-income countries and 209 from high-income countries. In considering age, 143 would have been children under 15 years of age, 407 adults aged 15-69 years old and 450 adults aged 70 years and older (WHO, 2015:1).

In isolating the top ten causes of deaths in the low-income countries, which have shown to be highly impacted by the disease burden, the disease pattern is not different except that malaria and tuberculosis are shown to be amongst the leading causes as presented in Figure 2.10:

Figure 2.10: Top Ten causes of death in the low-income countries



Source: WHO, (2014).

As presented in Figure 2.10, lower respiratory infections, HIV/AIDS, diarrhoeal disease are amongst the leading cause of deaths in lower income countries. Malaria is a leading cause of the disease burden in areas especially from West Africa to Madagascar (Murray *et al.*, 2013:455). In summary, the African Region where most of these low-income countries are, these conditions still dominate, causing 61 percent of deaths in 2012, down from 71 percent in 2000. HIV/AIDS, lower respiratory infections, diarrhoeal diseases and malaria were and continues to be the

leading causes of in 2012, killing 3.3 million people, which was over one-third of all deaths in the region (WHO, 2014:1). These prevailing conditions in developing countries are mainly associated with effects of poverty for example poor sanitation, poor quality of health services as restrained by impoverishing economies, poor life styles which have not only proven to be risk factors among many developing countries but also have complicated progress towards achieving better health (United Nations, 2015:8).

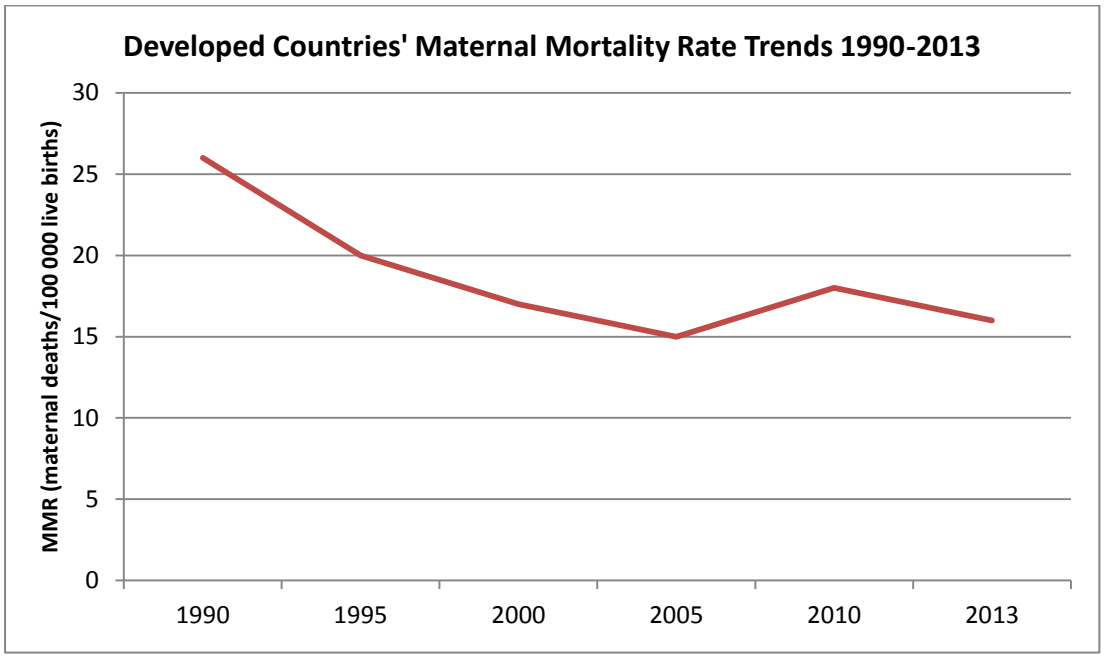
A low-income base is one of the social economic factors with which most developing countries continue to struggle in their efforts to improve their health indicators. Many developing countries' health systems have not been as effective as hundreds of millions of the world's poor people do not have access to public health services and personal health care they need (WHO, 2003:30). It is under these circumstances that it is not difficult to understand how social factors like poverty as material deprivation, dirty water, poor nutrition coupled with lack of quality medical care can account for high mortality rate in poverty stricken countries (Marmot, 2008:420). For example, communicable diseases especially those associated with poor environment, maternal, peri-natal and nutritional problems have been shown as being leading causes of for most instances of ill health in low-income countries and among the poor in the middle-income countries. They are the major cause of the general morbidity. These are also responsible for the most maternal and childhood mortality and morbidity as discussed in the subsequent section.

2.6.2 Maternal and childhood mortality in developed and developing countries

According to the WHO Global Health Observatory (2014), every day in 2013, about 800 women died due to complications of pregnancy and childbirth and that 99 percent of these deaths occur in developing countries. Almost all of these deaths occurred in low-resource settings, and most could have been prevented. Women in developing countries have on average many more pregnancies than women in developed countries have, and their lifetime risk of death due to pregnancy is higher. A woman's lifetime risk of maternal death, the probability that a 15 year old woman will eventually die from a maternal cause, is 1 in 3700 in developed countries, versus 1 in 160 in developing countries (WHO, 2013:21). The MMR for developed countries in 2013 was 16 as compared to 230 in the developing regions as observed further by

the WHO Global Health Observatory (2014). The MMRate trend in the developed region is shown in Figure 2.11:

Figure 2.11: Maternal Mortality Trends in the Developed Region



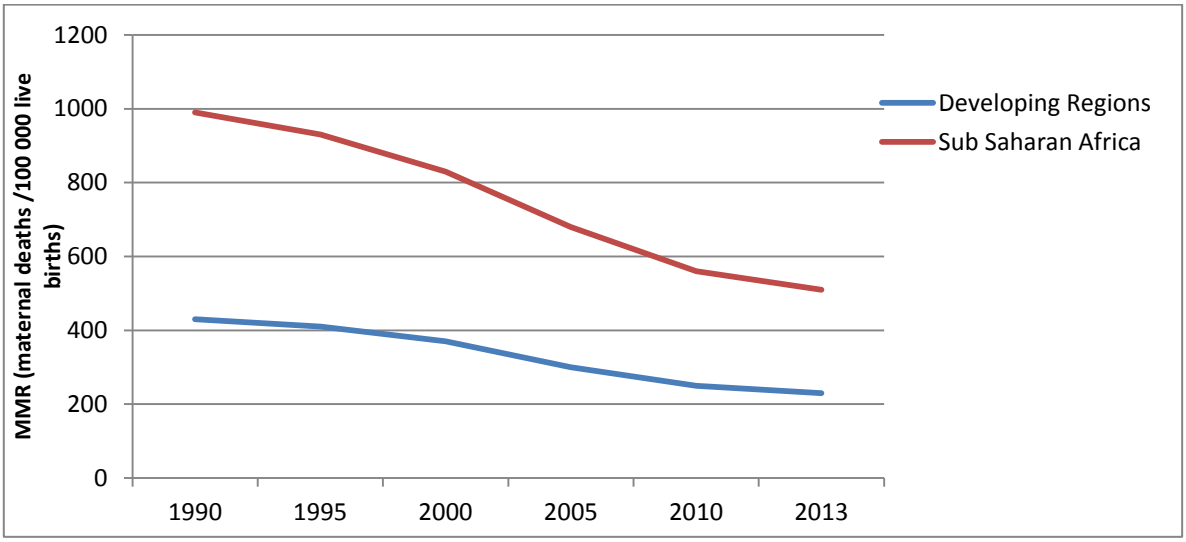
Source: WHO, (2014).

The Maternal Mortality Rates in developing countries have had an uphill challenge in the past decade. The high number of maternal deaths in some areas of the world reflects inequities in access to health services, and highlights the gap between rich and poor. According to WHO (2014) analysis on maternal mortality, almost all maternal deaths (99 percent) occur in developing countries. More than half of these deaths occur in sub-Saharan Africa and almost one third occur in South Asia.

The maternal mortality ratio in developing countries in 2013 is 230 per 100 000 live births versus 16 per 100 000 live births in developed countries (WHO, 2014:59). There are large significant differences between countries, with a small proportion of countries having extremely high maternal mortality ratios around 1000 per 100 000 live births as reported in the WHO (2014) report on maternal mortality. There are significant differences within countries when comparing women with high income those with low income and those living in rural as compared those living in urban areas. It is also noted that the risk of maternal mortality is highest for adolescent girls under 15 years old and that pregnancy and childbirth complications are the leading

cause of death among adolescent girls in developing countries. The MMRate trends in developing countries including the sub Saharan African Region are presented in Figure 2.12:

Figure 2.12: Maternal Mortality Trends in Developing Countries



Source: WHO, (2014).

In general terms, the situation in developing countries for the past decade has been progressive in reducing the maternal mortality rates as observed in Figure 2.12. In 1990, high-income countries in Western Europe, Australasia, and Asia Pacific had under-5 mortality of 10 per 1000 live births. Almost all of these deaths occurred due to interaction between pre-existing medical conditions and pregnancy in low-resource settings, and most could have been prevented (WHO, 2014:59). The primary causes of death have been mainly haemorrhage, hypertension, infections, and indirect causes. The risk of a woman in a developing country dying from a maternal-related cause during her lifetime as noted further in the report is about 23 times higher as compared to a woman living in a developed country. Maternal mortality rate is one of the health indicators which demonstrates wider gaps between rich and poor, urban and rural areas, in other words both between and within countries (Lozano *et al.*, 2011:1142).

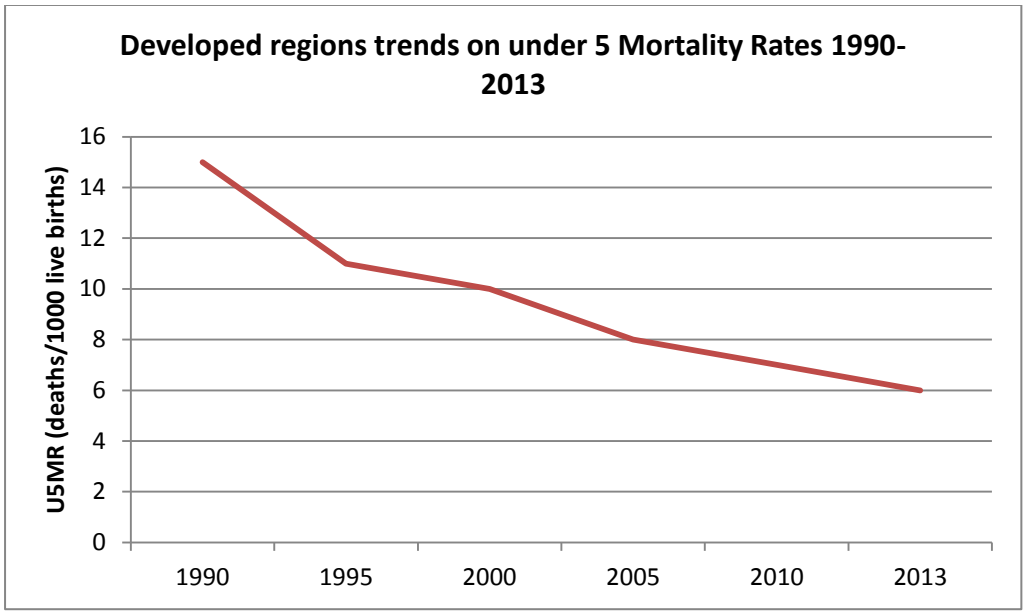
Global progress to reduce the MMRate should perhaps not be seen as surprising. Some powerful drivers of maternal mortality are in any way improving in most countries according to a study by Hogan *et al*. (2010), Word Bank (2014) and

UNICEF (2014). These are mainly the reduction of total fertility rate hence keeping the size of the global birth cohort stable as societies with decreased TFR have also been the places with declining MMR as the decrease in TFR has kept the size of the global birth cohort stable and reduced exposure to risk of maternal death (Hogan *et al.*, 2010:12). According to the World Bank, Population Division, total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates World Bank (2014). The other drivers have been the income per head, whose effect on maternal mortality is through the mothers' nutritional status as well as the role of income in enabling easy access to health care. The maternal educational attainment has also been another strong drive towards improved maternal mortality in for example in the sub Saharan Africa where the average years of schooling of women in the reproductive age of 25–44 years have increased (WHO, 2014:4).

The steady decline in maternal related deaths despite being slow in developing countries has also been attributed to the rise in coverage of skilled birth attendance. One of such countries that have demonstrated this factor has been India, which has witnessed over the recent years a quite rapid increase in skilled birth attendance (WHO, 2014). Several countries in east and southern Africa have had likewise experienced a substantial declines in the maternal related deaths due to the decline HIV-related deaths during pregnancy because of the expansion of antiretroviral drug programmes (Lozano *et al.*, 2011:1152). These factors have hence been behind the general decline in the global MMRate in the past decade and such a downward trend would not be as a surprising outcome.

The mortality disparities among countries have not only been observed with the maternal mortality rates but also with the under-five mortality rates. The under-five mortality rates in the developed countries in the past decade have been significantly declining between 1990 and 1995 and registers further decline in the subsequent years as summarised in Figure 2.13.

Figure 2.13: Under Five Mortality Trends in the Developed Countries

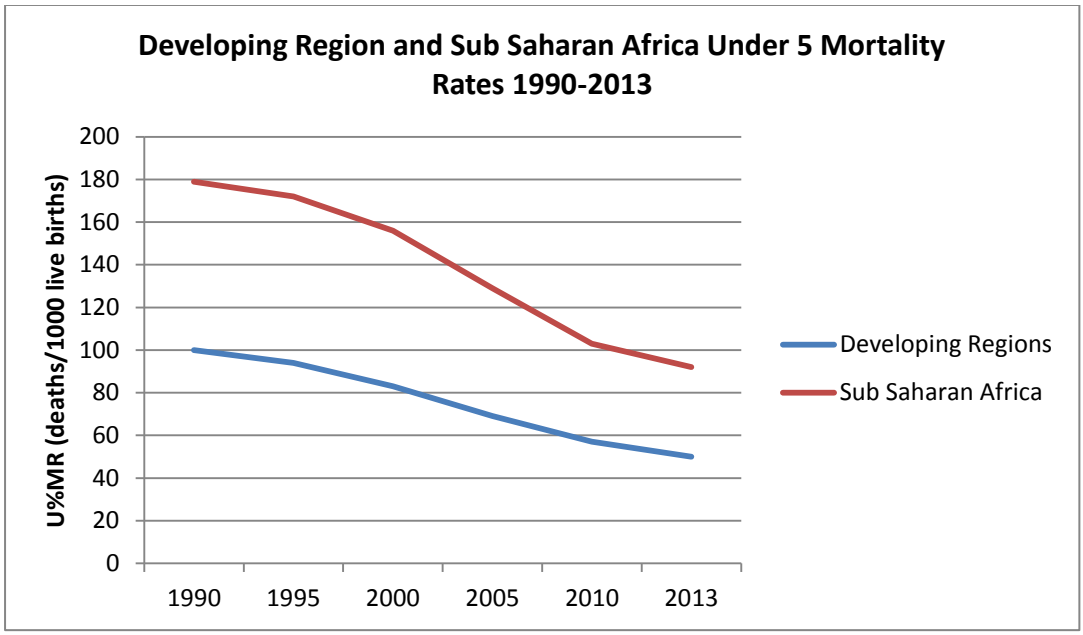


Source: UNICEF, (2014)

As presented in Figure 2.13, the under-five mortality rate in developed countries has been below 16 per 1000 live births and the trends have continued to decline. The childhood mortality decline in developed countries is attributed to the improved nutrition, sanitation and poverty reduction as early as 1900 from which developing countries can learn from in its fight against higher childhood mortality levels (Bowie & Geubbels, 2013:6)

In developing countries, on the other hand, the childhood mortality rate, especially the under-five mortality rate, are relatively higher as compared to the developed country despite that there has been a decline for the past two decades as presented in Figure 2.14.

Figure 2.14: Under Five Mortality Trends in the Developing Countries



Source: UNICEF, (2014).

By contrast, in the same years of 1990 to 2013, under-five mortality rate was relatively higher in developing countries and on average greater than 165 deaths per 1000 live births in the central, western and eastern parts of the sub-Saharan Africa. In these regions, the under-5 mortality was largely from the childhood mortality which contributed about 42·5 percent with early and late neonatal periods combined accounting for about 26 percent (Lozano *et al.*, 2011:1150). These higher under-five mortality rates have also been experienced in south Asia, where the early neonatal, late neonatal, post neonatal, and childhood have been showing wider gaps between 1990 and 2013 (Lozano *et al*., 2011:1150; WHO, 2014:4).

However, by 2011 notwithstanding the slower decline in child mortality worldwide, the age distribution pattern in sub-Saharan Africa also slightly changed, similarly in south Asia, Latin America (tropical and southern), as well as in north Africa and the Middle East where about 50 percent of deaths are in the neonatal period where early neonatal deaths did show some predominance (Lozano *et al.*, 2011:1150). Despite a steady decline in early neonatal, late neonatal, post-neonatal, childhood, and under-five deaths by country, the disparities have continued between 1990 and 2013. For example there have been lower childhood mortality, as low as 0.8 in Japan, a developed country, and higher in Equatorial Guinea and Mozambique at 35·7 and

postnatal reaching to greater than 60 deaths per 1000 live births in 2011 a case of developing country (Lozano *et al.*, 2011:1150; UNICEF, 2014:58).

It is also worth noting that the biggest mortality gap between countries was registered in the childhood mortalities, with reference to the 1990 and 2013 trends. In 2011, for example the childhood mortality in developed countries like Sweden, Italy, and Greece is about 0.5 deaths per 1000 live births, whereas in Niger and Equatorial Guinea it is around 87, representing a 173-times difference (Lozano *et al.*, 2011:1150). In analysing the decline in relation to the mortality distribution, the observation is that there has not only been the shifts in the distribution of countries towards lower rates of child mortality but also that the distribution width has narrowed over the recent years (Amouzou *et al.*, 2014:5). The distribution of countries in 2011 has shifted considerably towards lower levels of under-5 mortality and towards equally distributed child mortality levels across countries supporting a view that there has indeed been a steady, though slow, with convergence among countries (Lozano *et al.*, 2011:1150; Amouzou *et al.*, 2014:5).

It is important to appreciate that the trends and health outcomes are bound to be different from one region or category of people to another. Despite that, it is critical to note that some disparities can be reduced by eliminating the intra country disparities some of which are socio-economical. For instance, a study by Amouzou *et al*., (2014) suggests that the global under five mortality gap can be reduced by well over half if the inter country under five disparities are eliminated (Amouzou *et al.*, 2014:5). The findings support the very idea that economic inequalities in the developing countries, contribute a greater proportion to the global health gaps more than the inequalities between the countries does.

2.7 CONCLUSION

The chapter has discussed the notion of health literature by analysing its definitions and examining its determinants. The chapter also demonstrated how health is measured and provided these measures as shown by health outcome trends both at global and country levels mainly under the categories of developed and developing countries.

The definition of health in the study, having considered the biological, biomedical, frailty definitions, has been informed by the WHO definition which entails health as the complete state of physical, mental and social wellbeing however with emphasis on the ability to adapt and self-manage with regards to the social, physical, and emotional challenges (Huber *et al.*, 2011:1; Boers & Cruz Jentoft, 2015:2). The definition also provided the basis for understanding the determinants of health. In analysing how the health determinants operate, some models have been examined to provide the basis operational framework through which these determinants affect people's health.

The study has considered three models, namely the factor interaction model, which explains how the broad categories of society and environmental factors (upper stream factors) influence the category of individual's socio economic characteristics such as employment and level of education (downstream factors) which in turn impact the individual's health and behaviours, psychological state and safety. The study also considered the Whitehead (1991) model, which captures the contribution of sectoral policies to heath objectives, which are seen as beneficial or adverse and the impact increased through interactive effects between them. The last model was the tetrahedron model, which looks at health as resting on three pillars, hence a pure tetrahedron in promoting resilience and coping up with the wellbeing and integrity. The three pillars of physical, social and mental support individual health.

The concept of health has also further been elaborated in the study by examining the literature on how health is measured. Due to the scope of this study, the measurement of health was confined however to disease burden, which included incidence, prevalence and morbidity rates; and the measure of health as demonstrated by the mortality rates where maternal and childhood mortality rates have been focused. As a way of demonstrating these measures further, the chapter also focused on the health indicators trends in the period 1990 to 2013.

The burden of disease across the globe is shown to be higher amongst developing countries, especially in the low-income category, as compared to developed countries. With reference from the global disease burden and mortality indicators between 1990 and 2013, and also from the Millennium Development Goals health related indicators performance, an objective conclusion is that there has been a

mixed outlook in peoples' health performance across globe (United Nations, 2013:3; Lozano *et al.*, 2013:2096; United Nations, 2015:5–6). For example, communicable diseases, especially those associated with poor environment, maternal, perinatal and nutritional problems have been shown as being leading causes of for most instances of ill health in low-income countries and among the poor in the middle-income countries. These are also responsible for the most maternal and childhood mortality and morbidity as discussed in the subsequent section. Further analysis as based on the 2015 MDG report, some health outcome indicators across countries have shown substantial progress for example reduction and decline in under five and maternal mortality rates however with some indicators like HIV disease burden achieving insufficiently against their targets.

With reference to the Maternal Mortality Rates (MMR), in general terms, the chapter has shown that there has been a general decline in the MMR across the globe mainly from a number of factors. One such factor is the reduction of total fertility rate, which has helped keep the size of the global birth cohort stable and reduced exposure to risk of maternal death. The other contributing factor has been improved income per head, which can affect maternal mortality through several channels from nutritional status of mothers to physical and financial access to health care. The notable third factor has been increase in maternal educational attainment, which strongly correlates with maternal mortality, has been rising for example, the improved average years of schooling of women in the reproductive age. This substantial improvement in sub-Saharan Africa has also been attributed to the improved trends in the region. The maternal mortality declines some large countries such as India have been attributed to the quite rapid increases in skilled birth attendance in recent years.

In summary, there has indeed been improvement in many countries that had the highest rates of mortality despite the large gaps still persisting both among and within countries, more especially between the developed and developing countries. Despite such disparities though, the current trends continue to provide a sound basis for intensified collective action and the expansion of successful approaches in dealing with the immense challenges posed by multiple crises and large inequalities in health (WHO, 2013).

The same decline has also been observed under the child mortality trends. It is noticeable that despite the declining under-five mortality trends however the level of achievements varies from one region to another, and more staggering when analysed by country level. The under-five mortality rate in the low income countries have been higher, 12 times more than the average rate in the high income countries (UNICEF, 2014:2). These regional and country disparities indicate that increased child deaths have concentrated in the poorest regions of the world (UN, 2013:4). On global maternal and childhood mortality rates, it is observed within the years that many aspects of health systems for example financial and human resource limitations; slows down the scale-up of child and maternal interventions (UNICEF, 2014:2). Nevertheless, there have been some interventions such as vaccination, distribution of insecticide-treated bed nets, vitamin A supplementation, and deworming, which have been key towards registering the decline (Lozano *et al.*, 2011:1139; WHO, 2014:4).

In analysing the health outcomes trends and determinants associated, it is clear in the chapter that the role of socio-economic factors cannot be separated from understanding health the concept of health. These socio-economic factors have been touted as being key in determining health (WHO, 2005:35; Chapman, 2010:22) and continues to be crucial in shaping both population and individual health (Marmot, 2012:2; Braveman & Gottlieb, 2014:19). The next chapter provides an analysis on the literature and models of health as being determined by the social determinants.

CHAPTER 3

THE SOCIAL DETERMINANTS OF HEALTH

3.1 INTRODUCTION

The role that Social Determinants of Health play in health emanates from the definition of health itself as adopted in the study where health as a social, mental and physical state provides fundamentally an onset basis towards its inherent determinants critical role and influence. Evidence has accumulated for the past three decades, pointing to socio-economic factors such as income, wealth, and education as the fundamental causes of a wide range of health outcomes (Braveman & Gottlieb, 2014:19).

There has been a general agreement in most determinants of health literature that not all ill health is caused by biological or environmental factors (Lawn, 2008:36; Liamputtong, 2012:13). For the past three decades, since the Whitehall study by Marmot *et al*. (1978) on the causes of causes of disease, the research on social determinants of health (SDH) has not only gathered momentum (Hunter *et al.*, 2011:522), but also, enriched understanding that apart from medical care, social, economic, cultural and political factors play a critical role in shaping the health outcomes (Braveman & Gottlieb, 2014:19).

The SDH are factors as defined by the World Health Organization's commission on the social determinants of health as "the conditions in which people are born, grow, live, work and age" and "the fundamental drivers of these conditions" WHO (2005). They are conditions as simply put, in which people live and work and have a powerful influence on health-related behaviours (Marmot & Wilkinson, 2011), a media through which the social world shapes the persons health (Krumeich & Meershoek, 2014:1). This chapter seeks to analyse the impact these factors have on both individual and population health through analysis on their role in determining health. The analysis will consider the models of SDH and the known linkages including their nature of relationship of some of the socio-economic factors like poverty, education, and employment and population growth.

3.2 SOCIAL DETERMINANTS OF HEALTH MODELS

In understanding the frameworks through which the social determinants operate from, three approaches on social production of health provides a theoretical background on the SDH (WHO, 2010:15). These are the psychosocial approaches; social production of disease/political economy of health; and the eco-social frameworks, which provide the basis for most of the SDH models.

The psychosocial approach of SDH considers health as psychosocial factors with an emphasis that it is the perception and experience of personal status in unequal society, which instigate stress, and poor health (Raphael, 2006:651). This approach also agrees with Cassel (1976:107) study, which argued that stress emanating from the social environment plays a critical role in changing and affecting the neuroendocrine function hence rendering the person more vulnerable to diseases. The change in neuroendocrine patterns and compromised subjective health capability emanating from their place in social hierarchies has also been established by a study by Wilkinson and Pickett (2006: 1768). It basically looks at how individuals 'embody' aspects of the contexts in which they live and work (Kelly *et al.*, 2007:10). As a result, living in a social setting, which has inequalities forces people to compare constantly with others their social status and feelings of shame and worthlessness coupled with chronic stress, endangers their health. The approach hence suggests that increase in inequalities on income or social status, weakened social cohesion generate a negative resonance on people's health in any given society (Lynch *et al*., 2001:194; Marmot, 2002:31).

The social production of disease/political economy of health approach on the other hand consider explicitly the role of economic and political determinants of health and disease. The approach is sometimes referred to as a materialist or neo-materialist position (WHO, 2010:15). The approach, while accepting the negative impact of the psychosocial consequences of income and social status put an emphasis on the structural causes of the social economic factors and not the mere perception of people (Kaplan, 1996: 999; Lynch *et al*., 1998:1074). In other words, the negative effects of income or social status on health reflect both the lack of resources and poor social investments across the community.

The third approach is the economic processes and political decisions which does not only provide critical conditions for the health development but also shapes the nature of public infrastructure, education, health services, transportation, environmental controls, availability of food, quality of housing, occupational health regulations (Krieger, 2001:668). The approach, as further discussed under Krieger (2001) eco-social approach, provides insights in integrating the social and biological factors into the determinants of population distribution of health. The approach provides an analysis that current and population patterns of health, disease and wellbeing have a systematic relationship with biological, ecological and social Organisation (WHO, 2010:12). Health hence responds to the influence of biological and social world and that neither of these factors can be isolated in understanding the individual and society health and way of living.

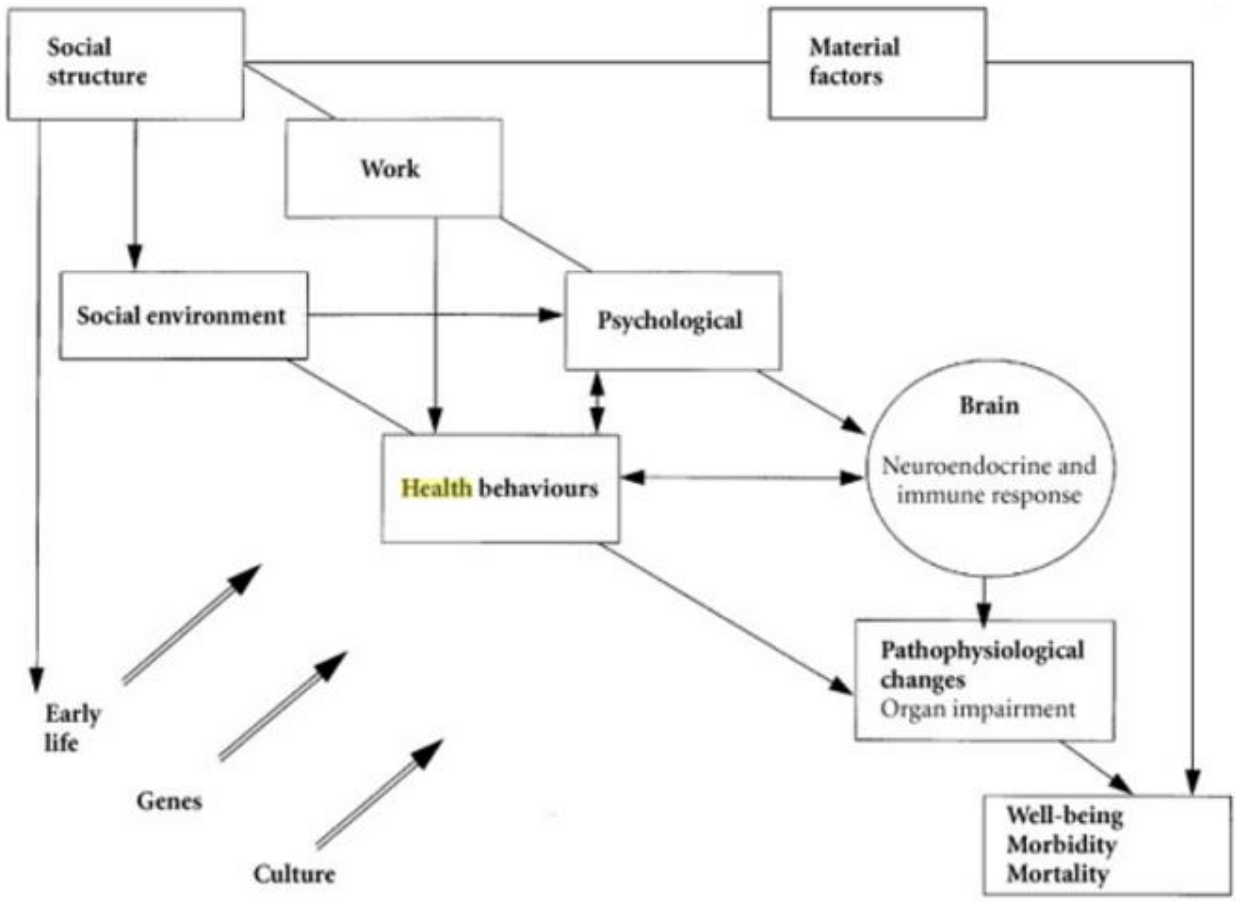
The three approaches in providing the nature and mechanisms of pathways for health and the SDH do consider the role of social position as critical in determining health and its inequalities. However, they differ on their aspects of the type of factors as they consider differently the role of the biological and social factors and how these conditions are integrated in determining health (Krieger, 2005:350). Regardless of the nature of factors, the SDH pathways analysis entails that when analysing levels of morbidity and mortality within a given society, the differences experienced are as a result of social position. Those towards the bottom end of the social scale are on average of often experiencing ill health and die earlier than those towards the top end of the scale experience. This is what is known as the social gradient in health (Liamputtong *et al*, 2012:180).

In any case, having analysed the approaches through which SDH pathways can take, the SDH are impeccably the major determinants of health and irrevocably underpinning the social remedies to being pivotal and critical in improving health outcomes (Marmot, 2005:1103). Furthermore, solid evidence from many epidemiological studies shows that people's health indeed is shaped highly by the social determinants (Liamputtong *et al*., 2012:180).

There are a number of models on the SDH as regards to focus, determinants to include and the levels of the determinants (Krumeich & Meershoek, 2014:2). One such model is by Marmot and Wilkinson (2005). The model as depicted in Figure 3.1

illustrates the interaction of the psycho, social and biological factors which are at the helm of defining the outcomes:

Figure 3.1: Social determinants of health



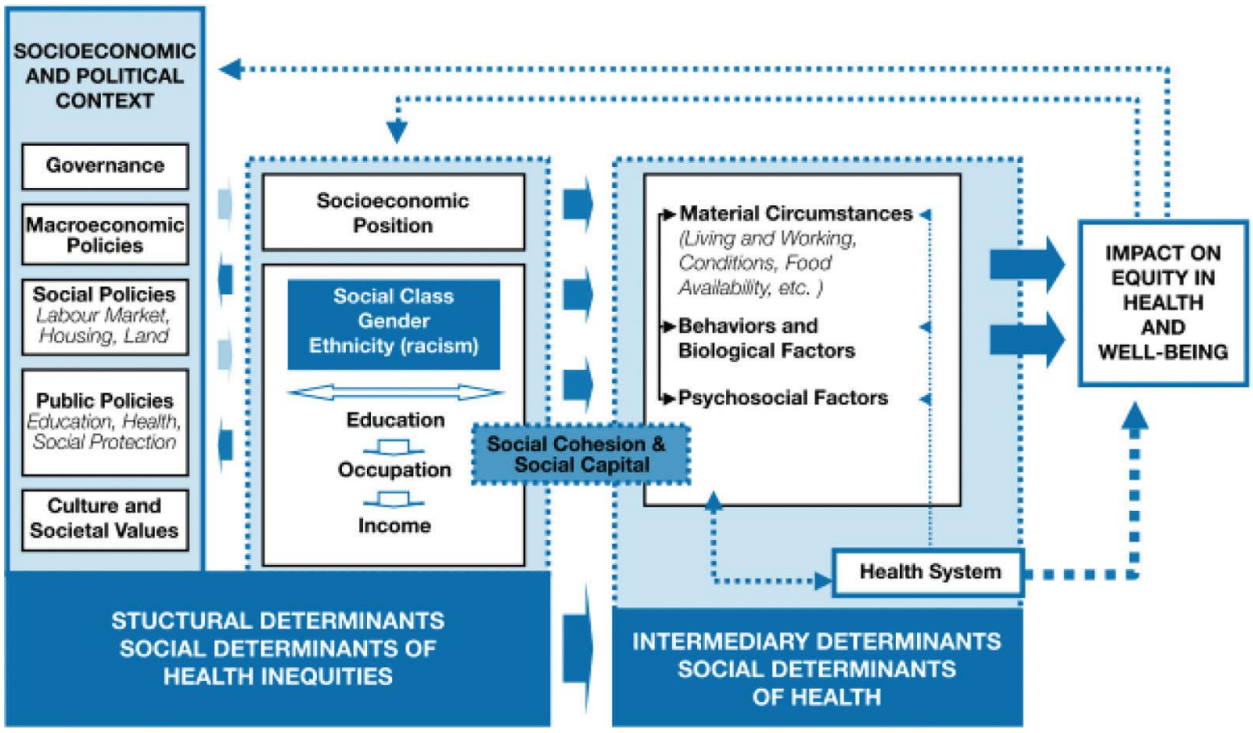
Source: Marmot and Wilkinson, (2005).

The model looks at health as being determined from social, psychological, biological and pathological perspectives. The model links the social structure to health and disease via material, psychological and behavioural pathways. The model also considers the generic early life and cultural factors as critical to the determination of the population health. The left side of the model is the depiction of the social and cultural environment and organisation of work as the upstream determinants of health. While on the right is the psychological and biological dimension of the determinants, which are main focus of the medical attention as causes of diseases. In this regard, the model, despite the critical role of socio factors, do acknowledge the fact that medical care has its own influence in determining health indicators but

to a larger extent limited than may usually be thought (Braveman & Gottlieb, 2014:19).

The role social factors play in determining the health outcomes has and continues to be a centre of discussion in most literature of determinants of health (Chapman, 2010:1; Braveman & Gottlieb, 2014:1) with the World Health Organisation having a particular attention that led to formation of the Commission on Social determinants of health (CSDH) (Irwin *et al.*, 2006:750). The work from the committee since its launch in March 2005 was to engage country data in uncovering the underlined causal effect of these social factors towards health indicators, and in the process strengthening equity access to health and institutional change and policy alignment in addressing the SDH (WHO, 2005:35). Much of this work has guided a number of researches on SDH and continues to enrich the debate both on the known linkages and the gap which is mainly on the systemic linkages when considering one category/level of society to another (WHO, 2013:12). Figure 3.2 shows the WHO SDH model:

Figure 3.2 WHO model of social determinants of health



Source: WHO (2005)

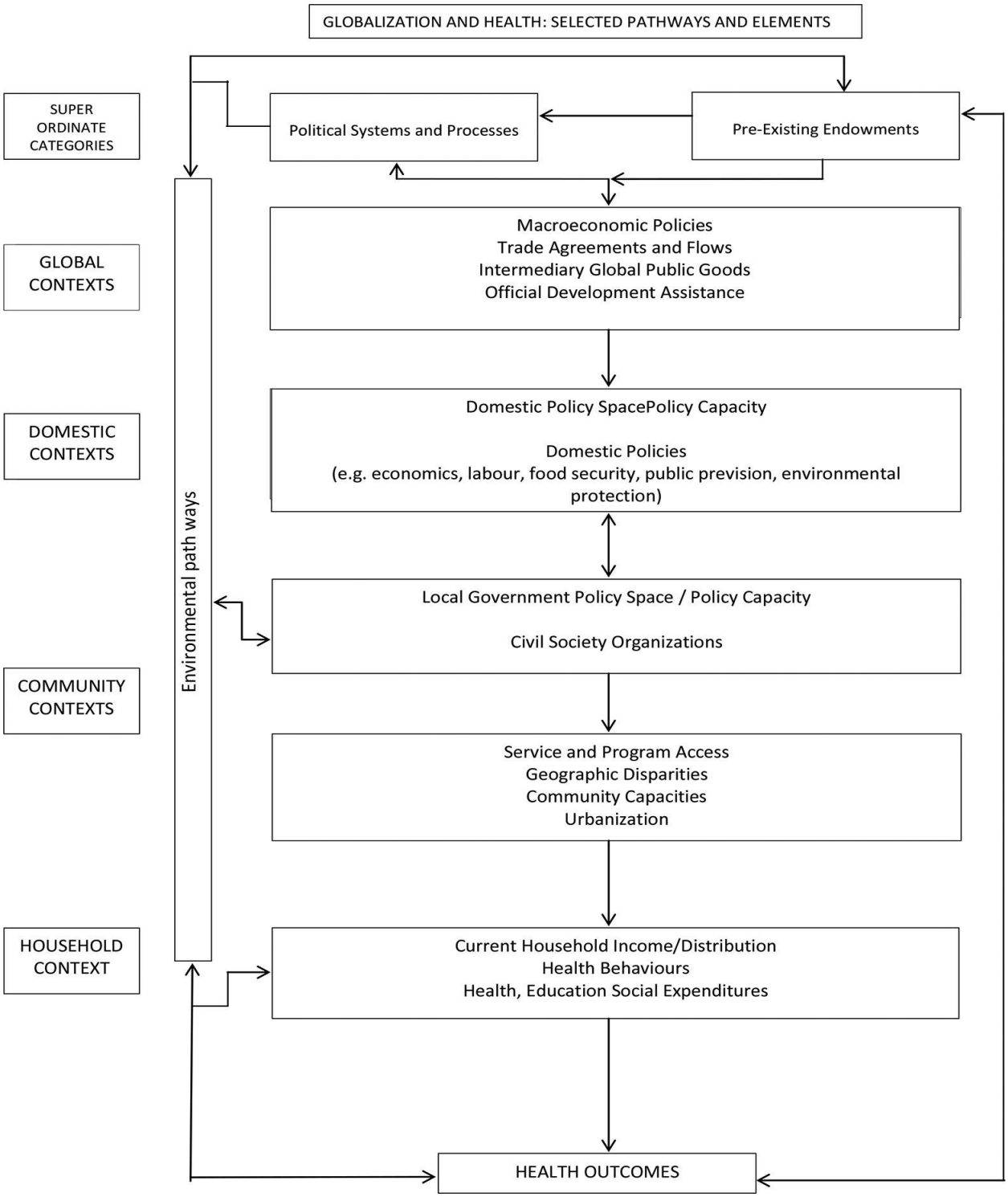
The WHO framework provides an overview of the major categories of determinants, and the interconnection between the categories. The model depicts beyond impact but serving as guidance towards policy, strategy and action in tackling health outcome interventions (Krumeich & Meershoek, 2014:1). One differentiating factor between the CSDH framework and many previous models is the conceptualising of the health system itself as among the social determinant of health (SDH). The relevance of the health system role is through the issue of access to health care, which incorporates differences in exposure and vulnerability, and through intersectoral action led from within the health sector (WHO, 2010:6). The health system hence becomes critical in mediating the differential consequences of illness in people's lives.

According to this model, it is through the set of the intermediary determinants of health the SDH inequalities operate to shape the health outcomes but distributed differently from one social group to another (Chapman, 2010:22). The three categories of intermediary determinants of health identified are first the material circumstances which include factors such as housing and neighbourhood quality, the financial means to buy such items as healthy food and warm clothing, and the physical work environment (WHO, 2005). The other category, as further shown in the WHO model, is the psychosocial circumstances, with factors such as psychosocial stressors, stressful living circumstances and relationships, and social support and coping styles or the lack thereof. The third category is the behavioural and biological factors, which include nutrition, physical activity, tobacco consumption, and alcohol consumption. The framework further differentiates 'structural determinants' that consist of all social and political mechanisms (governance, macroeconomic policy, social policy, public policy as well as social and cultural values). The mechanisms determine and uphold the socio-economic position for example social class, gender or ethnicity (Krumeich & Meershoek, 2014:2). In other words, the model implicates the structural determinants or drivers of health inequalities, socio-political statuses as shaping not only specific health outcomes but also social policies and programmes (Chapman, 2010:22).

The third and comprehensive model is the globalisation and health: selected pathways and elements by Labonte´ and Torgerson (2005). The model, as

presented in Figure 3.3, distinguishes the five levels of factors that function instantaneously and exhibit a composite of pathways to health outcomes:

Figure 3.3: Globalisation and Health: basic framework



Source: Labonte´ and Torgerson (2005)

The model considers each element and pathway as potentially able to impact health outcomes directly as well as indirectly from the global to household level through the interconnection within the levels (Labonte & Torgerson, 2005:166). The first level of the factors are called the 'super ordinate level' comprise of the main classifications of elements like the political, economic and the civil society traditions; primarily proving the society and the level of progress in economic issues, including the role of environmental and human resources. The second level of the model refers to the 'global context', which consists of macroeconomic policies, (such as structural adjustment programs and poverty alleviation policies), in other words the global context. This level encompasses and boarders around the trade agreements, global public goods, the role of development assistance in terms of both investments and impact as well as the role governments regulations. The third level as further discussed by Labonte´ and Torgerson (2005) is the 'domestic context' which influences the local resources allocation, endowments and opportunities as well as the space. This also includes the role of local civil society organisations and opportunities accorded, policies governing national labour, food security, public services provision and in general the country's governmental macroeconomic policies.

The fourth level of the model depicts the community contexts. This is the level at which access to programs and services are determined through geographic disparities, community capacity and urbanisation. The last level in the globalisation model is the household contexts, which is the last level and includes household income and distribution, subsistence production, health behaviour, and a household's health expenditures, and expenditures relating to education and other social amenities. In all the levels however, the environmental pathways are considered crosscutting and includes international dimensions such as waste management, biodiversity, etc. In summary, health outcomes in this model result from pathways connecting elements within and between the different levels of social factors (Krumeich & Meershoek, 2014:2).

In comparing these three models however, it is clear that neither Marmot's (2005), nor the CSDH (2005) framework nor the Labonte´ (2005) models is unique in their complexity of analysing the SDH (Krumeich & Meershoek, 2014:1). Similarly a

number of models, which makes reference to the different levels of SDH from which health disparities emanate from through direct or indirect pathways have been generated by Dahlgren and Whitehead. These models have considered the determinants as layers (general social economic and material people live and work in, the social networks and the fixed factors in other words the genetic makeup) influencing the health outcomes (Dahlgren & Whitehead, 1991:11), the Birn *et al*. (2009) model as discussed in Krumeich & Meershoek, (2014). The models bring into the picture more explicitly issues of power relationships, and to social class, social position and social structure while including the social determinants of empowerment along with the SDH. The model also explicitly distinguishes between SDH per se and SDH inequities in a complex manner, shaping the health outcomes in interaction with each other.

However, in all these models and propositions, what elements are included, what pathways they constitute, which pathways are involved, and how exactly they impact health inequalities; may differ from one location to another and in time (Krumeich & Meershoek, 2014:2). In understanding the complexity of the SDH especially in light of local health and health disparities, it is clear that everything can be related to everything however, analysis and understanding how different elements as well as the dynamics behind interacting pathways should always be on the basis of an effective and sustainable policy, strategy and intervention (Labonte´, 2011:1). Furthermore, while the general relationship between social and economic factors and health is considerably established (Marmot & Wilkinson, 2005), the need to understand precise ways in which the SDH operate is an area of great research interest considering the complexity and precise mechanism through which they operate (Kelly *et al.*, 2007:10; Krumeich & Meershoek, 2014:2). The relationship is ever complex more especially where the strength of the evidence which is critical in supporting the causal effect hence subsequent appropriateness of available methods in assessing such evidence, is concerned (Braveman & Gottlieb, 2014:19). One of such mechanism is the district level analysis of these as adopted in this research in determining such evidences.

In a bid to understand the framework through which the social and economic factors operate in determining health outcomes, the role of inequities in health across the

socio-economic positions and its determinants do play is an important role. The WHO Commission on social determinants of health defines health equity as 'the absence of unfair and avoidable or remediable differences in health among social groups' (Solar & Irwin, 2007), which is adapted from Margaret Whitehead's definition of health (Whitehead, 1992). Therefore, health inequity can be defined is as unfair and avoidable or remediable differences (Kelly *et al.*, 2007:15). The concept implies that ideally every person should attain their full health potential and that there should be no disadvantaged to anyone from achieving this potential as determined by their social position or anything socially determined (Whitehead & Dahlgren, 2007:5). This is the same fundamental principle as orchestrated in the 1948 WHO constitution asserting that "the highest standards of health should be within reach of all, without distinction of race, religion, political belief, economic or social condition" (WHO, 1946).

It should be made clear however that determinants of health are not necessarily to be equated to the determinants of health inequities as inequities are more linked to questions of social disadvantages (Kelly *et al.*, 2007:11). Improvement of health outcomes across different social and economic groups may therefore not mean the improvement of health inequalities despite their critical role in shaping the health outcomes.

3.3 MAJOR SOCIAL DETERMINANTS AND THEIR LINKAGES TO HEALTH: MECHANISMS AND EMPIRICAL DISCOURSE

The concept of the of SDH has been defined in many different ways across the literature and has referred to a wide variety of factors and mechanisms (Krumeich & Meershoek, 2014:1). However, despite such a wider discourse, there seems to be consensus that while illnesses have biological causes, in explaining the distribution of illness within a population or between populations, social causes are the main explanatory factors (Wilkinson & Marmot, 2003:7; WHO, 2010:45). The issue of why some people have a higher risk of ill health and of serious disability due to any disease than others can be explained through the social causes. The social cause also explain why the consequences of illness or disability have a more serious impact on the lives of the vulnerable than on those of the wealthy (Krumeich & Meershoek, 2014:1). The SDH are the media through which the person's health is

shaped directly and indirectly. The literature on SDH shows variables such as poverty, social economic position, gender, age, ethnicity, levels in education, access to adequate diet and safe water, access to adequate housing, living circumstances, habitual behaviour, exposure to hazards related to work, pollution exposures, waste management, exposure to violence, the ability to exert control over one's own life and over circumstances linking to health, the class system, the housing stock, the educational system, the health care system, the labour market, public and social policy (WHO, 2010:12; Marmot & Wilkinson 2011:2).

In analysing the linkages under all these specific SDH, it is necessary to consider first the underlining discourse on the basis under which the mechanisms and linkages are conceptually framed. There are three underling concepts, namely the social selective perspective, social causation and life cause perspective (WHO, 2010:16). Despite these conceptual bases relates to the health inequalities from the SDH point of view, they duly provide an in-depth understanding in understanding the nature of linkages between social economic factors of poverty, education, population and other demographic factors under investigation in the study.

The social selection perspective implies that health determines socio-economic position, instead of socio-economic position determining health (WHO, 2010:12). The basis of this selection is that health exerts a strong effect on the attainment of social position, resulting in a pattern of social mobility through which unhealthy individuals drift down the social gradient and the healthy move up (Grant, 2005:6). Despite that, the social selection perspective provides the continued spiral relationship between social economic position and health, the perspective entails a continued complex relationship that always exists between the socio-economic factors and health.

The social causation perspective, on the other hand entails that the social position determines health through intermediary factors. The main groups of factors that have been identified as playing an important part in the explanation of health are material, psychosocial, and behavioural and/or biological (WHO, 2010:12). These factor entail for example: the social gradient; the life expectancy tends to be shorter down the social ladder in any society, and further that most diseases are more common down the same ladder. The socio-economic status or position further demonstrates this as

it determines a person's behaviour, life conditions, etc., and these determinants induce higher or lower prevalence of health problems (WHO, 2010:12).

Another factor is stress in a sense that stressful environments tend to cause people to be worried, anxious and in the process unable to cope, leading to ill health or premature deaths. The related factor is work where stress in the work place increases the risk of diseases. This means that people who have control over their work, tend to have better health (Liamputtong *et al*, 2012: 180). Social exclusion which is a complex and multidimensional process (Liamputtong *et al*, 2012:190) involves the denial of resources, rights, goods and services, and also the inability to participate in normal relationships and activities which can be social, cultural or economic, which are available to the majority in the society. Such people tend to experience more ill health than those in the socially inclusive society (Stansfeld, 2011:148). Unemployment is also regarded as a key social determinant if health in a way that job security increases health, well-being and job satisfaction. High unemployment rates could cause ill health and premature deaths (Bartley, *et. al.,* 2011:78). The issue of addiction especially to drugs, tobacco and alcohol affects peoples' health. Health transport means driving less and more walking and cycling making the issue of transport as one of the key SDH. Finally is the issue of food where the concept of health food is not only a healthy issue but also a political one (Liamputtong *et al*, 2012:180).

A life course perspective does clearly show the importance of time and timing in understanding causal links between exposures and outcomes within an individual life course, from one generation to another, and in population-level diseases trends (WHO, 2010:12). Adopting a life course perspective directs attention mainly on how SDH function by considering every stage of development in life. This includes for example early childhood, moving towards childhood, at adolescent level until adulthood. This is mainly on both the immediate influence to health and to the basis for the subsequent health or illness later in life. This mean a life course of one cohort is related to previous life course perspective and it also attempts to understand how such temporal processes across cohorts and the subsequent ones are manifested in disease trends observed over time but mainly at the population level. The life course perspective hence considers time lags between exposures; disease initiation and

clinical recognition in early life as being the initiating pimp towards the disease processes prior to clinical manifestations. Social and early support in life is hence becomes key to the people's health development. An early life support to children and mothers has a positive contribution to better health. In the same way, friendships, good social relations and strong supportive networks improves both the individual and community health. Social exclusion is also another factor in the solid social determinants (Liamputtong *et al*, 2012: 180).

The interactive mechanism between socio-economic factors and health outcomes clearly underscores the dynamic nature of the relationship between them. In relation to the preceding concepts on interactive mechanisms between SDH and health outcomes, the major factors being reviewed in the study have been isolated in order to further demonstrate their interactive pathways both theoretical and empirically. These factors as earlier hinted are poverty (also covering income and population growth), education, and employment.

3.3.1 Poverty and health

Poverty and health are interrelated phenomenon. It is said that the poor suffer worse health and die younger (WHO, 2003:20) underlining the fact that high poverty levels have a critical bearing on people's health. This is mainly, as evidenced by the higher child and maternal mortality, higher disease burden, limited access to health care and social protection, and gender inequality among the poor (Marmot, 2012). Poverty further disadvantages health of vulnerable of vulnerable like women and girls among the poor (WHO, 2003:20).

Furthermore, good health from the social selection perspective is also a critical and important economic asset for the poor as their livelihoods depend on it (Grant, 2005:4). This is demonstrated in a case where a poor or socially vulnerable person becomes ill or injured, the entire household becomes also sick with them. The situation eventually, as further argued by WHO (2003), causes the household to be easily trapped in a downward spiral of lost income and high health care costs. Worse more as time is diverted from generating an income or from schooling to care for the sick and to some extent putting pressure on the already lean asset base required for their livelihoods (Bradshaw, 2006:4). Poor people are further considered more

vulnerable to this downward spiral not only to their susceptibility to disease but also have more limited access to health care and social insurance. A detailed discussion and debate on these linkages on poverty and health are systematically discussed in the subsequent sections.

3.3.1.1 Understanding poverty

Poverty is defined and its definitions are debatable depending on the conceptual, contextual and even measurement level of consideration. In defining poverty, Scott (1994:17) underscores the need to view the concept of poverty beyond its definition but also who to include in the category of those supposed as the poor. The definition of poverty shapes the understanding of it and the underlying effects (Alcock, 1993:67). Throughout history, poverty has taken different critical and necessary turns in terms of its definition and premises which basically are on the premise of individual deficiencies, cultural beliefs that support the poverty subcultures, distortions in the political and economic environment; geographical disparities; and cumulative and circumstantial origins (Bradshaw, 2006:2). These have categorically informed a number of poverty theories which will be discussed briefly in this section but suffice to note that despite enormous debate and controversies around the subject the convergence in poverty definitions and measurements is in the understanding that poverty entails a status of falling short some reasonable living standard.

In general terms, poverty is a lack of necessities which are considered necessary for human dignity basing on shared values, namely basic food, housing, medical care and safety (Bradshaw, 2006:4). The meaning of poverty hence heavily relies on the subject area being examined. The World Bank (2005:9-10) has made a synthesis of the various positions: “Poverty is the lack of, or the inability to achieve, a socially acceptable standard of living”. Bellù and Liberati (2005:2) point out that three key words in this definition are worth special attention.

As indicated by the World Bank (2005:1), Poverty can be looked at as deprivation from what might permit some individual to have their well-being. This is despite the fact that this would require a need to characterise further, what one's well-being implies. This is fundamentally a man's capacity to have a charge over wares when all is said in done. This implies that individuals are considered well off in the event that

they have adequate or more resources to be able get what they require in life. In this view, the primary center is on whether households or people have enough assets to address their needs. Poverty in this case hence measures on how income or access with what gives them a charge over their need, is compared to some characterised cut off point below which one is thought to be poor.

Poverty can likewise be characterised as a deprivation of essential human necessities. Similar to most definitions, poverty implies that one is unable to meet the basic pre-determined consumption needs. An imperative issue in this approach is the distinction between the extreme or relative Poverty. The extreme poverty as characterised by Ravallion *et al*., (2014:3) involves that the established purchasing power provides an edge to compare income level in deciding whether the household is poor or not hence the issue of poverty line. The poverty line is settled on by considering the nutritional necessities of human survival. By contrast, however, relative poverty implies that one is poor relying upon who they are being contrasted with. Along these lines, distinctive groups or nations would have diverse Poverty lines (Ravallion *et al*., 2014:3). Extreme poverty may even mean the absence of food or shelter. A second way to deal with well-being, which may clarify poverty better, is to see whether individuals have the capacity to access a particular kind of goods for consumption. In other words, considering whether they have access to enough food, or safe houses, or health services, or education or anything that is viewed as essential. In this perspective, one needs to go past the fundamental income measure of Poverty. The World Bank further proposes that nutritious poverty may be measured by considering whether kids have poor development or not and education poverty can likewise be measured by taking a whether a man is illiterate, or by the years of formal educating they have gotten (World Bank, 2005:1).

The measure of material needs and the degree of social deprivation in relation to income is the premise for the measure of relative poverty. The approach for finding out the threshold measure of income that is required by households of diverse composition to surmount poverty is then established by taking a gander at these needs. The utilisation of this method leads to conclusions, which are used to measure poverty trends and patterns across most countries (Townsend, 1979:1; 1993:33). The broadest approach to well-being however, in relation to poverty is the

one suggested by Sen, (1987:1), who contended that well-being is a function of a capability or ability as per the expectation of the society. Poverty can also be considered from the multi-dimensional measurement basis where poverty is not only considered as income based per most traditional theorists on poverty, but the deprivation of basic requirements. This understanding of poverty also provides a comprehensive basis when considering those being categorised as poor. For example, services like education, health, water, housing, with defined cut offs, those below cut offs are considered poor. Depending on what poverty is being considered, either by income, asset or multidimensional basis, the interaction of poverty and health becomes still essential as those termed poor are and continue being venerable in the society.

3.3.1.2 The known linkages and empirical evidences

The effects of poverty on health are discussed by considering poverty on its own as well as its related influence on income, food security, access to water and sanitation. One of the major determinants of poverty and ill health is gender inequality. In most societies, poor women and girls are worse off, in relation to assets and entitlements, within the household and in society (WHO, 2003:22). This is also influenced by the socio-cultural beliefs about the roles of men and women, which largely contribute to this inequality. In other words, the gradient between income poverty and health is steepest among the poorest of the poor (Wenzlow *et al.*, 2004:1). Considering this, it becomes more clear that the vulnerable among the vulnerable in this case the poor women and girls becomes deeply trapped and disadvantaged even when it comes to accessing resources for health despite women being the major producers of health care through their roles as household managers and carers (Graham *et al.*, 2004:23).

High levels of poverty in respect of income have caused households suffer from inadequate nutrition, heavy workloads and neglect of basic health care, more especially among women who have also fallen in the trap of sexual abuse and interpersonal violence (WHO, 2003:22). In considering the income status, some diseases have also been considered as being linked to lower economic status. A study in China found that lower income status increased a risk of contracting tuberculosis (Jackson *et al.*, 2006:5). This is mainly due to the tendency of harsh

conditions, congestions and poor ventilation, which are common among the poor households. These findings agrees with a number of previous studies on SES from income point of view (Adler and Newman, 2002; Deaton, 2001; Goldman, 2001) However, a study in Zambia found contrary results on the role of socio-economical position (SEP) where TB incidences were higher among those with higher economical position (HEP) than expected (Boccia *et al.*, 2009:1008). However, the study could not specify the causal links except the general environmental externalities where the sampled population with HEP was surrounded by industries which might have contributed to some levels of pollution. The relationship between poor households is also demonstrated with diseases commonly associated with poor sanitation like diarrheal diseases dirty water,(Dodd & Munck, 2005:13; Marmot, 2008:420) coupled with poor access to health facilities among the poor mostly living in the rural areas (World Bank, 2007). Poverty as deprivation of access to basic services does clearly show its linkage with health when considering water and sanitation. Almost 1.2 billion people lack access to safe drinking water and twice that number lack adequate sanitation (UN, 2015:5–6). As a result most waterborne diseases such as diarrhoea, cholera, trachoma, oncocercosis still thrive where there is inadequate water quality (WHO, 2014). The access to adequate water does also signifies its importance when considering food production as adequate quantities of water is also essential to food production which in turn improves nutrition, health and people's ability to withstand and recover from diseases (Dodd & Munck, 2005:10).

In considering the areas where most poor live, it is common than these areas which mostly are rural or congested urban areas which are unstable and dangerous (Dodd & Munck, 2005:10). Most of these areas are associated with poor facilities, low staff levels or absenteeism as well as rudeness due to congestion and overworked staff (WHO, 2003:40). Most of rural facilities have also faced the poor quality of service in terms of availability of drug: this is also a major issue and contributes greatly to the low health service utilisation, inconsistent opening hours, hidden costs in seeking care including opportunity cost of time spent in travel, waiting time for treatment, transport and buying of medicine which may be free but not available as well as poor or broken equipment (WHO, 2003:22; Dodd & Munck, 2005:11). All these have serious effects on human development and the formation of human capital. Despite

that, cost plays a major role among the poor on making decision of accessing health services, these factors also plays a role in deciding accessing health services.

In discussing about poverty effect of poverty at macro level, the role of economic growth cannot be divorced especially when considering its impact on health especially on poor countries. Pritchett and Summers (1996) have advocated before the notion of 'wealthier is healthier' which from the developing countries researches showed that economic growth led directly to improvement in health outcomes for example in the reduction of infant rates and improvement in life expectancy. These assertions were on the basis that higher income improved the nutritional status of people as well as that it provided for infrastructure development for public health such as water and sanitation. The strong causal links between income and health which run of course in both directions (Chin, 2010:997) have from the historical decline of mortality rates in now developed countries as well as the role of economic growth in health improvements in developing countries (Deaton, 2006; Cutler *et al*, 2006). The emphasis on income is basically on the role of nutrition, clothing and housing play as primary determinants of health in now developed countries (McKeown, 1976; Dodd & Munck, 2005:10). Linked further to economic growth is the technological progress point of view where the gains in health may be as a result of effective use of resources rather than as a proxy for wealth (Preston, 1975). Overall, the argument of economic growth being instrumental to health gains is however widely accepted especially among proponents of globalisation and development aid benefits (Filmer & Prichett, 1999; Dollar 2001; World Bank, 2002).

The effect of poverty can also be demonstrated though its impact on food insecurity and malnutrition: malnutrition and food insecurity has a greater impact on health with over 800 million people in developing countries being chronically hungry and malnourished. Despite increased rapid urbanisation, the majority of these people are the poor in the rural areas. Hunger and malnutrition increases the vulnerability to disease and premature deaths, reduces ability to earn a living and income generation (Dodd & Munck, 2005:10). Hunger is related more to availability of household income than availability of food. Hence improving food security entails more of managing access to food of increasing the purchasing power of a household (WHO, 2003). Malnutrition affects one in three people worldwide especially the poor

and vulnerable. Sixty percent of annual deaths among children and the under-fives are associated with underweight and while 161 million children are stunted in their linear growth (UNICEF, 2015:1). However, increasing income of the poorest groups especially among women is a critical tool in reducing malnutrition (UN, 2015:5–6).

Indoor and outdoor pollution is also another area that provides a platform in linking poverty and health (WHO, 2003). Around 3 billion people are exposed to indoor air pollution from the usage of traditional fuels for household energy. Poor households in sub-Saharan Africa and Asia depend on biomass and kerosene due to cost constraints (UN, 2015:5–6). It is estimated that 2 million deaths a year are caused due to indoor air pollution most of which are the poor in the rural despite the exposure being rising in urban areas. Most of the outdoor pollution is not surprisingly occurring in the developed countries and it is estimated that 1.5 billion are severe exposed in developed countries leading to poor health.

With all these linkages between poverty and health, it is not surprising to conclude that indeed 'poor places keep poor people, and poor places also kill' (Dodd & Munck, 2005:10).

3.3.2 Education and literacy

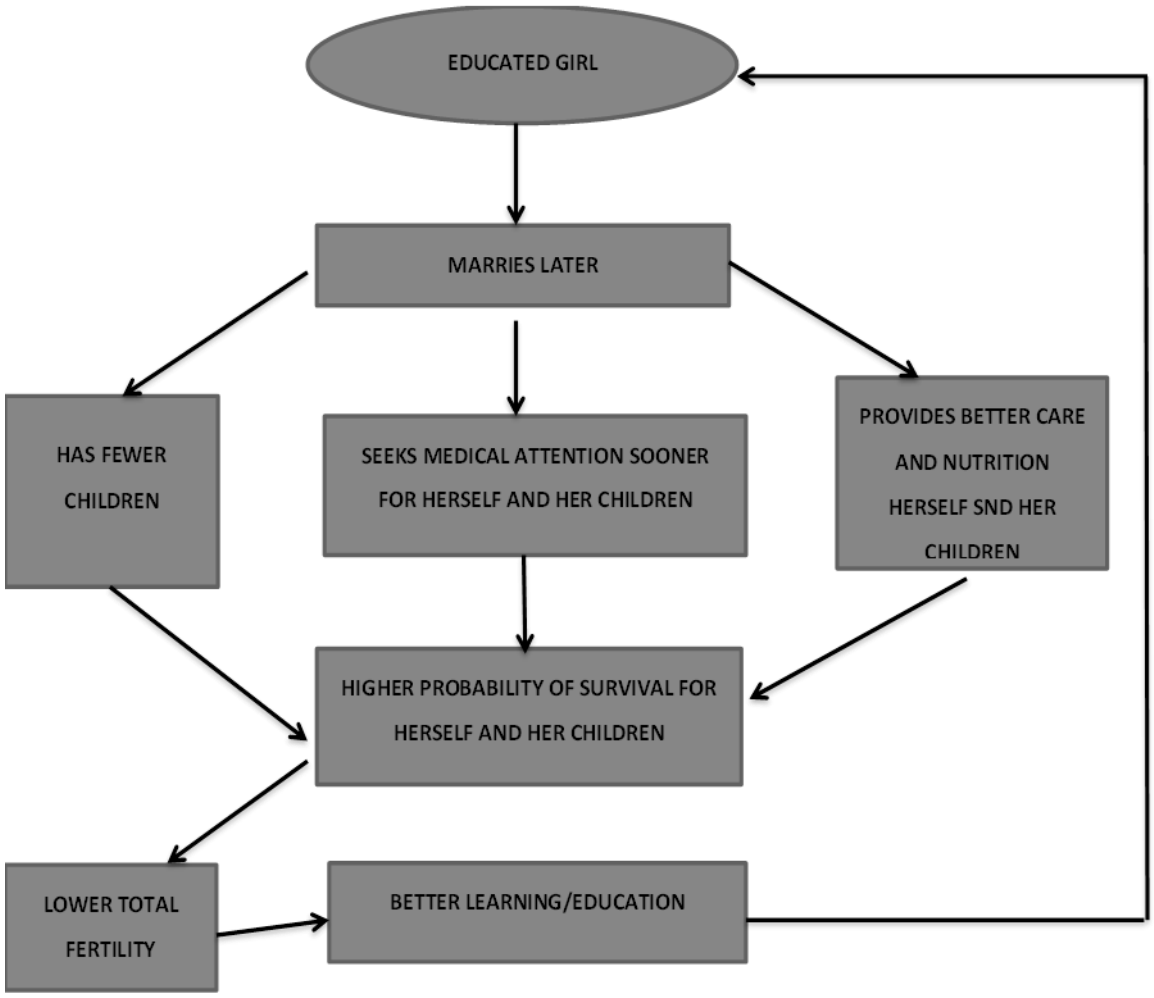
The benefits of education on health outcomes can never be over-emphasised as most researches have shown that it contributes positively to improved health outcomes including maternal and infant mortality, nutrition related, water borne just to mention a few (WHO, 2003; WHO, 2010, Marmot & Wilknson, 2011; Rahman *et al*., 2015). The role of education is linked to its ability to bring stronger receptivity and confidence which enables people to use the knowledge acquired and also its effect on personal behaviour hence critical to health interventions being offered (WHO, 2003:55). This has been demonstrated through both general and health related education like maternal education (Rahman *et al.*, 2015:173) contributing positively to health (WHO, 2010:31). A detailed analysis on the known linkages however, provides a better background in exploring both the strength and nature of the linkages, which are critical in shaping interventions.

3.3.2.1 Key linkages between education and health

The linkages or pathways through which education influence the health outcomes can be categorised in three ways as discussed in Marmot and Wilkinson (2011). These general pathways are mainly that firstly, education increases knowledge and skills and, which in turn enables healthier behaviours for example dietary behaviours, aversion of violence and injuries (WHO, 2003:55; Liamputtong, 2009:10).

In shaping behaviour, the role of education can be demonstrated further by considering its impact on early stage of life, which is proven critical for shaping future behaviour of a person as presented the generational benefits of female education model by Mehrottra (2006: 915) as seen in Figure 3.4:

Figure 3.4: Life cycle of an educated girl



Source: Mehrotra (2006:915)

As illustrated in Figure 3.4, the model depicts the role of education on health from an example of an educated girl. An educated young lady is likely to go into marriage, more especially those that have passed primary education and are able to participate in economic activities (Mehrotra, 2006:915). Furthermore, the model also shows that early child bearing can also be averted where a girl child is being educated which is also a key factor in not only promoting her health but also the health of the child she can bear. This eventually alleviates the infant deaths. Research has also in agreeing with the model that educated girls are likely to have fewer children, which enhance the ability for her to provide proper, care and nutrition to the and this subsequently would decrease the likelihood of morbidity and childhood mortality. This is also the case in health where two thirds of premature adult's deaths can be ascribed to behavioural pattern acquired during adolescence (WHO, 2010:33). in summary, education leads to changes in reproductive behaviour and subsequently leading to lower maternal mortality, female empowerment, higher survival rate of children, spacing of births, improved health of mothers and children, better care of children, lower desired fertility rates and subsequently poverty (WHO, 2003).

The model also provides the role education plays on the control over fertility rate by an educated girl as compared to uneducated one. This is mainly on the ability to use contraceptives hence lowering fertility rate which has even a longer term implication on the population growth which is a factor leading to higher population growth rate. With the same lower fertility rate, households are likely to be smaller hence easy to take care of and manage. All these benefits, simply put, befits also in the context of an educated mother. The model however, assumes that are being supported and complimented by other services like health/family planning/water and sanitation services (Mehrotra, 2006:915).

In general terms, education both formal, literacy as well as health related, enables people to take care of their health through better receptivity to health specific messages, both through learning and critical thinking abilities that are valuable in averting diseases, injuries and adherence to treatment and guidelines (Gottfredson & Deary, 2004). This is also on the use of preventive measures like use of malaria vector control interventions like use of mosquito nets to prevent malaria (UNICEF,

2014:2). The long run implication is that the acquired knowledge eventually leads to lower death rates from both communicable and non-communicable diseases such as malaria, tuberculosis, waterborne, HIV/AIDS, cardiovascular sickness and lung cancer (Hart et al., 2003).

On behavioural change, education plays a role in inducing health behaviours, which influences a person's receptivity to health education. For example, the perils of smoking or the significance of health checks, proper health promoting practices or behaviours (Fuchs, 1979; Keneckel, 1991). There is some proof that more education is connected with lower rates of smoking (Winkleby *et al*., 1992) and standard wellbeing checks (Coburn and Clyde, 2002). A man's feeling of control over their life may therefore interface the relationship between education and health. More education helps to train and expand the feeling of an individual to control investigative and relational abilities (Ross & Mirowsky, 1998). The feeling of individual control might likewise enhance health through improving solid practices, by controlling one's quick dependence for long-term medical benefits (Lazarus & Folkman, 1984), while the absence of individual control may be a stressor leading to unfavourable physiological results.

The second pathway is linked to the role of education on health as being demonstrated through its ability in enabling income in the household. This suggests that the effect of education on health operates through a pathway where higher education leads to higher occupational attainment and income, which, in turn, increases the chances of better health (Marmot *et al*., 2012:126). In contrast, other studies have found that the effect of education on health remains strong even after controlling for occupational class and income (Winkleby *et al*., 1992). The role of income on health has been discussed more under poverty and health linkages which have demonstrated that it has a positive contribution towards health outcomes (WHO, 2003). However, it is worth noting that it has long been assumed that poverty or lack of economic opportunities (for women) is an important contributor to the HIV/AIDS epidemic. This has been contradicted however by studies from Shelton, Cassel and Adejunti (2005) and Mishral *et al*. (2007) with surveys from the Sub Saharan Africa, which did show positive relationship between wealth and HIV

prevalence. The findings are typical association between household wealth, urban residence and higher HIV prevalence in urban areas.

The third pathway is depicted in the role of education through psychobiological processes where it affirms ability to control beliefs, subjective social status, and social networks, which further contribute to better health (Reidpath, 2004:22). Violence and injuries is among the leading cause of death among people worldwide especially those between ages 15-44 with over 90 percent taking place in developing countries. People with lowest socio economic status are at most risk of violence and the risk is increased by factors related to poverty unemployment, poor housing and lack of education. In 2000, over 1.5 million people died of violence and over 500 thousand from interpersonal violence, which is grossly underreported and stigmatised. Education hence is also considered as a tool in averting ill health from violence and injuries. Although education is a major determinant for health, as discussed under social selection perspective in section 3.4, health is also a major determinant for education attainment. Health has an impact on school attendance abilities and performance (WHO, 2010).

3.3.3 Employment and health

One of the major socio-economic factors under SDH is employment both environment and work associated. Employment in its general sense encompasses both paid and unpaid activities. Employment can be either formal or self-employment/informal employment. Formal employment is characterised by an explicit written contract specifying a basic remuneration, which is not directly dependent upon the revenue of the unit for which the work is done. This unit can be a corporation, a non-profit institution, a government agency or a household (United Nations, 2010).

Employment in the informal sector, which contribute largely to the employment levels in most countries, includes all jobs in informal sector enterprises or all persons who, during a given reference period, were employed in at least one informal sector enterprise, irrespective of their status in employment and whether it was their main or a secondary job (Hussmanns, 2004:4). The concept of informal employment is considered relevant for not only developing and transition countries, but for

developed countries, for many of which the concept of the informal sector is of limited relevance. In most countries the informal sector is a strategy of last resort where most people are rationed out due to the barriers of entry into the formal sector (Günther & Launov, 2012:88). In Malawi for example informal employment is as high as 89 percent (NSO, 2014:XX) and mainly in agriculture industry. Most of these people in informal employment do not have written contracts and are not entitled to basic benefits such as pension or medical aid contributions from their employer. The growing of informal employment may be attributed to the globalisation process of the economy as enterprises tend to respond to competitive pressure in resorting to mixed-mode labour arrangements, in which observance of labour regulations for some workers is combined with the use of non-standard, a-typical, alternative, irregular, precarious, etc. types of labour or various forms of subcontracting (Hussmanns, 2004:4).

The role of employment on health hence comes from four bases of psychological, physical, income and behavioural effects. These are also reflected in the context of unemployment as men and women who are unemployed are more likely to describe their health status as poor (Bartley *et al*., 2011:79).

On the psychological effect, employment negatively affects health where work environment becomes a stressor through work pressure or feeling of job insecure (Wilknson & Marmort, 2003:20). The effects of stress are revealed later in physical health due to the increased level of chronic anxieties (Bartley, 2011:85). Although findings regarding the psychosocial work environment are contradictory (Goudswaard & Andries, 2002:53), most workers in informal employment or on a temporary basis are likely to have poor working conditions as compared to permanent workers, risking more on occupational injuries. Furthermore, diverse employment issues like job security, protection and satisfaction do also come into play on psychological impact on people's health. For example in formal employment, due to organisations striving to compete on global market, work environment becomes competitive environments and workers have to adapt to the pressure their work demands (Nollen, 1996). Workers experiencing temporary and limited time contracts are often likely to have poorer employment protection and lower job security, which creates anxiety in fulfilling their duties. For instance, Dawson et al.

(2014) find that permanent workers in Great Britain in the period between 1991 and 2008 reported an approximately 40 percent higher mean level of satisfaction with job security than temporary ones. These pressures can sap energy and intensify psychological stress, and thus it is not surprising that a literature has evolved which suggests that employment status affects health.

The effect on physical health especially amongst workers in the informal sector may relate to higher fatigue and muscular pains leading to experiences outwards poorer physical health (Kim et al., 2012) which are also related to greater incidence of depressive symptoms (Quesnel-Vallee *et al*., 2010). Further corroborating evidence stems from Benavides *et al*. (2000), who found that workers on fixed-term contracts have worse physical health than permanent workers.

The early studies also from Hesselink and Vuuren (1999), reported that higher percentages of workers on fixed-term contracts had more physical health complaints than workers on permanent contracts. The underlining issue is that, employment dynamically comes into play as far as ones physical health is concerned.

On the other hand, employment is a positive contributor to health outcomes as it provides both economic and psychological support towards health outcomes. The impact of lack of employment has in most countries shown that mostly the unemployed people and their families do suffer premature deaths mainly from both the psychological and financial effects (Wilkinson & Marmot, 2003:20); WHO, 2010:30; Rumbold & Dickson, 2012:180). The economic support of employment on health is displayed on the income brought into the household. The role of income has been discussed under the effects of poverty where income is seen as an essential factor in enabling households providing required basic needs and as well access to health commodities (WHO, 2003:33), facilities and services (World Bank, 2007), nutritional diets (WHO, 2003:22; Chin 2010:997) inability to improve living environment hence poor sanitation (Marmot, 2008:420).

There are also some studies that have shown that employment averts some forms of health-damaging behaviours caused by unemployment including attempts to suicide some of which are more evident in the longer term (Wadsworth *et al*., 1999; Blackely, *et. al.,* 2003). The behavioural effect despite being one of the dimensions

in the models of SDH is not pursued much in specific linkages, as the general scope is adequate for the purpose of the study.

3.4 CONCLUSION

The chapter has discussed the SDH as one of the critical aspect of contextualising health outcomes. The SDH have been discussed from its models aspect as well as the isolated interactive mechanisms on how they define health. The SDH, as per the World Health Organisation's commission on the social determinants of health have been defined as conditions in which people live and work. These factors have a powerful influence on health and health related behaviours from the evidence accumulated for the past three decades, which have pointed to socio-economic factors having a greater influence on people's health. They thrive on unbalanced existing social gradient as well as inequalities across communities. Some of these factors are income, wealth, and education forming a fundamental influence in shaping a wide range of health outcomes. In understanding these SDH, three models were discuses in the chapter mainly structural level model by Marmot and Wilkinson (2005), the WHO SDH framework and the Globalisation and health: selected pathways and elements model by Labonte´ and Torgerson (2005).

The structural level model looks at four perspective of social, psychological, biological and pathological in determining health. The model links the social structure to health and disease via material, psychological and behavioural pathways. The model also considers the generic early life and cultural factors as critical to the determination of the population health. The social and cultural environment and organisation of work are positioned as the upstream determinants of health, while the psychological and biological dimension of the determinants which is main focus of the medical attention as causes of diseases as are considered to be on the downstream. In other words, the downstream factors provide the foundation of health and the upstream brings it to its manifestation.

The WHO framework on the other hand provides an overview of major categories of determinants of health with further interconnection between the categories. The model hence depicts beyond impact of the determinants however serving as guidance towards policy, strategy and action in tackling health outcome

interventions. The CSDH framework departs from many previous models by conceptualising the health system itself as a social determinant of health (SDH). In this way, the role of the health system becomes more relevant through the issue of access and intersectoral action from within the sectors.

The third model in describing the SDH is the globalisation and health: selected pathways and elements by Labonte´ and Torgerson (2005). The model considered each element as well as the pathway as potentially able to impact health outcomes directly. The model also considers health outcomes being indirectly affected from the global to household level through the interconnection within the levels (Labonte & Torgerson, 2005:166). The model suggests levels of factors, namely the super ordinate level having political, economic and the civil society categories; the global context where macroeconomic policies are the forces involved in shaping health as they interact with the domestic context which influences the local resources, endowments and opportunities.

These SDH factors have also been further analysed both empirically and conceptually by considering their nature of interaction with health outcomes. Three factors were isolated for further analysis, namely poverty, which also encompassed the effects of income, education and employment. Despite the critical role the SDH play, there have also been limitations to the entire modelling of health outcomes from the SDH perspective. These limitations include in particular with regards to measurements involving the impact of action on the SDH especially in establishing the exact nature of their relationship to health. In understanding the SDH factors in the context of health disparities, everything can be related to everything in a number of ways. In other words, there is always a challenge to analyse them basing on how different the elements are as well as the dynamically interacting pathways should for an effective and sustainable policy, strategy and intervention. The second challenge is the dominance of ever-changing life styles discourse among people. This calls for preference of lifestyle approaches in analysing health, focusing on individual behaviours hence immense complexities involved in dealing with the social nature of health. It also subsequently means preference to individualistic models for their relative simplicity and applicability.

The role of SHD is however evident across the globe and much more in developing countries where the world's poor people do not have access to public health services and personal health care they need (WHO, 2003:30). It is not difficult to understand how social factors like poverty as material deprivation—dirty water, poor nutrition coupled with lack of quality medical care can account for high mortality rate in poverty stricken countries (Marmot, 2008:420). However, with the fundamental concepts and propositions on SDH, what elements are included, what pathways they constitute, which pathways are involved, and how exactly they impact health outcomes, may differ from one location to another and in time (Krumeich & Meershoek, 2014:2). It has been pointed out not only that if it comes to understanding local health and health disparities, everything can be related to everything. The next chapter hence isolate the country Malawi for further investigation on these SDH mainly by establishing the nature of relationship and the immediate precursors to the country's health outcomes.

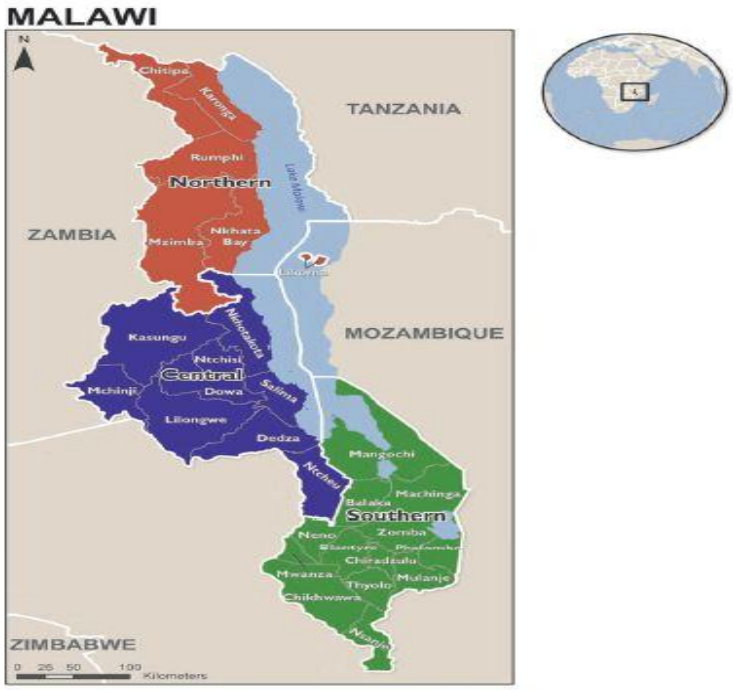
CHAPTER 4

MALAWI COUNTRY: DEMOGRAPHICS AND SOCIAL ECONOMIC CHARACTERISTICS

4.1 COUNTRY PROFILE

Malawi located south of the equator, is a sub-Saharan African country bordered to the north and northeast by the United Republic of Tanzania; to the east, south, and southwest by Mozambique; and to the west and northwest by Zambia. The country has an area of approximately 118,484 square kilometres with the lake and other water bodies covering about twenty percent of the area. The country is 901 kilometres long and 80 to 161 kilometres wide. Arable land covers twenty three percent of the country's total land size. Figure 4.1 shows the map of the country and its location.

Figure 4.1: Malawi Map

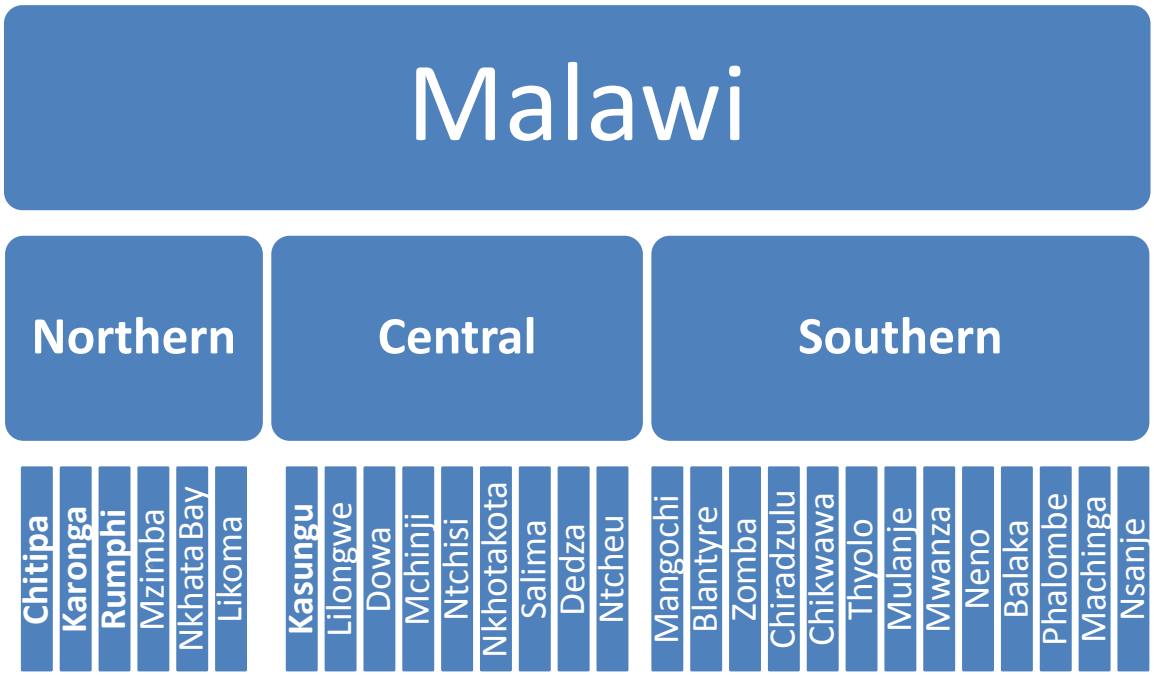


Source: Malawi Atlas (2015).

As depicted in the Figure 4.1, the Lake Malawi covers a larger component of the water bodies. It is about 475 kilometres long and stretches to the country's eastern boundary with Mozambique. Malawi is a rift valley, and it runs through the country from the northern region to the Shire valley in the southern region. The mountain ranges and peaks of the country ranges range from 1,700 to 3,000 metres above sea level.

The country is divided into three regions: the northern, central, and southern regions. There are twenty-eight districts in the country with the northern region having six districts, the central region with nine and the southern region having thirteen districts. Figure 4.2 provides the administrative division of the country:

Figure 4.2: Administrative division of the country



Source: Author's (adapted from Dunga, 2013).

The districts are further administratively subdivided into traditional authorities (TAs), presided over by chiefs. Each TA is composed of villages, which are the smallest administrative units, and the villages are presided over by village headmen. This structure to some extent shapes the health services delivery of the country which is divided into central (tertiary), district (secondary) and community (primary) level

(MoH, 2014:3). The health service delivery structure is discussed in details later under the health outcomes and sector section.

The climate in Malawi is tropical continental with maritime influences. The variation of rainfall and temperature is mostly dependent on altitude and proximity to the lake. The weather is cool and dry from the month of May to August and hot from September to November. The rainy seasons in general are from October or November and continue up until April (NSO, 2010:22).

Malawi, with a population of about 16.4 million people, according to the 2014 United Development Programme (UNDP) Human Development report, ranks 174 out of 187 on Human Development Index (HDI) with a World's lowest reported GNI per capita of $250 (World Bank, 2015). HDI is a measure of long-term progress in terms of a health life, access to knowledge and descent standard of living (UNDP, 2014:1). The country has experienced similar trends like most of the Sub Saharan countries in the low income category in terms of life expectancy, infant mortality, child mortality, child malnutrition, access to clean water, literacy and education enrolment, however, Malawi's HDI of 0.414 is still below the average Sub Saharan HDI of 0.502 (UNDP, 2014:3).

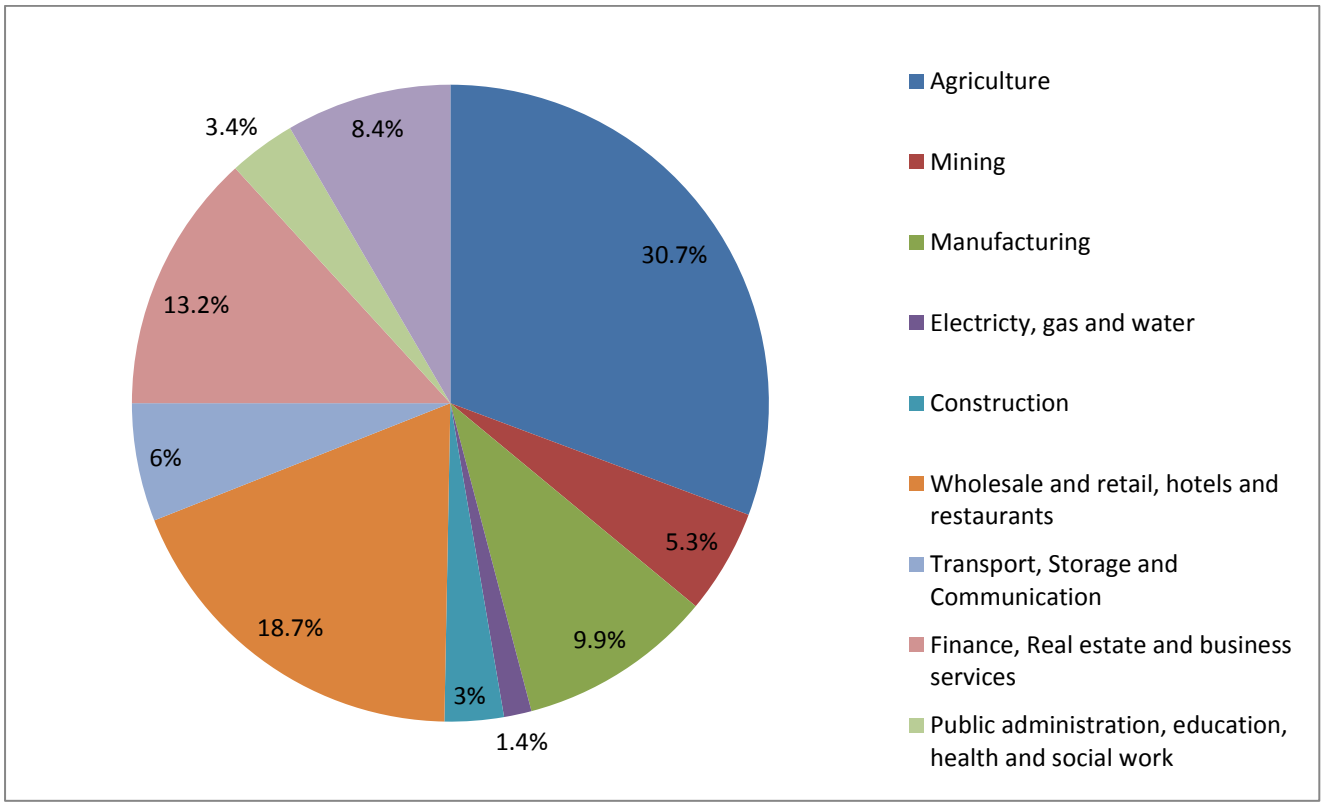
The country's health statistics are characterised mainly by a heavy burden of disease which is evidenced by the high levels of child and adulthood mortality rates and a high prevalence of diseases such as tuberculosis, malaria, HIV/AIDS and other tropical diseases (MoH, 2012a:14). Furthermore, evidence suggests that there is a growing burden of non-communicable diseases (NCDs) which when combined, accounts for an estimated twelve percent of the Total Disability Adjusted Life Years (DALY) in the country (MoH, 2014a:1). The economy relies on agriculture and is highly vulnerable to climatic conditions. The population density is one of the highest in sub-Saharan Africa; with thirty eight percent of the households having on average four to five members, and the poor households having three times household members than the non-poor households (NSO, 2012:12). The country main profile characteristics are further discussed in the subsequent sections; suffice to indicate however, that while the country has registered strides to achieving four of the eight Millennium Development Goals (MDGs). It still unlikely that the country will meet the MDGs targets relating to universal primary education and to reducing gender

inequality and maternal mortality (African Economic Outlook, 2014).

4.2 ECONOMIC ACTIVITIES

Agriculture is the mainstay of the country's economy, accounting for about 30 percent of the gross domestic product (GDP) which is estimated at $4 billion according to the April 2014 IMF World Economic Outlook. As can be observed from figure 3.3, the agriculture sector is the main contributor to the country's economy and continues to drive growth. However, the economic structure of the country is expected to be more diversified in the longer run to cushion it from the agricultural vulnerabilities of weather and ant smoking campaigns, which may affect tobacco, the main foreign exchange earner in the agricultural sector. The other key sectors are mining, services and manufacturing activities, which their growth and strengthening may help the country to create job opportunities and build the required economic resilience.

Figure 4.3: Malawi's 2012 GDP by Sector (percentage)

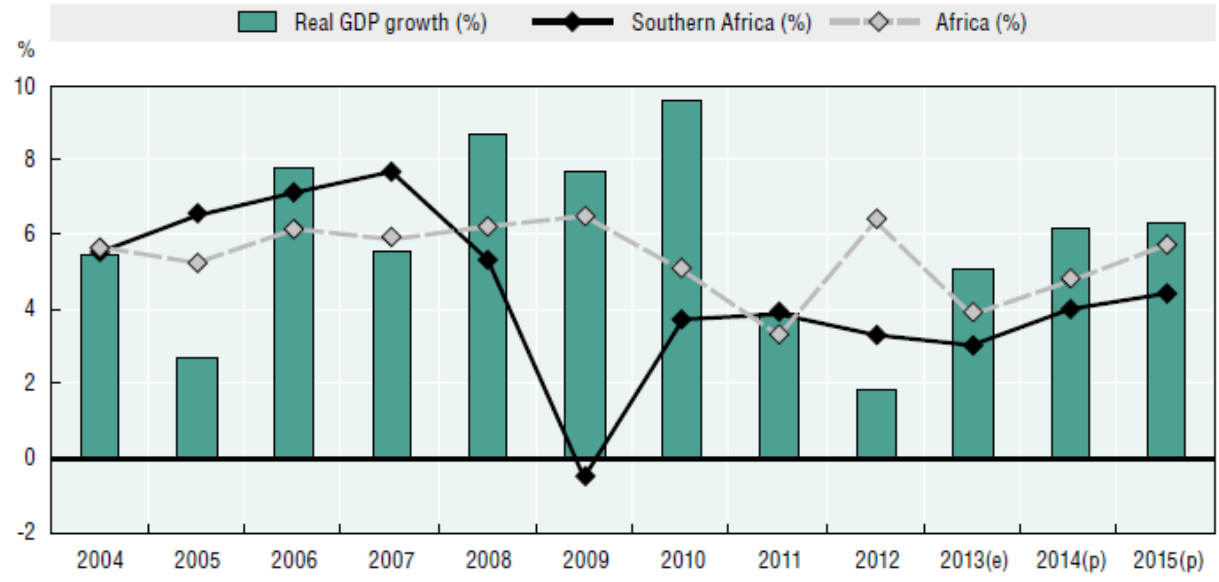


Source: African Development Bank, (2014).

As presented in Figure 4.3, agriculture is the backbone of the economy and contributes 31 percent towards the country's GDP followed by the wholesale and retail, hotels and restaurant with 19 percent. The mining industry stands at 5 percent and is one of the industry as reported by online newspaper, the Malavi Post of 20 August 2015, being touted by Malawi Government as to help reshape and reconstruct the economy in the near future (M'bwana, 2015).

On the GDP growth trends, as indicated in the Figure 4.4, the average real GDP growth rate was seven percent between 2006 and 2010 and a slump in 2012 of about two percent and a rebound of five percent in 2013 due to a good tobacco season and a strong recovery of growth in manufacturing, construction, and the wholesale and retail trade sectors (African Development Bank, 2014:3). The output of tobacco, which is the main export earner, boosted the overall agriculture sector growth to six percent from a two percent contraction in 2012 as it increased from 79.8 million kilograms (kg) to 168.6 million kg in response to improved auction prices following the depreciation of the country's kwacha (MWK). Generally, agricultural production increased in 2013 and it is this expansion in agricultural production that contributed to the revival in manufacturing output activities, especially agro-processing (African Development Bank, 2014:2). The country experienced some consistent increased trend in GDP growth rate between 2012 and 2014 as presented in Figure 4.4:

Figure 4.4: Malawi's Real GDP Growth 2004-2015



Source: African Development Bank, (2014).

The improved GDP growth rate was also due to the manufacturing output growth that increased from around one percent to 19 percent due to the improvement in the availability of foreign exchange as the country had been experiencing a critical shortage of foreign exchange 2011-2012. According to IMF World Economic Outlook April 2014 report, Malawi's real GDP growth was projected at just above six percent in 2015.

In general terms, the country's economy slowed down in 2011/12 during which the country's traditional development partners had suspended their aid due to issues surrounding to governance and fiscal challenges (IMF, 2015:5). After the new government was elected in 2012, the economy picked up especially after macroeconomic reforms that were pursued under the Economic Recovery Plan (ERP) which improved the foreign exchange availability and provided better incentives for producers of export commodities (African Development Bank, 2014:2). However, the economy continued to face some macroeconomic pressures including inflation, exchange rate volatility and excessive government domestic borrowing. While government continues to implement a tight monetary policy stance and implementing austerity measures towards fiscal discipline, the pace in curbing high inflation has been slower than expected because of the sharp depreciation of the Malawian kwacha.

Furthermore, the macroeconomic challenges faced by Malawi were aggravated by the revelation in September 2013 of the looting of public funds through the Integrated Financial Management System (IFMIS), known as "cash-gate". This led to the development partners suspending their budget support, leading to a widening of the fiscal gap (IMF, 2015:5). The IMF Observer Mission in November 2014 acknowledged that the Country is going through turbulent economic moments despite the economic activities demonstrating significant resilience (IMF, 2014). Real GDP growth for the year 2014 is projected between 5 and 6 percent, mainly with contributions from the agriculture and retail trade sectors. The Mission further observes that inflation remains high, due to mostly the uncertainties about the resumption of budget support who mainly contributes up to 40 percent of the national budget.

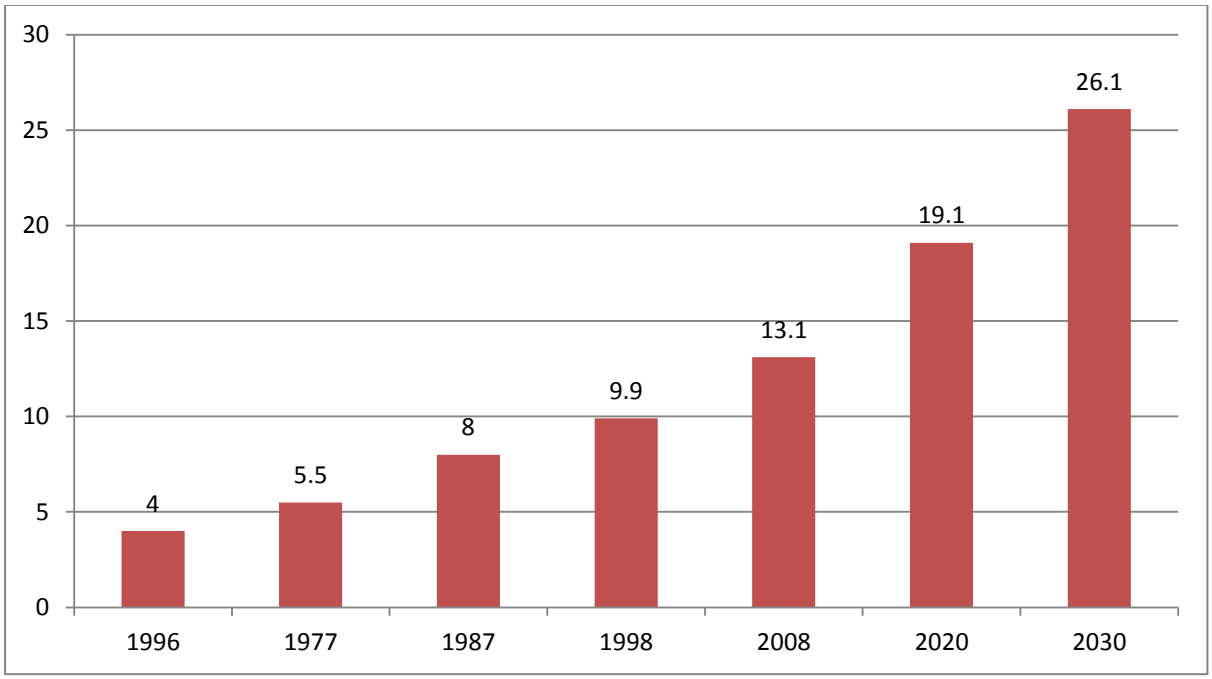
Malawi's economy also relies on exports however, the export base is largely dominated by primary commodities but, with globalisation, opportunities for exports

of processed products have emerged. The country has not yet repositioned itself to exploit opportunities to integrate into global value chains (GVCs). Obstacles to integration into GVCs include poor infrastructure, low skills and a weak business climate (African Development Bank, 2014:2). The government is implementing the national export strategy in order to improve its export competitiveness and this is highly skewed towards the processing of agro-products to feed into regional and global value chains. On resources for health, the country's financial resources for health are mainly sourced from external resources (donors), government revenues, and private institutions and households. According to the 2009/10–2011/12 National Health Accounts, the total health expenditure in the 2011/12 financial year was equivalent to about 9 percent of the national's gross domestic product at current market prices (MoH, 2014:8). This translated to US$39 per year as per capita health spending. In Malawi donor partners are by far the biggest financing source towards health sector, with an average contribution of 68 percent, as compared to government's 16 percent, while local NGOs and households contribute 10 percent and 6 percent, respectively (MoH, 2014a:8). In other words, critical issue towards governance and subsequent budgetary support, economic growth of the country have a bearing on the health financing, quality of service and health outcomes.

4.3 POPULATION AND DEMOGRAPHIC TRENDS

The population in Malawi has been and continues to be growing rapidly, and in just over 40 years, the population has increased from 4 million people in 1966 to 13.1 million in 2008 (NSO, 2012:2). In considering the high level of fertility rate of 5.7 births per woman, the population is likely to grow steadily unless fertility rate (FR) substantially decline. Fertility rate is expressed as number of births per 1000 women and also include a specific age hence referred to as age specific fertility Rate (ASFR) (NSO, 2014:113). With an estimated level of fertility decline from the 2010 level of 5.7 to 4.6 by 2020, the population will still grow to 26 million in 2030 as further noted by NSO (2012). The country's population trend is presented in Figure 4.5.

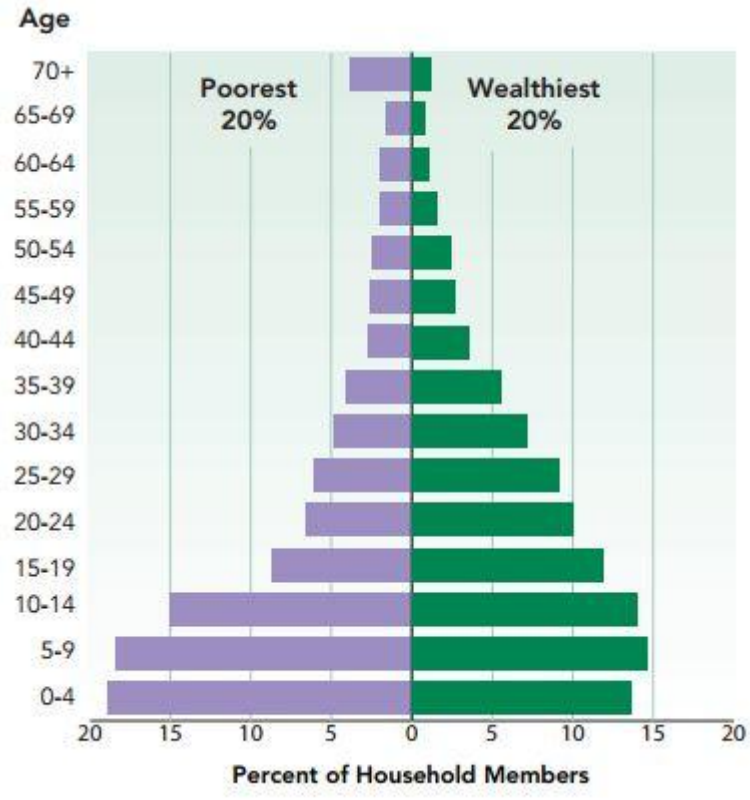
Figure 4.5: Population trend in Malawi (in millions)



Source: NSO, (2012).

The population in the country is projected to keep increasing even further and in order to understand population concentration and distribution, district data provides such in-depth understanding. In summary though, within the country, the annual district population growth rates were highest and above the national average of 2.8 percent in the districts of the northern and central regions while slower growth rate has been observed in the southern region. However, looking at population density, which is population per square kilometre, southern region still has the highest at 258 people per square kilometre, the central region with 194 while the north has 64 people per square kilometre (Tversky & Kahneman, 2014:116). One of the major contributing factors towards high population growth rate in Malawi is high fertility rates (NSO, 2012:2; NSO, 2014:114). The fertility rate distribution is presented in figure 4.6 according to ages by considering the poorest and worthiest 20 percent:

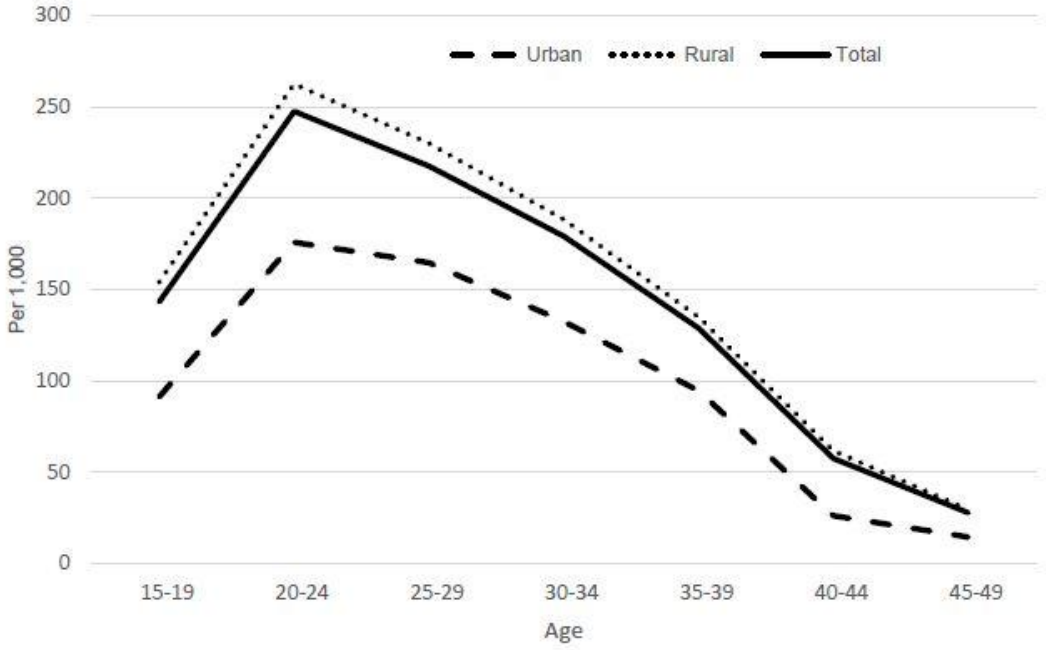
Figure 4.6: Fertility rates in Malawi



Source: NSO, (2012).

The Figure 4.6 shows fertility rates in Malawi across age structure. The population of the country is still youthful with a median age of 13 for the 20 percent poor and 17 for the 20 percent wealthiest. Taking into consideration the ages, the ASFR is considerably higher in rural areas (5 births per woman) as compared to the urban areas (3 births per woman) as shown in Figure 4.7.

Figure 4.7: Fertility rates by area



Source: NSO, (2014).

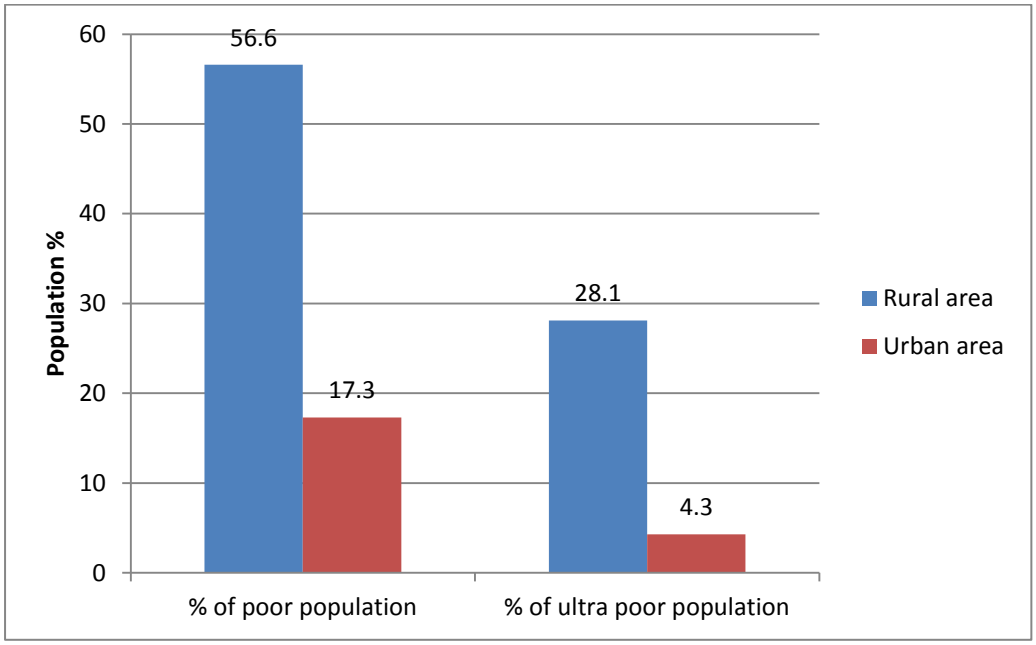
As presented in the Figure 4.7, the urban-rural difference in fertility is most pronounced for women in the 20-24 age groups: 176 births per 1,000 women in urban areas versus 263 births per 1,000 women in rural areas. With such fertility rates coupled with low literacy and education levels rates in rural areas, the population growth rate is consequently higher in rural areas as compared to the urban setting (NSO, 2014:114). The population growth rate hence has a bearing on country's resources and service delivery capacity and further complicates when urban and rural as well as districts settings are brought into the picture on the population impact on health outcomes.

4.4 POVERTY IN MALAWI

Poverty in Malawi as defined by the National Statistical Office is widespread despite some significant high economic growth the country has experienced in the recent years. This is the number of people whose total consumption is below MK37, 002 (USD235.23) per person per year (NSO, 2012:207). As high as 50.7 percent of the population is poor and a quarter of the population living in ultra-poverty (NSO, 2012:207). The level of poverty is significantly higher in rural where 57 percent of the

poor population resides as compared to the urban areas of the country. Figure 4.8 provides the comparison of the rural and urban areas.

Figure 4.8: Poverty distribution between urban and rural Malawi



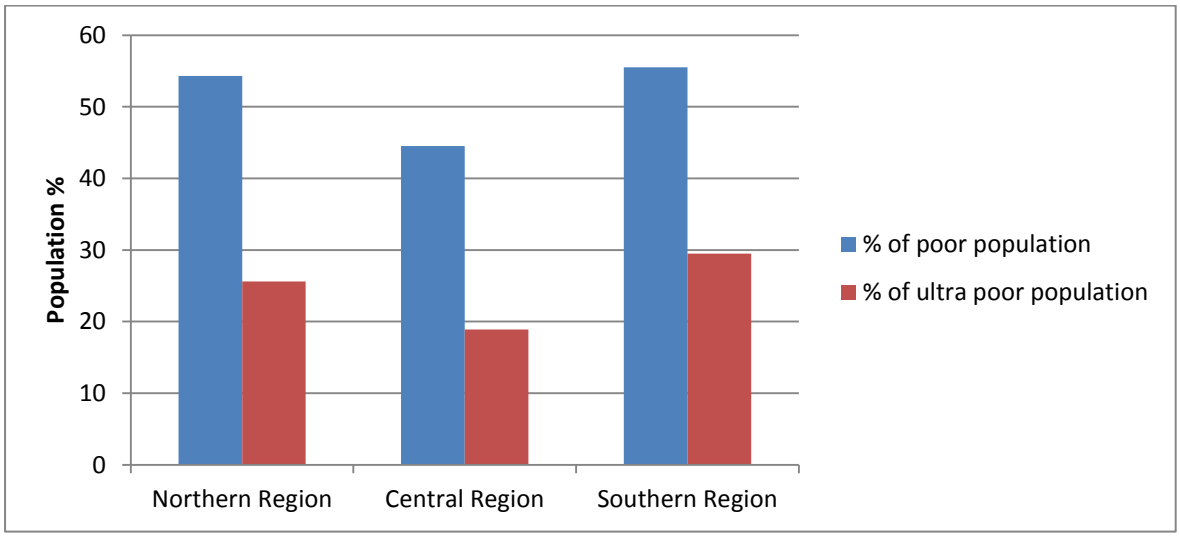
Source: NSO, (2012).

Poverty in Malawi is skewed towards the rural areas where more than 80 percent of the people dwell. In 2011, as reported in the third Integrated Household Survey (IHS3), 57 percent of the rural population was poor as compared to the 17 percentage of the urban population. The rural population, as shown in Figure 4.8, had 28 percentage of its population as ultra-poor as compared to the 4 percent in the urban area in 2012. The ultra-poor are defined to be the population whose total consumption is MK22, 956 (USD 146) or below per person per year (NSO, 2012:204). The distribution of poverty has a significant influence in shaping the health outcomes disparities across a given population. This is mainly from the fact that major life shocks leading toward impoverishment, namely hunger, famine, disease, deaths, drought and floods renders the poor vulnerable as they are faces with unhygienic homes, lack of money to pay for their health needs including transport to hospitals or clinics where necessary, lack of food, lack of peace of mind (Conticini, 2004:22).

Considering household characteristics, poverty is worse amongst female-headed households; and households whose head has no formal education this in both in poor and ultra-poor incidences. The proportion of head count poverty in Malawi is 58 percent for female-headed households and 51 percent for male-headed households and for the ultra-poverty measure; the female-headed household's proportion was higher with 27 percent for females and 21 percent for males. The IHS also reveals that on average, female-headed households earned 60 percent of the annual income of male-headed households. Thus for every MK100 a man gets, a woman got MK60. About 60 percent of the female-headed households expenditure was on food, which is less as compared to the male-headed households food expenditure which was at 54 percent of their total income (NSO, 2012:204). It however critical to still consider other measure of poverty when understanding the dynamics of poverty as more and more multidimensional measure of poverty that is poverty beyond income and consumption dimensions are shaping most policy directions (Günther *et al.*, 2007:22)

The country still faces a number of challenges in its efforts towards extreme poverty eradication and these challenges include inadequate financial resources towards the poverty reduction programmes; high levels of illiteracy; and critical shortage of capacity in institutions which are at the helm of implementing development programmes (NSO, 2012:204). In comparing the regions of the country, the southern region of the country is poorer than the central and the northern regions as can indicated in Figure 4.9.

Figure 4.9: Poverty in Malawi as per regions



Source: NSO, (2012).

As indicated in Figure 4.9, the southern region of the country has the highest level of both the poor and ultra-poor population. Furthermore, poverty in Malawi from the years between 2005 and 2011, which will be used more in the study, declined only marginally from 52.4 percent in 2004/05 to 50.7 percent in 2010/11 – an insignificant reduction. The depth (how far off households are from the poverty line) and severity (how distant are the poor from the poverty line and how unequal is consumption shared among the poor) of poverty did also increase (NSO, 2012:213). As further reported in the report, almost half of the children under age 5 in Malawi, are short for their age due to long-term effects of poverty through malnutrition (stunted) and 20 percent are severely stunted and that high mortality and morbidity are mostly associated with high level of poverty.

4.5 EDUCATION AND LITERACY IN MALAWI

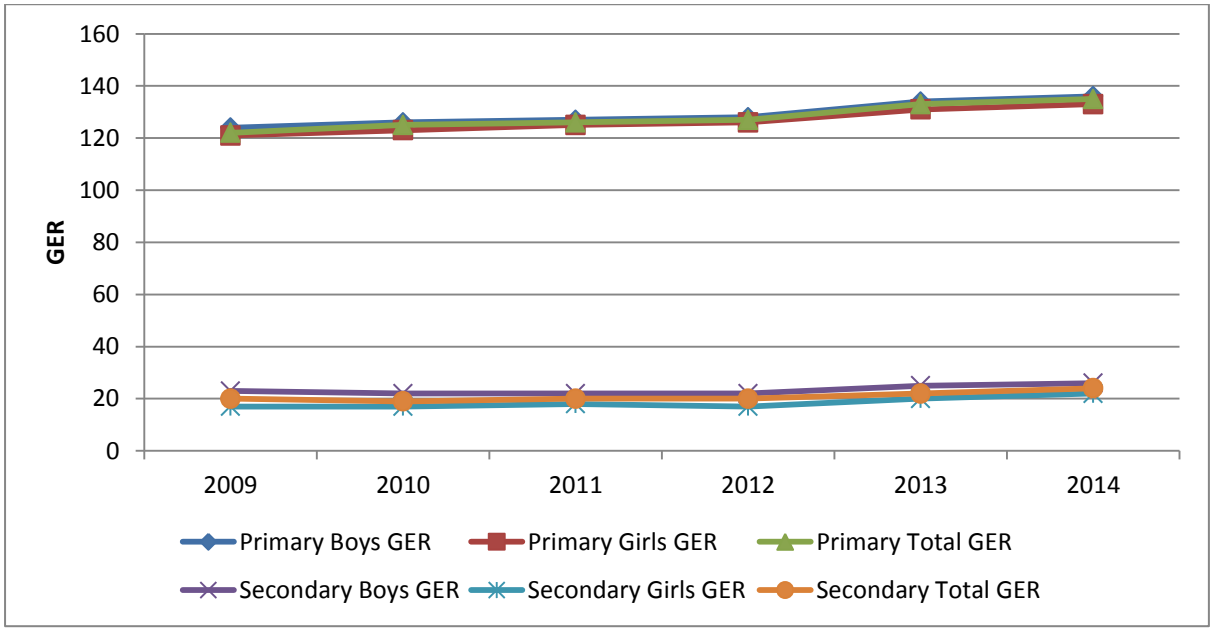
The education system in Malawi is to a greatly informed and founded on the British education system, which may not be much of a surprise since it was the British who introduced education in the country during the colonial era (Chimombo, 2005:1). With exclusion of early child development, Malawi's levels of education can be classified in three main levels, namely primary, secondary and tertiary. The Primary education has eight grades (standards) and in grade 8, pupils sit for the primary school leaving certificate examination with those that pass being awarded the primary school leaving certificate PSLC (NSO, 2014:166). After primary school, the best students are selected to secondary schools. Not everybody that passes the PSLC is selected because there are a limited number of available spaces in the secondary schools. The transition rate from primary school to secondary remains very low in the country despite efforts in increasing enrolment in schools. The official prescribed age for primary in Malawi is supposedly six to thirteen years of age (NSO, 2012:27). However as reported in the MDG End-line Survey, the transition rate from primary to secondary based on the ISCED classification (from Standard 6 to Standard 7) is 93 percent, but only 33 percent of children of secondary age according to the ISCED classification (12-17 years) are attending secondary school.

Most of the students are likely to have dropped out or still within the primary system as repeaters. The use of Effective Transition Rate which takes into account of the repeaters puts that 80 percent of the children that were attending the last class of

primary school do start the first class in secondary school against the 58 percent when repeaters are not included (NSO, 2014:174). In Malawi, over 20 percent of the primary school enrolment are either under or over aged (NSO, 2012:12) and analysing the 2014 EMIS report, approximately, 21 percent of the primary school enrolment was between the ages of thirteen to eighteen and no major differences between the girls and boys (MoE, 2014:27) and the trend is not much different between 2005 to 2014 reports from which the study has used and also as basis for adjusting the dropout rate in relation to maternal, infant mortality and TB prevalence.

The total enrolment in a specific level of education, regardless of age, is expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school year (MoE, 2014:27). This rate shows the general level of participation in a given level of education and does further indicates the capacity of the education system to enrol students of a particular age group. The enrolment rate for both primary and secondary is given in Figure 4.10:

Figure 4.10: Enrolment Rate in Primary and secondary schools in Malawi



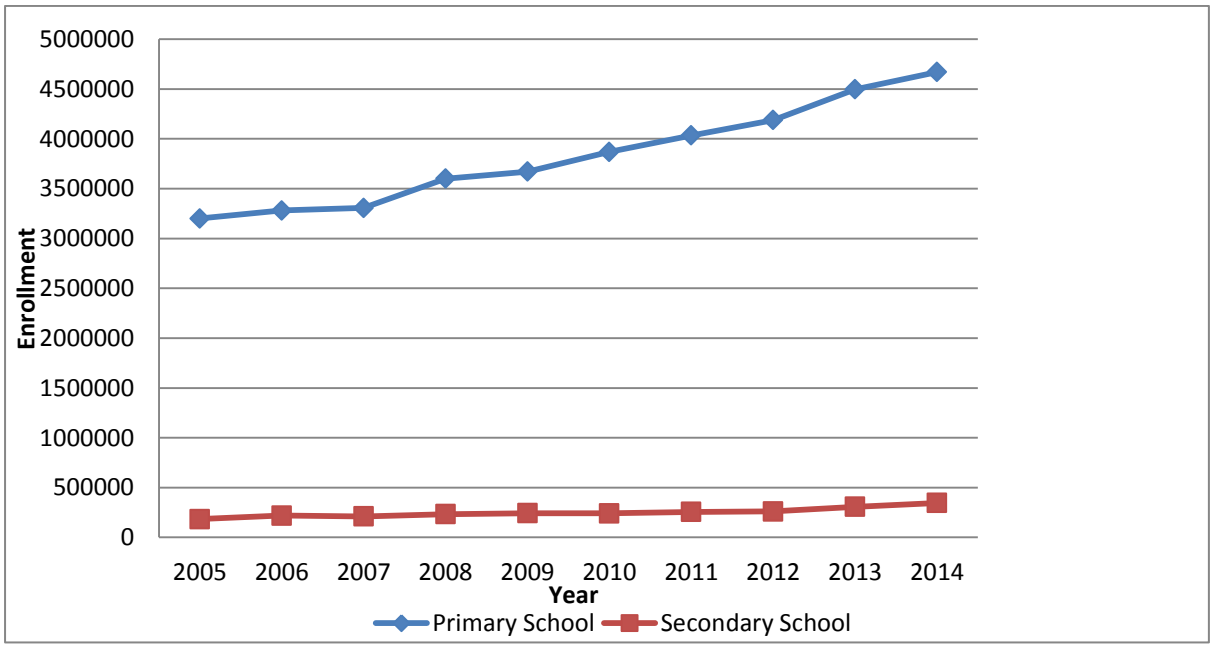
Source: EMIS, (2014).

The gross enrolment rate has for the past five years been over 100 percent in the primary school while in secondary school between 20 to 24 percent with more boys than girls in school have but with a minimal difference. The secondary school net attendance ratio, however, shows that only 16 percent of the secondary school age

children are attending secondary school and about two-thirds (64 percent) of the remaining are still attending primary school with 20 percent children of secondary school age completely out of school (NSO, 2014:170). It is also be worth noting that the secondary net attendance ratio for males, which is 14 percent, is lower than that of females, which is approximately 18 percent.

In considering the enrolment levels, the trend shows that for the past decade, there has indeed been a significant increase in the primary school enrolment levels as compared to the secondary school as presented in Figure 4.11.

Figure 4.11: Primary and Secondary school Enrolment levels in Malawi

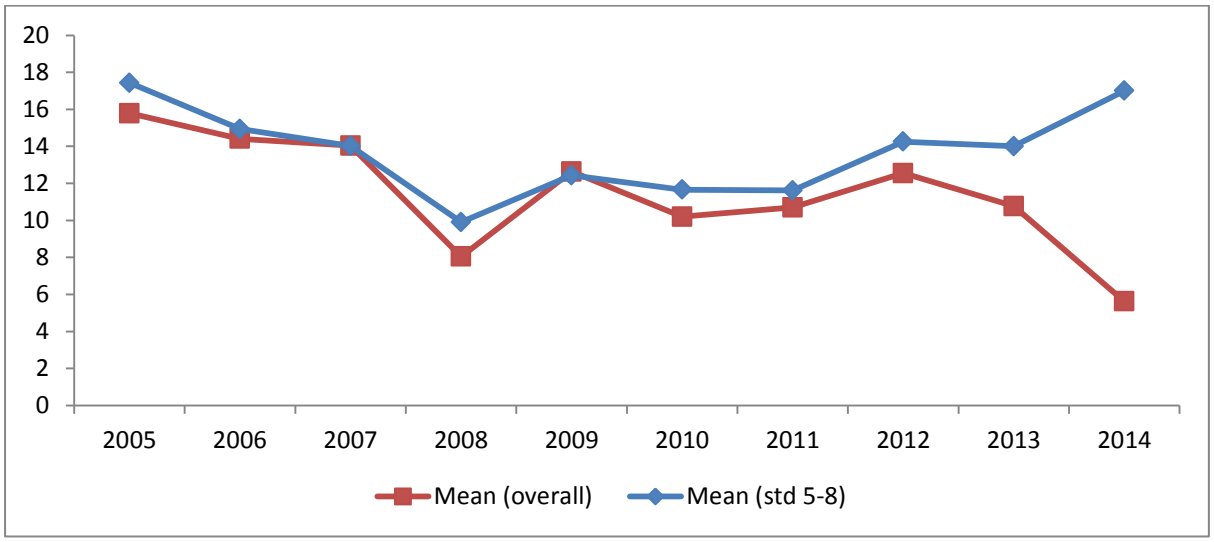


Source: EMIS, (2014).

The increased levels of enrolment is attributed to, apart from population growth, the continued free primary school since 1994 in the country which is part of the policies in the country has been skewed towards increasing the primary school enrolment (Chimombo, 2005:155). In primary school attendance, some differences are observed when comparing the urban-rural areas as well as regions. For example by region, the Northern Region, for instance, the primary school attendance reaches 84 percent, while it is 78 percent in the Central Region and 80 percent in the south, and 98 percent of children attend school in Urban areas while 93 percent in rural areas (NSO, 2014:169).

While the country has made much progress in maintaining pupils in school, there are still some who drop out for various reasons. Dropout rate is the proportion of pupils from a cohort enrolled in a given year who are no longer enrolled in the following school year hence captures the phenomenon of pupils from a cohort leaving school without completion (MoE, 2014:8). The IHS3 indicates that on average**,** the dropout rate in primary schools in Malawi is at one percent with a significant decline by 4 percent from the 5 percent in 2005 (NSO, 2012:37). This however different from the education statistics from the Ministry of Education published as Education Management Information System (EMIS) which show a trend of primary school dropout between 2005 and 2014 ranging from 10 to 17 for both the overall and those in ages 13 to 18 (approximated by standard 5-8) as shown in Figure 4.12.

Figure 4.12: Dropout Rates overall and for standard 5 to 8 (2005-2014)



Source: MoE, (EMIS 2005-2014).

As presented in Figure 4.12, the dropout rate in the ages of 13 to 18 as approximated by the standard 5 to 8 has had similar levels and trend except after 2012 where the standard 5 to 8 shows an increasing trend. The standard 5 to 8 dropout rate is used in the study to adjust the overall dropout rate when considering it under health outcomes of maternal, infant and TB prevalence rate. The main reasons that are commonly reported to have an effect on dropout rates in primary are such as pupils are not interest, no money, illness, marriages, pregnancies and help at home (NSO, 2012:37). The IHS3 indicates further that the dropout rate is

almost in the same proportion in both rural and urban areas however more female students than their male counterpart. On a regional basis, the central region has on average the highest number of primary school dropouts, followed by the south and then the northern region (MoE, 2014). The IHS3 has however shown that the secondary school dropout rate in Malawi is at 12 percent and regional wise, the southern region of the country has the highest number of pupils dropping out of school at around 14 percent while the northern (13 percent) and central region 9 percent (NSO, 2012:37).

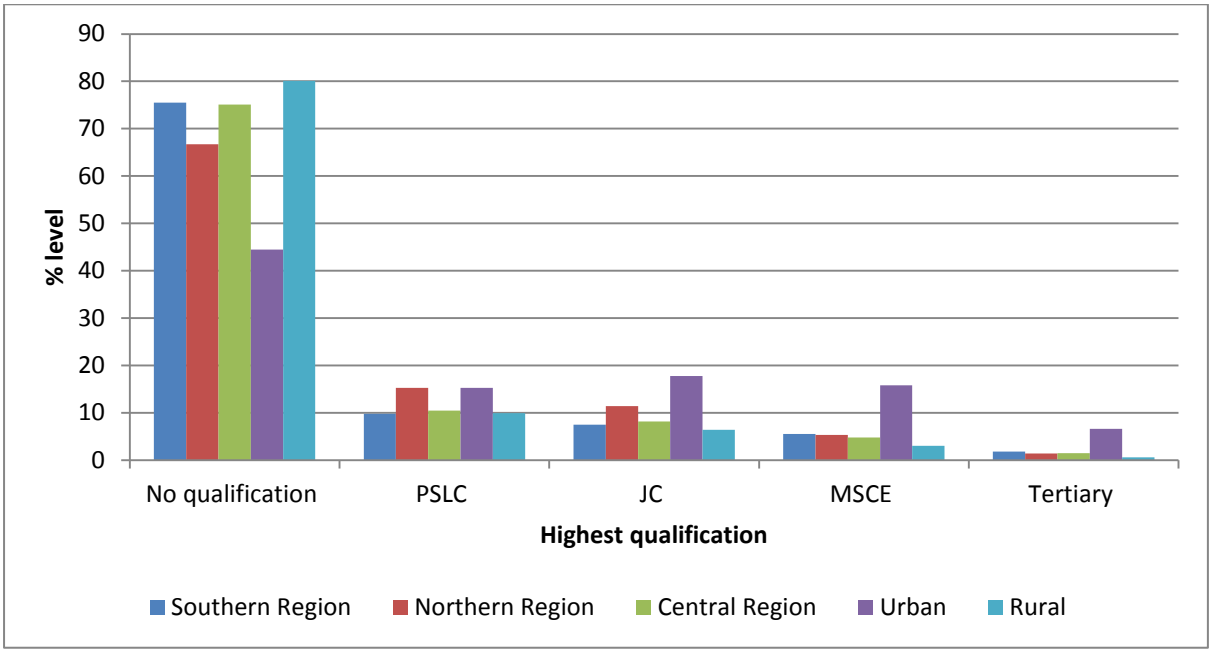
In Malawi, the population of 10.6 million is aged 5 years and older (NSO, 2012). This is a population age category internationally used to determine the literacy of the nation. The country has 6.8 million people who are literate, representing a 64 percent literacy rate, with urban 85 percent while rural 15 percent (MoE, 2014:7). Literacy is described as the ability to read and write with understanding in any language expressed as a percentage of the total population of the same age group (NSO, 2012:27). The male aged 15 years and above have 74 percent literacy rate as compared to the female, which are at 57 percent of the same aged group. The place of residence also shows differences with those in urban areas showing higher literacy rate of 89 percent as compared to rural areas who are at 61 percent. In comparing the regions, the northern region has proportionally higher literacy rate of 77 percent, while the central and the south have 65 percent and 62 percent (MoE, 2014:7).

In considering the youth literacy rate which reflects the effectiveness of the primary education over the previous 10 years or so and also used as a proxy measure of social progress and economic achievements, 72 percent of young women in Malawi are literate and that those in urban area have 90 percent while 69 percent in rural (NSO, 2014:163). The report further indicates that the northern region has the highest level of literacy rates while the central has the least, 86 percent and 70 percent respectively. On the other hand among young men of the similar ages of 15 to 19, the distribution levels are similar as 78 percent of young men in Malawi are literate with urban area at 89 percent while the rural area at 75 percent in rural areas with the central region the least at 68 percent and both north and south at 79 percent

In general, with all the education statistics, a summary of how educated Malawi is can be shown by the highest qualification distribution table. As indicated earlier,

having completed the primary school pupils take the Primary School Leaving Certificate Examination (PSLCE), then at the end of two years of secondary, pupils take the national Junior Certificate of Secondary Education (JCE), which is followed by the Malawi School Certificate Examination (MSCE) two years later. The country's highest qualification as per the IHS3 is summarised in Figure 4.13.

Figure 4.13: Highest qualification by regions and area



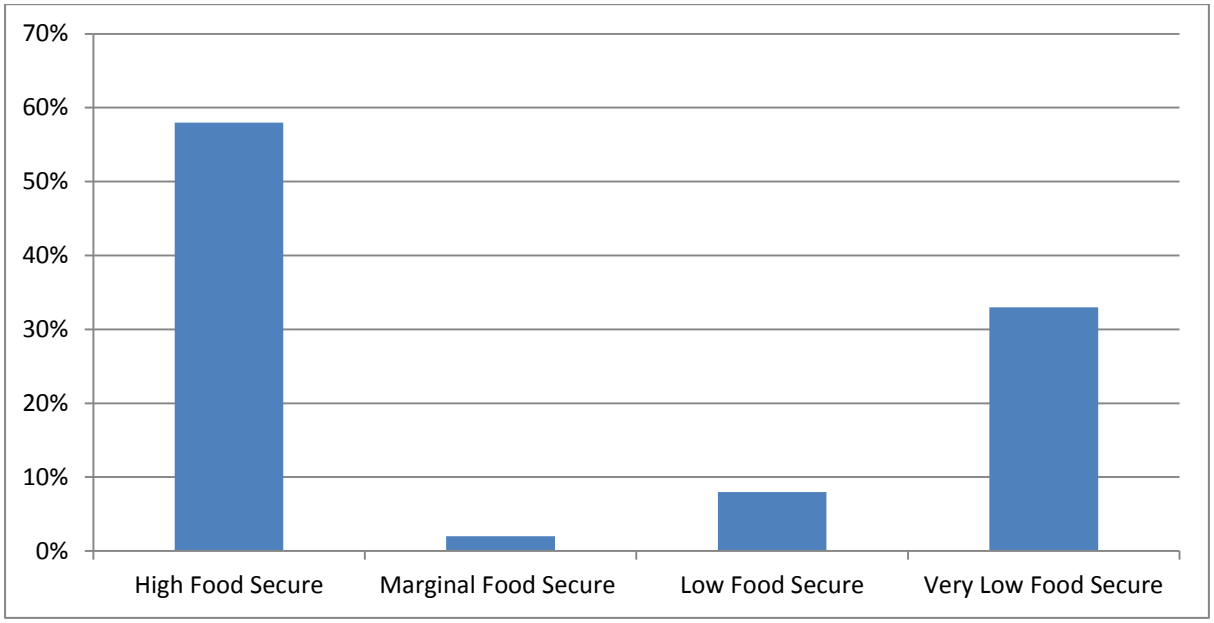
Source: NSO, (2012).

The country has higher qualifications skewed towards the urban population and still has over 50 percent of its population with no qualification. The role of literacy and education on health can never be overemphasised. Universal access to basic education and the achievement of primary education by the world's children is one of the most important goals of the MDGs (World Bank, 2010). In general terms and with no exception for Malawi scenario, education is a plays a pivotal role as a prerequisite for improved health and well-being though not limited to combating poverty, empowering women, protecting children from hazardous and exploitative labour and sexual exploitation, human rights promotion and informed choices, protecting the environment, as well as influencing population growth (Ayi *et al.*, 2010:1; MoH, 2012:30; NSO, 2012:21; WHO, 2014).

4.6 AGRICULTURE AND FOOD SECURITY

A person is classified as food secure when he or she has a permanent physical and economic access to sufficient, safe and nutritious food to meet his dietary needs and food preferences for an active and healthy life (NSO, 2012:187). The classification by IHS3 is in four categories with each representing a different degree of food severity: high food security where households have food adequacy and no disruption in eating patterns; marginal food security where there is concern on adequacy while the rest hold; low food security where access becomes a concern, quantity and variety of food reduced without disrupting normal eating patterns; and very low food security where the household further does experience multiple disruption of eating patterns and food intake and dependency on relatives and friends.

Figure 4.14: Food security levels by category in Malawi

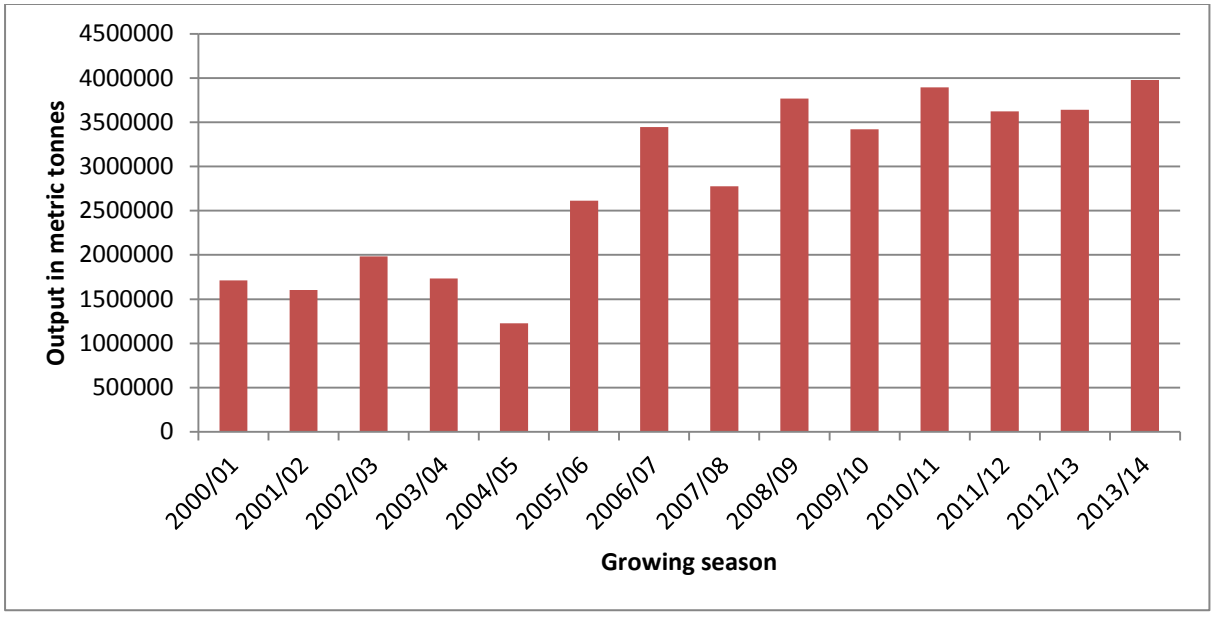


Source: NSO, (2012).

The Figure 4.14 shows that the country had about 33 percent of the population had very low food security. That is, about one in every three people lives in severe low food security, 8 percent experiencing low food security and about 2 percent in the marginally food secure category while about 58 percent are food secure. In Malawi, food security cannot be divorced from crop enterprise.

The country has 85 percent of its households engaged in crop production with maize as the major crop and staple food (NSO, 2012:130). It is not surprising though that food security in the country is synonymous with maize output (Chirwa et al., 2008:9). Maize is one of the strategic crops of the country for both food and as cash crop for most subsistence farmers in Malawi and is cultivated across the country. The maize production in the country is mostly rain fed. As the dominant crop, it occupies about 67 percent of the total cultivated plots and 80 per cent of cultivated land in the smallholder sector while the rest of land has crops like cassava, groundnuts, cotton, rice, sorghum, millet, legumes and tree crops (NSO, 2012:139). Since the reintroduction a fertilizer subsidy programme in the country in 2004/05 the government has made increasing maize yields a pinnacle of most agricultural policies, putting it as indeed a strategic crop (Chirwa et al., 2008:9). The maize output trend is presented in Figure 4.15.

Figure 4.15: Maize output trend in Malawi 2000-2014



Source: GoM (2014)

The maize output in the country has been increasing, however, in 2004/05 season the country experienced some dry spell, which led to the reduction of the maize output before a recovery in 05/06 growing season. Good rainfall pattern plays a critical role in the production of maize in the country as most maize farming in Malawi is rainfall fed (NSO), 2012). The fertiliser program in the country has also been

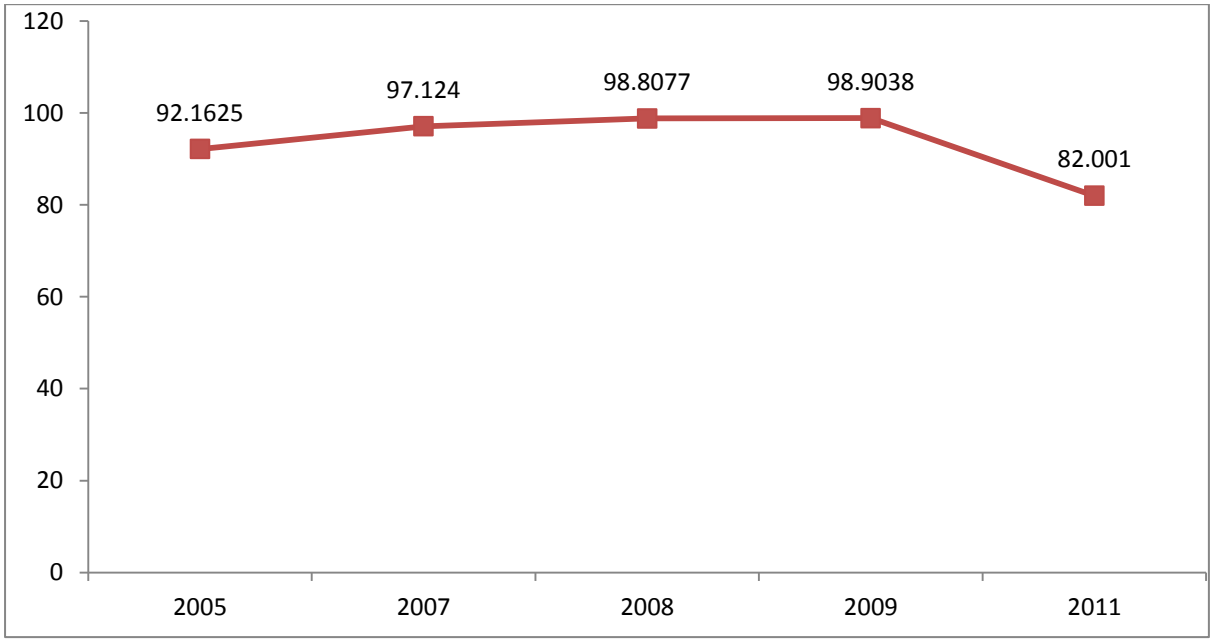
touted as one of the contributing factor to the increase in maize output since its introduction by government in 2004/05 growing season. The crop hence provides indications towards food security for both at national and household level which is one of the important factors towards improved health in the country as it relates to nutrition which is a risk factor to a number of diseases and stress associated to perpetual food insecurity among the identified pathways in literature (Ignacio *et al.*, 2014:2068; Klawetter, 2014:134).

4.7 EMPLOYMENT IN MALAWI

In Malawi, employment rate is at 89 percent and this is on the basis of the broader definition of which captures the percentage of the of the population (labour force) age 15 – 65 years who, during the reference period of one week were employed to the total working population (NSO, 2014:26). As further noted in the 2013 Malawi Labour Force Survey (MLFS), a total of 5.5 million people were employed, representing an employment rate of 80 percent with more males who have 86 percent than the females who are at 74 percent (NSO, 2014:21). The agricultural sector (including forestry and fisheries) as further reported in the 2014 MLFS, has the majority of employed persons (64 percent) and wholesale, retail and repair of motor vehicles (16 percent) manufacturing at 4 percent, construction at 3 percent and mining and quarrying at 0.3 percent. The agricultural sector employs more women mostly on an informal basis (98 percent) than men (94 percent) while on formal employment; the men have a higher rate of 5.5 percent against 1.6 percent for female. In considering regions, the Northern part of the country has the highest employment rate, which is at 87 percent while the southern part has the lowest employment rate at 73 percent.

It should also be noted that most people in Malawi are engaged in informal employment which has 89 percent of the people working and predominantly higher in rural areas, while the formal employment is higher in the urban areas as in rural areas, the percentage of employed persons in informal employment is 91 percent compared to 69 percent in urban areas while the formal employment is higher in urban areas than the rural. The employment trend in Malawi for the period under the study is presented in Figure 4.16:

Figure 4.16: Employment levels in Malawi 2005 - 2011



Source: Authors' (Data from WMS 2005 – 2011).

The Figure 4.16 shows that from 2005, Malawi levels of employment have been over 80 percent. In other words, considering that much of it is in the informal employment, much of the employment benefit is mostly subsistence income. As from the employment definition, the implication is that a person is considered employed if he/she is involved in an economic activity within the Systems of National Accounts (SNA) boundary even if the work is for one hour mainly because the ILO conceptual labour force framework considers employment as taking more precedence over unemployment while unemployment takes precedent over inactivity (NSO, 2014:9).

The employment measure however does bring a challenge as it distorts the ills of unemployment in the country. This for example entails seasonal vulnerability as most of the employment is informal and depends on seasons and furthermore uncertainty on measuring underemployment as hours may vary all the time (Durevall & Mussa, 2010). However, the inclusion of hourly measure adds more weight on the role of subsistence income and is worthy investigating as most of the Malawians are employed in the informal sector with no defined hours of work. Furthermore, despite the shortfall on the measure, the implication of income gained still become relevant as the gains of any form of employment would be more positive towards health than

unemployment or inactivity based on the assumption of ability to purchase health or health related commodities as well as the reduced dependency burden. This becomes even more complicated when considering the challenge of teen age marriages and pregnancies considering that in Malawi the highest percentage of inactive population is in age 15-19 with the youth unemployment at 28 percent (NSO, 2014:42).

4.8 HEALTH SECTOR, OUTCOMES AND TRENDS IN MALAWI

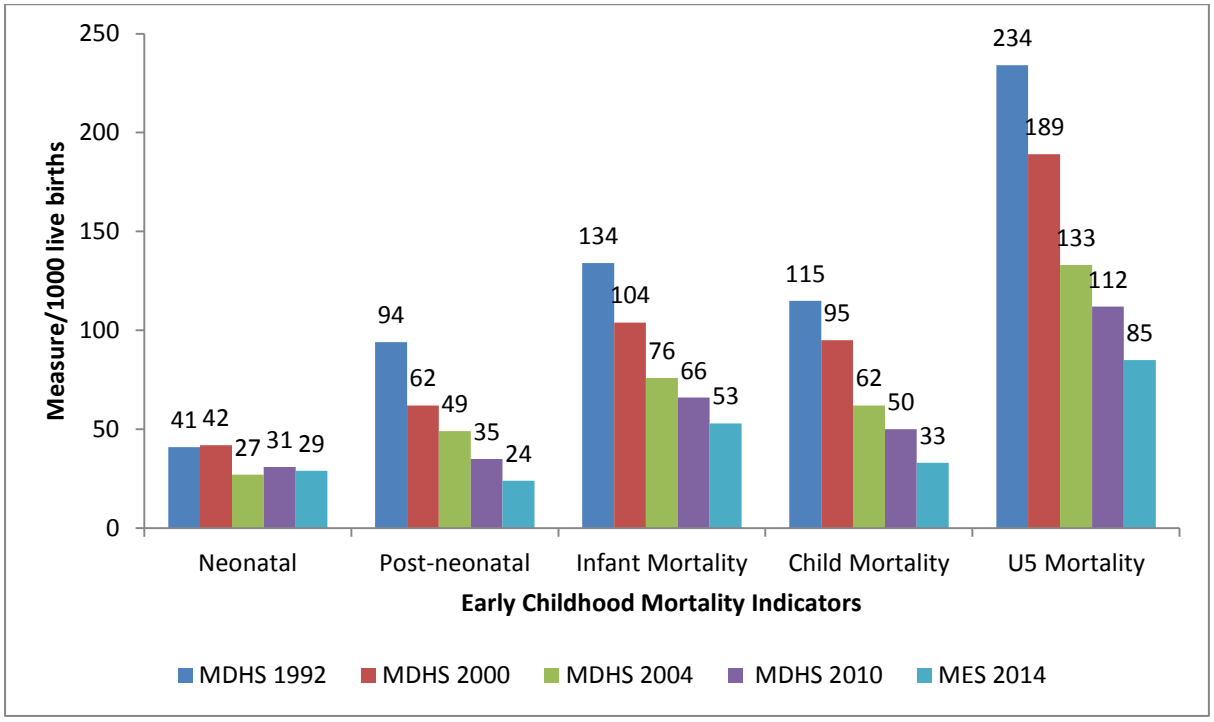
The section provides an outlook of the country's health sector outcome indicators in by providing both the general picture and specific indicators trends which provides health performance of people of Malawi as well as applicable to the study. In general, the Malawi's health outcomes indicators for the past 20 years have had a mixed trend of direction according to various Malawi Demographic and Health Surveys (MDHS). These are national wide surveys capturing demographic and health indicators and normally are conducted every two years.

The country's life expectancy has grown from 39 years from the 1990s to about 55 years in the recent years with the improvement mainly due to the positive efforts in combating the HIV/AIDS (through the provision of life-prolonging drugs and other preventive measures) which had affected the country in the 1990s (MoH, 2014a:1). The major indicators' trends to be analysed in details are mortality rates and disease burden, which are further analysed in the subsequent chapters.

4.8.1 Health outcomes in Malawi – childhood mortality

The health situation in Malawi shows that the health status of Malawians has seen improvement in some indicators over the past decades. Apart from improved life expectancy, there have also been improvements in child health as demonstrated by the declining of childhood mortality rates over the last two decades as shown in Figure 4.17.

Figure 4.17: Child mortality Indicators for Malawi 1992-2014



Source: Author's Calculations (data from MDHS and MDG End-line Survey 2014)

As presented in Figure 4.17, the country has registered substantial decline in childhood mortality indicators, which are measures as deaths per 1000 live births. One of the major contributing factors to such progress in infant and under five mortality decline is the investments in child survival interventions for example the vaccines for various diseases, effective pneumonia treatment at community level, and effective prevention and treatment of malaria and diarrhoeal diseases (MoH, 2014a:1). The report also attributes the progress in improving child health to socio-economic factors of education especially to the mother as well as household improved income.

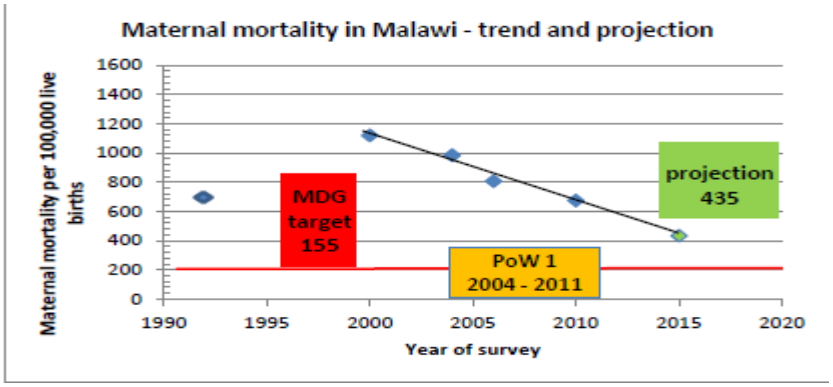
In considering the regions of the country, except for the post-natal mortality, the southern region of the country has relatively higher mortality rates as compared to the central and the north, which has the least. Comparing rural and urban, the rural has higher under five mortality (86 deaths), child mortality (35 deaths) as compared to urban under-five mortality (80 deaths) and child mortality (20 deaths). However, the neonatal, post-neonatal and infant mortality rates among children in urban areas are higher than in rural areas. These trends further demonstrate the country's

possibility that of reaching the MDG targets for these two indicators. This will be possible if significant investments are made in child survival interventions.

4.8.2 Maternal mortality

The maternal mortality ratio in the country has decreased from 984 per 100,000 live births in 2004 to 574 per 100,000 in 2014, with an increase in women delivering at health centres, as a positive development, from 57.2 percent in 2004 to 87 percent in 2014 (NSO, 2014:IX). The maternal mortality trend is presented in Figure 4.18.

Figure 4.18: Maternal Mortality Ratio Trends 1990 - 2015



Source: MoH, (2012a).

The significant decline in maternal mortality ratio has much been attributed to additional investment towards the increased access to Emergency Obstetric Care (EmOC) for many more pregnant women and also towards family planning targeting the reduction in the total fertility rate (MoH, 2012a:22). Furthermore, the 2012 Malawi HHSP shows that sepsis and post-partum haemorrhage are the most likely causes of death in the majority of mortality cases based at health facilities. Unlike the MDGs relating to child health, the maternity MDG targets are unlikely to be met. This may not only emanate from the required efforts and investments, but also considering that the MDG target of 155 might have been estimated too low for the country as most of the previous surveys had under-estimated the MMR (Bowie & Geubbels, 2013:53).

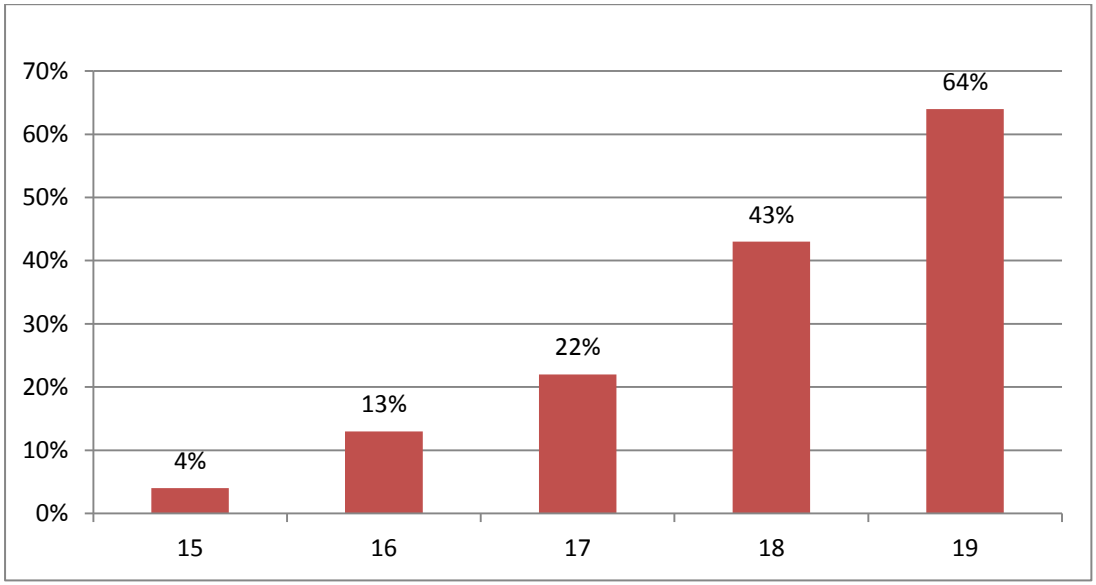
One of the contributing factors towards reducing maternal deaths is the improved hospital deliveries, which vary from area, age, regional and income (wealth). In

Malawi, about 89 percent of births are delivered in a health facility (MoH, 2014a:117). The level increase more in 2005 after a ban in the country on the use of Traditional Births Attendants (TBAs) which was later uplifted and the TBAs role redefined in 2011 (MoH, 2012a). In considering age, 92 percent of women less than 20 years are most likely to deliver in a health facility. Women living in urban areas are more likely to deliver in a health facility than their rural counterparts are with 95 percent and 88 percent respectively while on regional basis, 88 percent of women delivers at a health facility, and 92 percent (highest) of women in the northern region of Malawi. Comparing income, in Malawi the proportion of births occurring in an institution increases with wealth, from 85 percent in the lowest wealth quintile to 96 percent among those in the highest quintile (NSO, 2014:131).

It is worth noting that while positive strides in reducing maternal deaths, early marriages and adolescent pregnancies retards such effort as they are likely to increase maternal deaths. In Malawi, more than one in four adolescent boys had sex encounter before age 15, and this is higher among girls as this ratio is twice as much of girls likely to have sex before age 15 (NSO, 2012:4). The role of family planning among the youths is as important as saving their lives as considering disease considering the high prevalence of HIV (and other STIs) and unintended pregnancy, hence helping promoting their healthy transition to adulthood.

In more than a decade now, early marriage persists, and considering the years under this study, by 2012, the young women aged 20 to 24, half were married by age 18 15 (NSO, 2012:4). The distribution of child bearing against age in the country is presented in Figure 4.19

Figure 4.19: Child bearing against age in Malawi



Source: NSO, (2012).

In Malawi, a child is legally defined as any person under the age of 18 (GoM, 2013:4). As presented from the Figure 4.19, more than 1 in 5 adolescent girls have begun bearing children by age of 17. It is actually estimated that in Malawi, marriages before the age of 15 are at 10.6 percent while below 18 years of age are at 50.2 percent (GoM, 2013:12). The issue of early childbearing is not only a legal issue but also more of a major health concern as most of these adolescents have increased risks of death and disability. The risk is not only to the mother but also to the child during pregnancy and childbirth. Furthermore, by delaying marriages, young women are more likely to bear fewer children and further their education for productive life. The new marriage divorce and family relations bill comes at the right time in helping restrict all marriages below 18 years of age (GoM, 2015:4). However, there have been incidences as reported by Nyasatimes of 16 November 2015, where girls even as low as the age of 10 being married (Mahwayo, 2015).

4.8.3 Disease burden: morbidity and prevalence

Malawi continues to carry a high burden of disease, with HIV/AIDS, lower respiratory infection, diarrhoea related diseases, and malaria as the top four causes of the burden of disease in the country. Furthermore, the country does not only face the

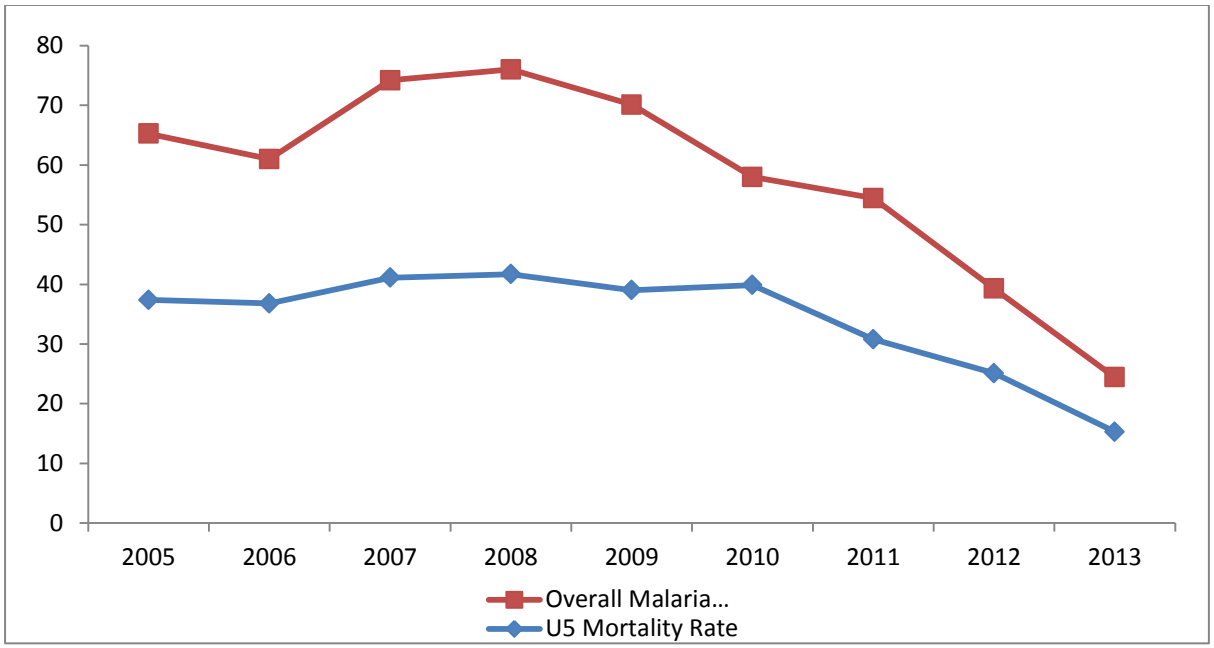
burden of these communicable diseases as greatest cause of morbidity and mortality, there is also a disease burden emanating from the non-communicable diseases (NCDs) (Msyamboza *et al.*, 2011:4; MoH, 2012:28; MoH, 2014:1). NCDs as a group are thought to be second only to HIV/AIDS as a cause of death among adults and are currently, accounting for approximately 12 percent of the total Disability Adjusted Life Years (DALY) in the country, global estimates by WHO of 70 percent developing countries carrying the 80 percent of the such deaths by 2015 (WHO, 2005a:4) .

HIV/AIDS is still a significant public health and socio-economic challenge in Malawi as the most affected population are those in ages 15-49, which is the age group that provides the majority of Malawi's workforce (MoH, 2014a:1). Malawi's national response to HIV/AIDS continues to boarder around the emphasis on prevention mainly through behaviour change and safer sexual behaviour; the use of antiretroviral therapy, and palliative care (MoH, 2012a:28; MoH, 2014:1). Tuberculosis is also noted in the Malawi Services Provision Assessment Report (2014) is also a significant contributor to the public health burden in Malawi. Recently, HIV/AIDS and TB co-morbidity has caused serious concern and has warranted the integration of TB and HIV/AIDS programmes. However, the incidence of TB has been declining and is presently estimated at 30 new cases per 100,000 populations annually.

4.8.3.1 Malaria and tuberculosis

In Malawi, malaria is endemic throughout the country and continues to be a major public health problem with an estimated 6 million cases occurring annually (MoH, 2014a:163). Malaria is the leading cause of morbidity and mortality especially in children under five years of age as well as among pregnant women (MoH, 2012a:2). The disease continues to be a major health burden for Malawi as it still ranks fourth among causes of deaths accounting for 8 percent of mortality (Bowie, 2011; MoH, 2014a:163). The malaria mortality rate has however been declining in the country since 2007 as per from the HMIS data provided in Figure 4.20.

Figure 4.20: Malaria Mortality Rate (overall and U5 rates)



Source: Author's calculation (Data from HMIS 2005-2013).

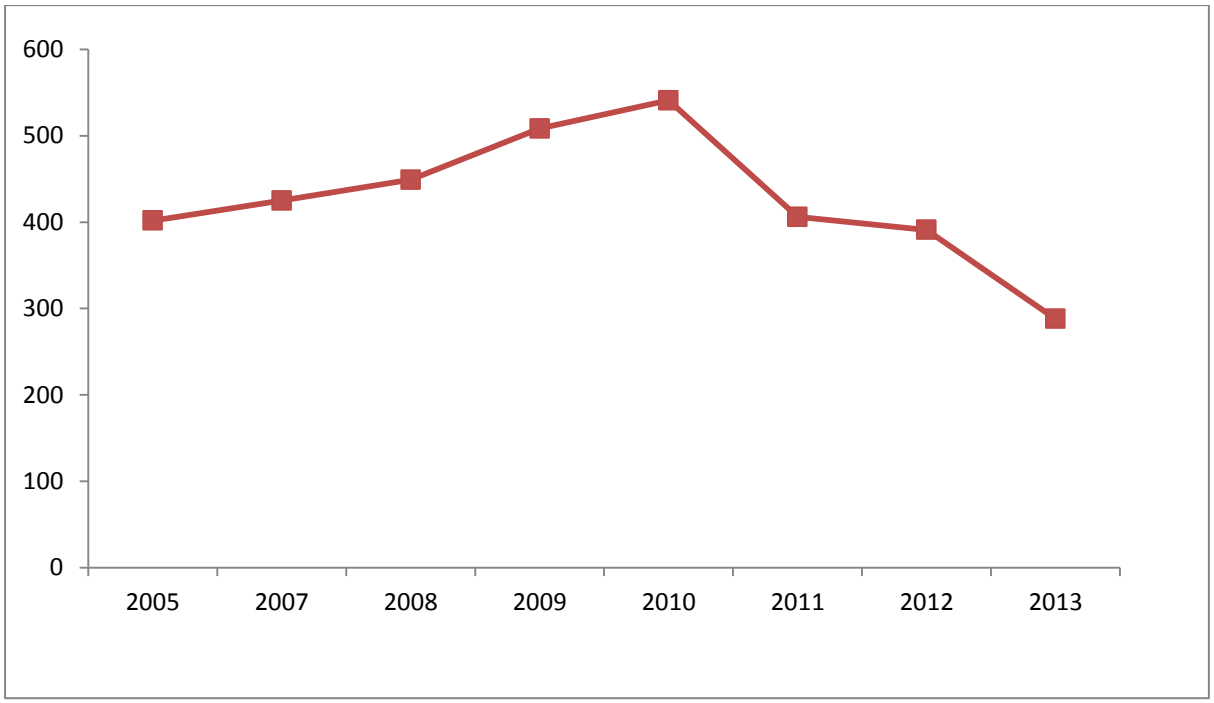
The trend shows that the mortality rate has been declining for the past five years despite still high. The data shows that the under-five mortality is proportionally higher than the over five population confirming the known fact that the age group is more vulnerable to the disease.

The Malawi National Malaria Indicator Survey 2012 showed that malaria prevalence rate was 43.3 percent nationally, 32 percent being under the under-five aged population, and related severe anaemia prevalence was 12.3 percent among children under five (MoH, 2012a:34). Malaria is responsible for 40 percent of all hospital deaths however, there has been a 9 percent decline in deaths from 2006 – 2011 despite still being the highest share of the total deaths.

Transmission of the disease as further indicated in the report is mainly determined by climatic factors: temperature, humidity, and rainfall hence the extent and distribution of these factors influence the prevalence rate where areas in Malawi with more rains or humid coupled with proportionally higher temperatures are likely to experience more malaria incidences unlike those hilly and cool areas for example of the south and northern part of the country (MoH, 2014b:164). Transmission is

highest in areas of high temperature and frequent rainfall from October through April according to the country's season. One of the major primary control strategies towards reduced malaria prevalence is the use of Insecticide Treated Nets (ITN) when sleeping. However, the coverage of Insecticide Residual Spraying (IRS) is been low in the country, which has been attributed to the poor diagnostic capacity, abuse of ITNs, low coverage of second dose of SP in pregnancy, shortage of quality ACT in the private sector, and inconsistencies adherence to treatment guidelines and policies all affecting the implementation of malaria interventions (MoH, 2014b:164). The malaria prevalence trend is provided in Figure 4.21:

Figure 4.21: Malaria Prevalence Rate in Malawi 2005-2013



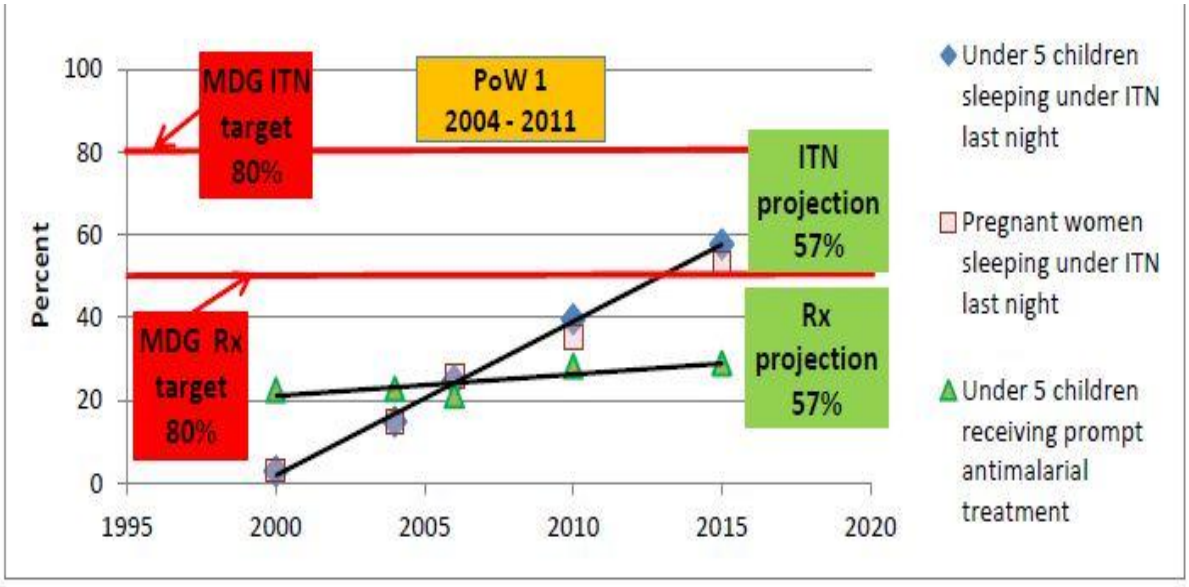
Source: Author's calculations (Data from HMIS Data 2005-2013).

As presented in Figure 4.21, despite higher prevalence rates, malaria prevalence in the country has been declining for the past five years. Malaria however still accounts for about 34 percent of all outpatient visits and is estimated to be responsible for about 40 percent of all hospitalisation of children under five years old and children less than five years constitute about 50 percent of the total suspected malaria cases (MoH, 2012a:20). As expected, the HSSP notes that both malaria parasite and severe anaemia prevalence rates are higher among children who do not sleep under

an ITN the previous night. However, the prevalence of severe anaemia in children under two years of age who did sleep under an ITN the night before was recorded to be 25 percent as compared to a rate of 13.6 percent among those who did sleep under a net the previous night with the poor wealth quintiles having higher levels.

The use of vector control strategies, which includes the use of ITNs and residual spraying, are hence proving to be registering positive gains against malaria prevalence rates. The past decade has since seen the use of these interventions increasing as Figure 4.22 shows.

Figure 4.22: Malaria prevention in Malawi

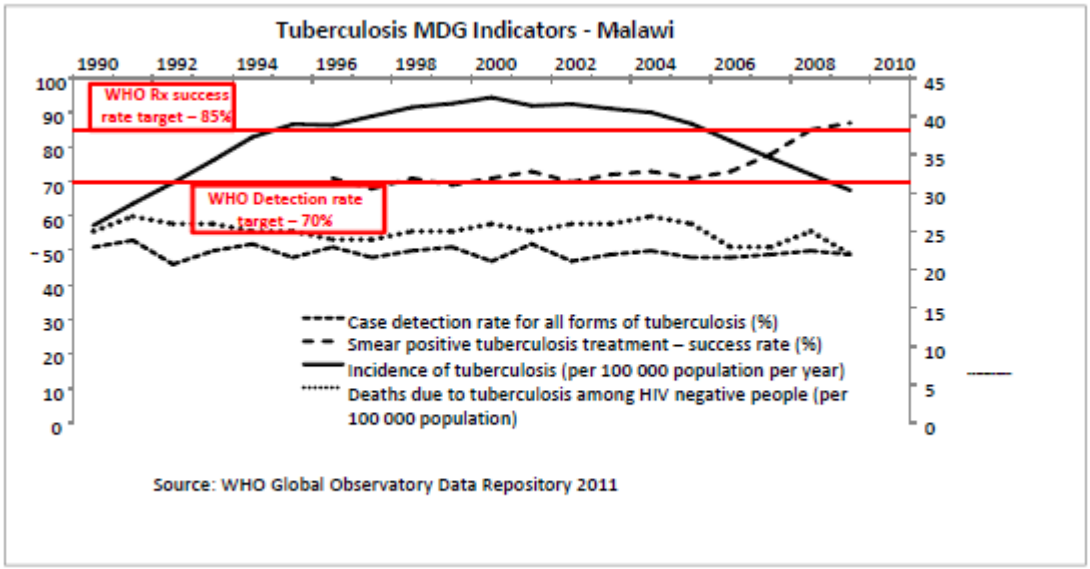


Source: MoH, (2012a).

As shown in Figure 4.22, the use of ITN for both pregnant women and under five children is projected to be reaching 57 percent against the MDG target of 80 percent. As indicated by the 2012 Malaria Indicator Survey, the majority of Malawians do not have access to an ITN. Two in five people (41 percent) slept in homes with no ITN the night before the survey and therefore were not able to use an ITN the proportion of persons with access to an ITN tends to decrease as household size increases (MoH, 2012a:23). The registered improvements in malaria prevention in Malawi is

also attributed to the prompt use of the antimalarial treatment (MoH, 2012a:20; MoH, 2014a:169).

Figure 4.23: Trends in tuberculosis in Malawi

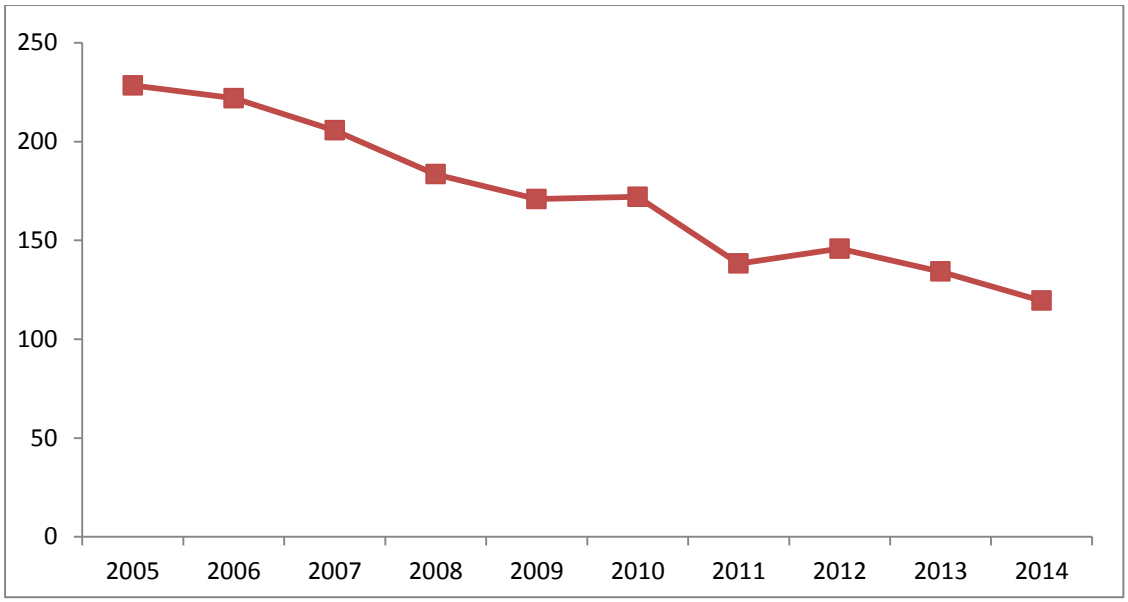


Source: MoH, (2012a).

In Malawi, the annual number of new TB cases began to increase rapidly around 1985 as a result of the growing HIV epidemic. There were approximately 5,000 new cases that year. Ten years later, in 1995, there were around 20,000 new cases, increasing to about 27,000 new cases in 2000, and around 29,000 new cases in 2005 (MoH, 2014a:156). With regard to tuberculosis prevalence, the disease prevalence has also been declining in the country. Using the WHO Global Observatory Data Respiratory 2011, there has been a steady decline of the TB incidences since 2002 as shown in Figure 4.22.

The trend has also shown that TB caused deaths especially among the HIV negative people showing signs of declining. More cases of tuberculosis are being detected and treatment failure is diminishing. There is some success in reaching the MDG targets for tuberculosis with treatment success rate at 86 percent is slightly above the World Health Organization (WHO) target of 85 percent. However, the case detection rate (46 percent) is still below the WHO target (70 percent). The declining trend in the TB prevalence is also confirmed in the HMIS data, which captures all the cases registered in that particular year as shown in Figure 4.24.

Figure 4.24: TB prevalence (cases per 100,000 population) 2005 - 2014



Source: Author's calculations (Data from Malawi HMIS 2005- 2014).

The trend has shown the declining trend in the country for the past decade. Since 2005 the annual number of new cases has declined, reaching about 20,000 in 2013 (MoH, 2014a:156). The case fatality rate under DOTS of all forms of TB remains high, at 8 percent. The TB survey conducted in 2010/11 to assess the prevalence of MDR-TB in the country did actually showed a 4.8 percent prevalence among retreatment cases and 0.4 percent prevalence among new cases with treatment success continuing to improve towards 88 percent for (MoH, 2012a).

4.8.4 Health care system in Malawi

The government of Malawi, through the MoH, provides leadership for the entire health sector of the country. In Malawi both private and public are involved in the health service delivery. Under private, there are the for-profit and not for-profit entities (CHAM, NGO). The health care delivery system hence consists of government facilities, approximately half of all the facilities; Christian Health Association of Malawi (CHAM) with 15 percent and some private-for profit providers as well as private providers the rest (MoH, 2014a:7). Over the public facilities, Ministry of Health coordinates the development of plans current budget and development, as well as monitoring their implementation. The Ministry also oversees the development of various policies and guideline. In working with the various

stakeholders a number of mechanisms are put in place to facilitate the partnerships and participation of development partners, NGOs, Private sector, faith-based organisations (FBOs) and civil society hence the operation of the Malawi Health Sector-Wide Approach (SWAp), and the Malawi Health Sector Strategic Plan and its governance structure.

The SWAp approach being implemented in the country is a form of partnership with a funding mechanism that have partners pool the resources together either as discrete or non-discrete, with an aim of implementing programmes under the Government leadership (World Bank, 2001:V; MoH, 2012a:1). Malawi's health care systems have been anchored in, first, the Programme of Work (2004-2010) and now the Malawi Health Sector Strategic Plan (HSSP) (2011-2016). These strategies anchor the foundation of the health sector reform programmes and have guided their on-going implementation in country. As part of the reforms, the introduction of the Essential Health Package (EHP) in the first Programme of Work (PoW) and the subsequent strategic plan (HSSP) has improved cohesiveness among the existing essential service packages leading to a shift in focus from reducing the burden of disease to the promotion of healthy lifestyles of individuals and communities. The EHP is defined as core health service interventions which are basically offered for free as a minimum package at the basic health facility and provide the first formal contact with the health care system in the country (MoH, 2014a:36).

The delivery of the health services in the country are defined on the basis of primary, secondary, and tertiary levels (MoH, 2014a:3). The primary level offers mainly the promotive and preventive services with minimal curative services. These are offered with community initiative, at health posts, dispensaries, maternity facilities, health centres, and community/rural hospitals by community based health staff health surveillance assistants (HSAs), community-based distributing agents, village health committees, and other volunteers. This is the level where administratively community leaders like village headmen and chiefs play an integral role in influencing the quality of health service delivery through their health development committees. The secondary level services are delivered by district hospitals and acts as referral facilities for the primary level of service. This level provides both the inpatient and outpatient services and are better equipped both with

medical equipment and different health professional cadres. At this level also, traditional leaders like Traditional Authorities (TAs) who work hand in hand with District Commissioners as controlling officers and influences the modus operandi of the health services being delivered thin the district and are part and parcel of the District Health Management Team (MoH, 2014a:6). Under the Decentralisation Act, both secondary and primary level health services are delivered under the leadership of the District Health Management Team (DHMT) at the District Health Office. These DHMTs are under the leadership of their respective District Commissioners as the controlling officer. Their oversight on both operation and financial management comes from the National Local Government Finance Committee (MoH, 2014a).

The last level of health service in the country is the tertiary level, which provides specialised health services, professional training, and conduct research, and provides support to the districts. These are called central hospitals in Malawi and currently there are five central hospitals (MoH, 2014a) and they do act as referral facilities for the district hospitals while providing services in their regions (with two in Zomba the old capital city).

The biggest challenge however in the referral system of the country is that most of the central hospitals are still overwhelmed with primary health care services as most people would prefer them as they are between equipped than most nearby facilities and end up having 70 percent of their services as primary health care (MoH, 2012a) a situation the government is trying to minimise through fees when the referral system is violated. In considering the human resource for health, Malawi still faces the acute shortage of the much-needed human resource in its facilities. There are only 2 physicians and 38 nurses per 100,000 populations The government in conjunction with its development partners implemented an Emergency Human Resources Plan from 2005-2010 which among other things included a 52 percent salary top up to 11 cadres of health professionals. These initiatives helped to have a 50 percent increase in health work force and did help in expanding the enrolment among the medical training institutions. Despite these gains, the country still faces acute shortage of the required medical staff in its facilities (MoH, 2014a:36).

4.8.4.1 Health finance and investments

The health sector budget in the country is provided for under the Ministry of Health budget and comprises of Ministry of Health Headquarters (Vote 031) and District Health Offices (Vote 900). As per the National Health Accounts, the total Health budget was 13.5 percent in 2009/10, 11.9 percent in 2010/11 and 12.8 percent in 2011/12 of the total Government budget (MoH, 2014b:21). However, on the actual expenditures from the total Health budget as compared to the total Government expenditure was 10.5 percent in 2009/10, 11.0 percent in 2010/11 and 11.7 percent in 2011/12.

As earlier indicated, MOH SWAp fund is comprised of Ministry of Health headquarters and District Health Offices with main contributors as Government and Donor Partners. In analysis the contribution trend, in 2009/10 financial year, Government of Malawi contribution was 46 percent against 54 percent from the development partners and in 2010/11, the Government's contributions went up to 63 percent while the development partners' went down to 37 percent. However, in 2011/12, the development partners contribution rose again to 52 percent while Malawi Government was at 48 percent (MoH, 2014b:21). The NHA also shows that most of the contribution from private sources is obtained from households in the form of out-of-pocket expenditure and this as a percentage of the health expenditure has move from 5.4 percent in 2009/10 to 7.4 percent in 2010.11 and to 7.4 percent in 2011/12.

In general and current situation, donors contribute 68 percent of the total resources for health, including more than 75 percent of the funds for major disease areas such as HIV/AIDS, malaria, and TB. Such a high dependency on development partners on health financing has always been a challenge as the volatility of donor funding contributes to weaknesses in resource planning and programming (MoH, 2014b:9). The current situation where most development partners have withdrawn their budgetary support to the country, entails already the urgent and critical need for the country to develop sustainable alternative finance mechanisms some of which have being proposed are introduction of sin taxes, user fees and the fully fledged private public partnerships in health (MoH, 2014b:105). The study has further discussed the development of the PPPs in health in the policy recommendation section as an

integral part of improving health outcomes in the country emanating from the study results.

4.9 SOCIAL DETERMINANTS OF HEALTH IN MALAWI

The Malawi Government and learning from the commission on social determinants of health also acknowledges the fact that misdistribution and poor quality of health care delivery systems form part and parcel of the SDH in the country (MoH, 2012a:23). The high burden of illness hence thrives and is responsible for most appalling premature loss of life which arises by and large because of the conditions in which people are born, grow, live, work and age.

The underlying risk factors for the major diseases in the country considered to be influencing health status are mainly the environmental: for example safe water, sanitation and vector control, safe housing and work environments; the physical which also include the lifestyles and behaviours with those affecting adversely the health status as alcohol and drug abuse, lack of exercise, unsafe sex; access to health services, access to education, socio-cultural, spiritual and mental health (MoH, 2012a).

In bringing some of these social determinants into context, national surveys have shown general associations between the health indicators and socio factors and of such is the level of education. The surveys like IHS2, IHS3, as well as welfare monitoring surveys have shown that health indicators are worse among people who have no or little education than those who have received secondary education or higher (NSO, 2005; NSO 2009; NSO, 2011; NSO 2012). For example, health indicators of underweight and the prevalence of diarrhoea and malaria among children under five both decreased the higher the educational level of the mother. The surveys have also shown further that health indicators are also better among higher income groups, implying that improving income and educational levels would therefore help to bring improvements in health status. However some of these general associations have been proven otherwise, for example a study by Makoka (2013) that showed no evidence in the impact of increased education on child nutrition status, as well at Bowie (2011) that has shown poverty in the country as being a no significant factor for some indicators like disease burden and child mortality rates. Despite such differences in the relationship between some social

factors and health indicators, the bottom line is that such relationship exists and there is always need to establish such relationship, their role and significance and further their distribution and consistency which is one of the objectives of this study.

4.10 CONCLUSION

The chapter has analysed the Malawi's economic and demographic factors based on the characteristics, level and trends. These factors have included the location and the related weather, the economy, the social and economic factors of employment, food security, population growth and distribution, which have a bearing on the health indicators of the country. The chapter has also analysed the major health outcome indicators that are further isolated in the study for further investigation.

The country is administratively divided into 28 districts, which fall under three regions of the south, central and north. The district division also entails the distribution of the health services as each district is served by a respective district hospital and several community hospitals and health facilities under them. On the socio-economic factors, Malawi's economy has experienced GDP growth since 2006 with an average real GDP growth rate of seven percent between 2006 and 2010 and later a slump in 2012 of about two percent followed by a rebound of five percent in 2013 due to a good tobacco season and a strong recovery of growth in manufacturing, construction, and the wholesale and retail trade sectors. The economy however has been challenged by the plunder of government resourced duped as cashgate, which has since seen the withdrawal of budgetary support by country's major development partners in 2013. The IMF Observer Mission in November 2014 also acknowledged the fact that the Country is going through turbulent economic moments despite the economic activities demonstrating significant resilience (IMF, 2014). For the year 2014, the real GDP growth is projected between 5 and 6 percent, mainly with contributions from the agriculture and retail trade sectors. The country's inflation rate remains high, due to mostly the uncertainties about the resumption of budget support who mainly contributes up to 40 percent of the national budget.

On population growth rate, the population of the country continues to be growing rapidly, and in just over 40 years, the population has increased from 4 million people in 1966 to 13.1 million in 2008 (NSO, 2012:2). The main reason for the rapid growth rate is the high fertility rate, which is at 5.7 births per woman. With an estimated level

of fertility decline from the 2010 level of 5.7 to 4.6 by 2020, the population will still grow to 26 million in 2030 as further noted by NSO (2012). This has an enormous pressure on the country's meagre resources and subsequently on the delivery of services among which is health, which in the long run, may affect the country's population health indicators. It also has an impact on the already poverty-stricken country.

This is a country where over 50 percent of its population is considered poor with a quarter living in ultra-poverty. The country's poverty is more rampant in rural areas with 57 percent of the rural population poor as compared to the 17 percentage of the urban population. The rural population, by 2012, anchored 28 percentage of its population as ultra-while the urban had about 4 percent. The distribution of poverty has a significant influence in shaping the health outcomes disparities across the country. This is from the mare fact that major life shocks leading toward impoverishment, namely hunger, famine, disease, deaths, drought and floods renders the poor vulnerable as they are faces with unhygienic homes, lack of money to pay for their health needs including transport to hospitals or clinics where necessary, lack of food, lack of peace of mind (Conticini, 2004:22). The fact that out of pocket expenditure is still increasing in Malawi amidst free health services at point of delivery is a clear indication that household level of income plays a crucial role in shaping the health outcomes.

The other three socio-economic indicators discussed in the chapter are education, food security and employment. The education system of the country has three tier systems, namely primary, secondary and tertiary. By 2012, the country had almost 20 percent of its population to have reached the primary school certificate as the highest qualification, about 30 percent with junior certificate, less that 20 percent with Malawi School Certificate of Education and about 10 percent with tertiary education. The country has higher qualifications skewed towards the urban population and still has over 50 percent of its population with no qualification. On general literacy, 6.8 million people are literate, representing a 64 percent literacy rate, with Urban 85 percent while rural 15 percent (MoE, 2014:7). The role of literacy and education on health can never be overemphasised. Universal access to basic education and the achievement of primary education by the world's children is one of the most

important goals of the MDGs (World Bank, 2010). In general terms education plays a crucial role as a prerequisite for improved health and wellbeing through a number of ways including combating poverty, empowering women, protecting children from hazardous and exploitative labour and sexual exploitation, human rights promotion and informed choices, protecting the environment, as well as influencing population growth.

Food security levels of the country by 2012 shows that about 33 percent of the population had very low food security. That is, about one in every three people lives in severe low food security, eight percent experiencing low food security and about two percent in the marginally food secure category while about 58 percent are food secure. In Malawi food security cannot be divorced from crop enterprise of which maize is the main food crop hence its synonymy to food security. The agricultural enterprise also defines the employment levels of the country as most people in the country are employed in the agricultural industry. It has been shown that most people in Malawi are engaged in informal employment, which has 89 percent of the people working and predominantly higher in rural areas, while the formal employment is higher in the urban areas as in rural areas. Employment has also an important role towards the health of households as it provides income, which enables the household's access health services where applicable.

Apart from the social and economic factors of the country, the chapter also analysed the health sectors, both on outcomes and on the health care system including health care financing in the country. The health services in the country are provided at primary where community health facilities are main providers, the secondary level, mainly at district and the tertiary level, which is provided by the central hospitals. The country's health outcomes have shown mainly gains with declined levels of childhood mortalities, maternal mortality rate, the disease morbidity and prevalence. Despites such declines however, the country still faces the diseases burden not on from the communicable but as well as from the non-communicable diseases. The delivery of the health care services in the country also faces the challenge of resources both financial and human. The financial resources constraint is mainly on the country's health system dependency on development partners as 68 percent of the health budget is funded by the development partners hence its volatility. This has been shown during the suspension of most of traditional donors to the country's

budget support in 2013 and the health sector has not been an exception. The human resource challenge comes in as the vacancy rate in the health sector is still high and the population being underserved. With all the socio-economic factors at play in the country and the health outcomes trends, the link between these socio-economic factors and health outcomes is the main focus of the next chapter in which systematic linkages will be drawn by focusing on the nature of such relationship at district level.

CHAPTER 5

RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

This chapter presents the formulation of the model, which has been used to get the results in chapter 6 of the study. The chapter also includes the data collection process for the study, which mainly is from Welfare Monitoring Surveys (WMS 2005-2011), 2005 Integrated Household Survey (IHS2) and 2011 Integrated Household Survey (IHS3); the Malawi Demographic and Health Studies (MDHS) and also from the Malawi Ministry of Health, Health Management Information System (HMIS). The chapter discusses the data sources for the independent and dependent variables of the study, which are the socio-economic factors and the health outcomes respectively. The discussion of the health outcome variables will also include its methodological measurement. The chapter also discusses the model specification to be used in the study, its assumptions and justification, including the diagnostic tests accompanying the use of the model.

5.2 EXPLAINING THE DATA SOURCES AND THE INDEPENDENT VARIABLES

The study utilised panel data, which is also referred to as pooled data as it brings together observations from across-sections of the districts and overtime. This is unlike the common three data categories, namely time dimensional longitudinal data where a group of entities are studied over a period of time, historical analysis where movement of successive conditions are studied over time or the cohort analysis; following and studying a specific group over time and consequential analysis (Gujarati, 2009:591).

The use of panel data is more desirable on the premise that it can be used to describe changes over time, for example socio-economic changes change. It can provide information on income distribution changes, poverty levels, behaviours changes and many other social or economic variables over the passage of time hence having some advantages over cross-section or time series data (Gujarati,

2009: 592). One of these advantages is that panel data relates to specific entities (Brooks, 2014:528). However, in relating to specific entities and in the context of this study, districts, there is a likelihood of heterogeneity (Gujarat, 2009:592). Nonetheless, the estimation techniques for panel data take into consideration this by allowing the specific entities variations into account. The other advantage in panel data usage is in the combination of the cross-sectional and time series data. This combination provides a more informative data platform hence less collinearity among the variables and accords more degrees of freedom and increasing efficiency when utilised (Baltagi, 2008:3). Further advantages for the panel data as also discussed by Gujarati (2009:593), are that panel data are bound to capture dynamic changes on top of detecting and measuring effects, which could have otherwise been not observed by simply using pure cross-section or time series data. The use of panel data enhances the studying of complicated behavioural changes like changes in economies of scale and technology; and also minimises the biasness when dealing with units at aggregate level like in this study the aggregation of households at district or regional level.

The panel data utilised in the study, pools socio-economic factors from the Welfare Monitoring Surveys (WMS) ranging from 2005 to 2011 as well as the Integrated Household Surveys (IHS 2 and IHS 3) where more years of observations were to be used. The WMS are routine surveys in Malawi, which are designed to collect information for the classification of the vulnerable groups among Malawian communities (NSO, 2012:2). There have been six of these surveys since 2005. The ultimate aim of these surveys is to provide guidance for research based policy formulation. The questionnaires as indicated further by NSO (2012:5) are designed in a way to collect concise information pertaining to household characteristics, across board services utilisation as well as satisfaction. Most of the data are disaggregated at district level to align the information to the decentralisation program being implemented in Malawi (NSO, 2012b:14). On the other hand, the IHS provides detailed information on various aspect of welfare and socio-economic status of Malawi at five ears interval since 1990 (NSO, 2012:5). The 1990 survey was referred to as the Household Expenditure and Small Scale Economic Activities (HESSEA), which was followed by the 1997/8 Integrated Household Survey (IHS1). Since then the subsequent survey was conducted in 2004/5 (IHS2) and IHS3 which was

conducted in March 2011. These survey reports have provided the socio-economic variables utilised in the study as disaggregated at district level.

5.3 SOURCE AND METHODOLOGIES IN MEASURING DEPENDENT VARIABLES (HEALTH OUTCOMES)

The health outcomes in the study were measured at district level from the Demographic and Health Survey (DHS) as well as the Health Management Information System under the Ministry of Health, and the specific methodology is discussed according to the particular health outcome. The Malawi Demographic and Health Surveys are conducted with an aim of updating the health related indicators at household, district, regional and national level. There have been several studies since 90s, namely 1992, 2000, 2004 and 2010. The Ministry of Health Management Information System provides health data as collected from the health facilities (MoH, 2012a) hence acts as hospital based survey (Cameron Bowie & Geubbels, 2013:53) and aggregated both at district and national level. The database provided more data on the health outcomes being investigated especially in the study. The outcomes, which are used as measures of health in the study, are discussed briefly in the subsequent subsections.

5.3.1 Maternal mortality

A maternal death is defined in the revised International Classification of Disease ICD-10 by the World Health Organisation, as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the size of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (WHO, 2005:4). The study has adopted and used this maternal mortality rate due to the limited data availability and the model used. The MMR captures the maternal deaths per number of women of reproductive age for example 1000 women in the reproductive age for example between ages 15-49 (WHO, 2014:6) or 10, 000 women of reproductive age depending on the size of a population (NSO, 2012:5; Bowie & Geubbels, 2013:53). However, the study adjusted the age bracket to 13-49 from the evidence that there have been pregnancies and sexually active girls even as low as 13 years of age which have proven more riskier (NSO, 2012: 4; GoM, 2013:12). There have also

been incidences where girls as low as 10 years being married in the district of Ntcheu as reported by the Nyasatimes of 16 November 2015 (Mahwayo, 2015). Despite that Maternal Mortality Ratio is the most widely used measure the maternal mortality rate however provides on the other hand a comprehensive rate as it takes into account the annual probability of becoming pregnant for women of a defined reproductive age (Bowie & Geubbels, 2013:53). The fundamental issue being investigated is the maternal deaths which have remained as a challenge across countries (Hogan *et al.*, 2010:1609; WHO, 2014:2).

The use of HMIS hospital based survey data however has weakness in that it can miss some home deliveries and also the bias towards high risk pregnancies (Wilmoth *et al.*, 2012:9). However, though it underestimates (approximately 27 percent), the hospital based survey data for Malawi case, the HMIS, provides useful information when investigating the maternal mortality influencing factors (Bowie & Geubbels, 2013:4) and in this study the socio-economic factors. Furthermore, with the new policy of banning traditional birth attendants in 2007 hence encouraging hospital deliveries and later their redefined role after uplifting the ban in 2010 (Ngozo, 201), the under-estimation should be lower than 27 percent.

5.3.2 Measurement of Infant Mortality Rate (IMR)

Infant mortality is defined as the probability of dying before the first birth (WHO, 2010). The Infant Mortality Rate (IMR) hence measures the number of deaths within the first 12 months of life and this is normally per 1000 live births. The IMR was one of the MDG 2015 targets aiming at reducing the IMR by two thirds across the globe. The study has utilised the data as captured under the Health Management Information System of the Malawi Ministry of Health from 2011 to 2014 and verified with other relevant published reports, which have been acknowledged accordingly in the results and discussion section.

5.3.3 Measurement of disease burden

Disease burden in the study was measured by the disease incidences as well as the morbidity. As discussed in section 2.3, disease burden refers to the impact a health problem brings about and can be measured monetary for example financial cost or

by use of health indicators for example mortality, morbidly or incidences of a health problem as measured by financial cost, mortality, morbidity, or other indicators (WHO, 2013:10). The study has isolated Malaria and TB, both prevalence and mortality rates. The malaria prevalence rate will be measured considering the incidences per 100, 000 population with a separate regression for the under-fives and the mortality rate will be measured per the deaths per 100, 000 as population well. This is a standard measure in most of the countries and globally (WHO, 2010). The TB prevalence rate has also been measured per 100, 000 population. The data being utilised is facility based data as obtained from the Malawi Ministry of Health HMIS and aggregated at district level.

5.4 Model specification

The study used the Random District Effect Model (RDEM) as adapted from the conventional Random Effect Model also called the Error Component Model (ECM) (Gujarati & Porter, 2009:602). The REM assumes that the variation across individual entities are random and uncorrelated with the explanatory or exogenous variables included in the model (Torres-reyna, 2007:25). For the purposes of this study, the model assumed that the variations in the health outcomes across the districts in Malawi are random and not correlated with the socio-economic factors under investigation in the study. This is unlike in the use of the Fixed Models where they are assumed to be fixed and that the individual entity intercept does not change over time, in other words, they are time-invariant. Greene (2008) expresses it the difference between the fixed and random effect as follows:

> *"…the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not*" [Greene, 2008:183]

The rationale on the random district effect model lies on the same premise that the differences across given entities have some influence on the dependent variable in question. Putting it in another way, the assumption exemplifies the fact that the differences in socio-economic factors between the districts of the country breed differences in the health outcomes. A study in Nigeria across regions had shown the impact of such regional of district factor differences on their impact on the differences

in health outcomes (Kandala & Ghilagaber, 2014). Studies of childhood mortality in developing countries using aggregated data and methodologies that ignore spatial dimensions as further argued by Kandala and Ghilagaber (2014) run the risk of explaining very little of the variations in mortality rates as well as masking spatial variations. This can be demonstrated for instance by results of the 2003 in the Nigeria Demographic and Health Survey (NDHS), disaggregated by geopolitical zones, shows that the infant mortality rate (IMR) for the period 10–14 years preceding the 2003 NDHS (1989–1993) at the national level was 113 per 1,000 live-births, while the corresponding IMR for the then four geopolitical zones was north east (129/1,000), north west (136/1,000), and south east (74/1,000), south west (81/1,000) (NPC 2004) (Kandala & Ghilagaber, 2014:30). Despite that the study used the geo-additive bayesian discrete-time survival model where the impact of geographical differences between the regions and zones was being captured, this study uses the socio-economic factors between the districts and are assumed to be randomly distributed. In disaggregating data by some kind of level or category, Bhargava *et al*, (2001:424) in using the static random effect modelling, acknowledges the need of analysing the data at all possible level for enriching analysis.

It is therefore of great value that disease prevention need to combine person centred approaches with approaches which eventually can help in changing residential environments (Merlo, 2003:552). The traditional measures of association (for example, regression coefficients, odds ratios) in considering neighbourhood socio-economic characteristics and individual health become hence relevant approaches in analysing the cross level effect pathways and SDH (Blakely & Woodward, 2000:367–374). Furthermore, when it comes to analysing the risk distribution and the public health relevance of specific administrative boundaries for example, districts, regions or municipalities, on different individual health outcomes, multilevel measures of health variation , present themselves as a new epidemiological approach that may prove very useful in social epidemiology (Merlo, 2003:552). This study hence was based on district random effects. This hence provides another advantage of the random effects also is that the model can include time invariant variables (i.e. district) which in the fixed effects model are absorbed by the intercept (Gujarat & Porter, 2009:603).

The general random effects model is specified as follows:

$$\mathbf{HO}_{it} = \boldsymbol{\beta}_0 + \sum_i^n \boldsymbol{\beta}_i \mathbf{X}_{it} + \boldsymbol{\omega}_i + \boldsymbol{\mu}_{it}$$

Where: HO_{it} is the health outcome under investigation, ω_{it} is the cross section or individual entity error component and μ_{it} is the idiosyncratic term as it combines the cross-section and time series error component. The model can now be differently as follows:

$$\mathbf{HO}_{it} = \boldsymbol{\beta}_0 + \cdots \sum_i^n \boldsymbol{\beta}_i \mathbf{X}_{it} + \boldsymbol{\varepsilon}_{it}$$

Where: ε_{it} is the composite error term consisting of both the individual entity error term and the combined time series and cross-sectional error terms. In other words:

$$\boldsymbol{\varepsilon}_{it} = \boldsymbol{\omega}_i + \boldsymbol{\mu}_{it}$$

The basic assumption of the model as earlier discussed is that the individual error terms are uncorrelated and further that there are not autocorrelated both with time series and cross-section entities across (Gujarat & Porter, 2009: 603).

Taking into account the issue of multicollinearity and heteroscadasticity, the District Random Effect Model will make use of the Generalised Least Squares (GLS) unlike the Ordinary Least Squares (OLS) to avoid inconsistencies in the estimators (Langford *et al.*, 1999:257) despite the estimators still being unbiased (Gujarat & Porter, 2009:371). The OLS is the method of estimating the unknown parameters in a linear regression model by way of minimising the variance between the observed and approximated outcomes (Brooks, 2014:91). The underlining assumptions for the method are beyond the scope of this study. Suffice to indicate however as noted by Gujarat, (2009) that GLS is the type of OLS on the transformed variables in order to achieve and satisfy the standard least square assumptions. In other words, the GLS

approach transforms the disturbance term to be homoscedastic mode hence making the estimators unbiased unlike the OLS, especially where there is heteroscadasticity problem. This in the model is also confirmed by the statistically significant Wald chi2, which demonstrates the goodness of fit of the model when testing the regression model (Gujarat and Porter, 2009).

5.4.1 Model specification for the District Level Analysis

The Random District Effects Model used in the study was based on the same REM as discussed in the general model specification section 4.3.3. The model uses the district level data and all the variables measured at district level. District in this study denotes an administrative boundaries of local authorities of the country, which are in total 28, as will be further discussed under Chapter 5 of the country profile. The model specification is given as follows:

$$\mathbf{DHO}_{it} = \boldsymbol{\beta}_0 + \cdots \sum_{i}^{n} \boldsymbol{\beta}_i \, \mathbf{DX}_{it} + \boldsymbol{\varepsilon}_{it}$$

Where: DHO_{it} is the health outcome under investigation measured at district level, $\mathbf{DX}_{it}$ is the socio-economic factor also measured at district level and $\boldsymbol{\varepsilon}_{it}$ is the composite error term measuring the specific district error component as well as the cross section (from district i to district n) and time series defined by time 't' in the equation.

The district level model allowed the capturing of influences from the socio-economic factors at play at district level which might as well have been over-estimates or under-estimated at a higher aggregated level like the national level On the other hand, the use of the conventional model with its assumption of uncorrelated random components and in this case at district level can be challenged for the mere fact of correlated random residuals practically (Langford *et al.*, 1999:254). The independence assumption has also been challenged on the basis of neighbourhood effect where district close to each other are assumed to be exclusively independent as that it may only be logical that on the basis of proximity, districts close to each other will tend to have similar patterns unlike those far apart hence the problem of inconsistence (Borgoni & Billari, 2003:68). Furthermore, Rabe-Heskesth and Everitt (2000) argues that in treating observations from the same districts as independent may lead to under-estimation of the standard errors for the between district factors.

The Random District Effect Model being used is however based on the significant differences between the districts even those close, both in health outcomes and socio-economic factors as will be demonstrated in the health outcome variances at district or regional level hence the conventional random effects model would still provide unbiased and consistent estimation from the results. A study in Malawi on the Social Economic Status (SES) on health outcomes using a random effect model, showed that there were significant differences in the health outcomes due to geographical (from sampled districts) and socio-economic status variations in childhood fever, diarrhoea and stunting at district level in both the highest and lowest categories of the SES (Kandala & Ghilagaber, 2014:93) .

5.5 THE MODEL DIAGNOSTIC TESTS

There are a number of classical model assumptions that are emboldened in the relationship between the dependent variables, in this regards, the health outcomes and the independent variables, the socio-economic factors in the panel data. Firstly, is the linear relationship assumption where the study assumes the linear relationship between the district health outcome being specified in the regression and the specific district socio-economic factors before the regression is run. The second assumption is the error term distribution. The study assumed the residuals in the specified regressions are normally distributed. In affirming that the variables used in this panel data are fit in the model, the study used the Wald Chi2 results where the statistically significant value implies the goodness of fit and reliable model specification. On the assumption of individual error terms not correlated, a Hausman test will be conducted. The study also conducted the Breusch-Pagan test to ascertain the model specification appropriateness and in this case the use or random effects model. These tests are discussed in the subsequent sections.

5.5.1 The Hausman test

The random effect model is also called the error component model because its composite error term consists of two or sometimes more error components (Gujarati & Porter, 2009:603). The critical assumption made for these individual error components is that they are not correlated with each other and also not autocorrelated both with times series and cross-section variables. This assumption can be demonstrated as follows:

$$\boldsymbol{\omega_i \sim N(0, \sigma_\omega^2)}$$

$$\boldsymbol{\mu_{it} \sim N(0, \sigma_\mu^2)}$$

Where: ω_i is the cross-section or in this case district specific error component with a mean value of zero and a variance of σ_ω^2 and $\mu_{it}$is the idiosyncratic term combining both the time series and districts across with mean value of zero and a variance of σ_μ^2. The uncorrelated assumption is shown as:

$$\boldsymbol{E(\omega_i \mu_{it}) = 0: E(\omega_i \omega_j) = 0} \qquad (\boldsymbol{a})$$

$$\boldsymbol{E(\mu_{it} \mu_{is}) = 0: E(\mu_{ij} \mu_{ij}) = E(\mu_{it} \mu_{js}) = 0} \qquad (\boldsymbol{b})$$

Where: i and j represent different districts and time t and s are also different in other way where: $i \neq j$ and $t \neq s$. As a result of these assumptions, it can therefore be concluded that $E(\varepsilon_{it}) = 0$. The Hausman Test therefore will guide as to whether the composite error term (with the unobserved individual effects) is correlated with the explanatory variables or not (Baltagi 2008:310). Putting it differently, to avoid the inconsistent estimation of the regression coefficients, the test helps to ascertain that, $E(\omega_{it} X_{it}) = 0$ hence the use of the REDM. This implies:

$$Var(\omega_{it}) = \boldsymbol{\sigma_\omega^2 + \sigma_\mu^2} \qquad (\boldsymbol{d})$$

This further implies that district specific effects have all been accounted for in the explanatory variables and that, the composite error term is homoscedastic and that any special correlation features are taken care of by the use of the GLS estimators in the model (Gujarati, 2009:373).

5.5.2 The Breusch-Pagan Test

The Breusch-Pagan Test was used in the study to test the presence of the random effects. Breusch and Pagan (1980) developed this test. The test will hence reinforce on the results of the Hausman Test on the error term correlation and random effect model appropriateness. It is a Lagrange Multiplier test, which tests the null hypothesis that the variance of $\boldsymbol{\sigma_\mu^2}$ is equal to zero (equation b). The null hypothesis

is rejected when the p-value of obtaining a chi square value is significant. The test statistic is given by the following equation:

$$\boldsymbol{LM = \left(\left(\frac{NT}{2} \right) (T-1) \right) \left[\left(\sum_{t=1}^{T} e_{it}^2 \Big/ \sum_{t=1}^{T} e_{it}^2 \right) - 1 \right]^2}$$

Where $\boldsymbol{e_{it}}$ denotes the OLS residuals on the pooled model, $\boldsymbol{e_i}$ denotes their sum over t, respectively. The test results provide direction as to whether to either reject or accept the null hypothesis. Where the LM test statistic is significant at 1 percent or 5 percent the study will reject the null hypothesis hence accepting the use of the Random Effect District Model. This will be conducted per specific regression as deferent health outcomes have independent variables depending on data availability and model specification.

5.6 CONCLUSION

The research design and methodology chapter for the study has discussed the study's data sources for both dependent and independent variables. It has also discussed the model to be utilised both the basis and the specification. A number of diagnostic tests have also been discussed.

The study utilised panel data from the routine surveys conducted by the National Statistical Office in Malawi. These are mainly the Welfare Monitoring Surveys from 2005 to 2011 and IHS2 and IHS3, which have mainly provided the socio-economic factors. The socio-economic factors isolated for the use of the study are poverty rate, employment rate including the sectors, literacy levels for male and female, education attainment level, maize production, maize average price, population and dependency ratio. All the socio-economic factors have been measured at district level. On the health outcomes, the study used mostly the Health Management Information System of the Ministry of Health and the Demographic and Health Surveys in providing a set of dependent variable. These have also been measured at district level. The panel data were opted for due to a number of advantages among which the identification of districts as specific entities, the pooling together of time series and cross-sectional nature which helps analysing more on the selected socio-economic factors and the health outcome.

In discussing the health outcomes, the study has looked at the methodologies used for measuring the health outcome of the Mortality Rate on maternal and child health, disease burden in looking at the TB and malaria incidences and associated mortalities. Under mortality rate, the study has used maternal death which has been measured by the death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy as defined in ICD-10 by WHO (2010). The use of hospital based maternal mortality was opted from instead of the commonly used population based survey maternal Mortality Ratio which is the number of maternal deaths per 100, 000 live births due to data availability at district level. The Infant mortality rate, which is the probability of dying before the first birth according to (WHO, 2010) will also been used under reproductive health. The study has adopted the measure of the number of deaths within the first 12 months of life, which is normally per 1000 live births also at district level.

The disease burden has also been considered a critical health outcome as it measures the loss of life due to specific mortalities, morbidities caused by disease incidences. The study considered the malaria and TB disease incidences rate which are measured per 1000 or 100, 000 population across many countries (UNICEF, 2014).

On the model specification, the study adopted the conventional random effect modelling hence the use of the Random District Effect Model (RDEM) in analysing the health antecedents across the country. The model was selected due to its applicability on the differences arising from the health outcomes and some socio-economic factors across the districts of the country. Apart from the classical regression modelling assumption, the specific assumptions under the model are the uncorrelation of the error components across the districts as well with the explanatory variables according to Gujarati (2009: 63). A number of diagnostic tests have been discussed which will be used before running the regression in ascertaining the pooling of data from different sources, the use of the random model and the presence of the random effects hence the applicability of the model. These tests are the Hausman Test and the Breusch and Pagan Test respectively. The

basic assumptions under the test have also been discussed including their statistical coefficients interpretation and application thereof.

The specified model will provide the basis for results interpretation and discussion as will be presented in the next chapter and consequently, the study conclusion and its policy implications in the last chapter.

CHAPTER 6

ANALYSIS, RESULTS AND DISCUSSION

6.1 INTRODUCTION

This chapter presents the results of the study following the objectives as set in the preceding methodology chapter. The results are presented in such a way that each objective has some descriptive statistics at the beginning of their discussion to provide a background on the specified variables both on trends and the general picture. Where a regression has been used, the appropriate diagnostic tests, as discussed in the methodology section, are conducted for the regression. The regression results are then presented followed by a discussion with reference to other studies either on affirmative or contrary point of view

The main objective of the study was to investigate the socio-economic antecedences of the health outcomes in Malawi. This objective was to be achieved through a number of specific objectives both theoretical and empirical. The theoretical objectives of the study were to review the literature on health both from its determinants and from their models premises, which has been discussed in chapters two and three on literature review. The study also aimed at briefly analysing the trends on health outcomes across the globe; both developed and developing countries, with special attention to the sub-Saharan region, and the SDH. This was to be conducted both in literature and in implications on health systems by isolating the linkages between the critical SDH and health outcomes. These were addressed in chapter two and three respectively.

Empirically, the study aimed at investigating the linkages of socio-economic factors and health outcomes at district level and isolate further the critical socio-economic factors on their impact on specific health outcomes, namely maternal and infant mortality, disease burden (malaria and tuberculosis prevalence and mortality), as to allude to policy implication and relevant guidance. Except for the last empirical objective of policy and guidance, the rest are being addressed in this chapter

through both descriptive statistics and regression analysis with associated empirical literature and linking to previous studies where applicable.

6.2 HEALTH OUTCOMES AND SOCIO-ECONOMIC ANTECEDENTS

There are several outcomes, which the health sector in Malawi monitors mainly due to their impact on the overall health indicators of the country as well as the contribution to the population health. The current Malawi Health Strategic Plan (2011-16) has isolated health outcomes relating to health impact basing on mortality and morbidity; among which are maternal mortality Infant Mortality Rate, Under Five Mortality Rate; coverage of health services including essential health package coverage and improved skilled worker services; coverage of health determinant, coverage of risk factors and health systems outputs (MoH, 2012a:135). The study has selected from these, the impact level of the indicators hence health outcomes of maternal mortality, infant mortality, disease burden, namely malaria, tuberculosis prevalence rates as well as disease morbidity levels specifically due to malaria with the under-five category analysed separately. The selection was based on the impact of these health outcomes in the country as well as the availability of data from the districts as the study focuses on the district level analysis.

The socio-economic factors that have been included in this study are poverty levels, employment rate disaggregated by sectors where applicable, education attainment levels, literacy rate and other demographic factors. These have been included as discussed earlier in chapter 4 as they are among many socio-economic factors being reported in major country social, and demographic surveys (NSO, 2005; NSO, 2010, NSO:2012) sources) as well as being among major socio-economic determinants of health in SDH research (Liamputtong *et al*, 2012:180).

6.3 MATERNAL AND INFANT MORTALITY

6.3.1 Introduction

The first section in discussing the health outcomes focuses on the maternal mortality Rate (MMRate) and Infant Mortality Ratio IMR). The section will analyse the general descriptive statistics for maternal deaths and infant mortality ratio and establish the

basis for further analysis. The basis is mainly on the differences in the registered maternal deaths IMR at district level. The regression analysis is conducted with an aim of establishing the socio-economic antecedents to the two health outcomes.

Malawi continues to face a mixed output fight against the maternal and infant deaths despite commendable efforts that have seen the country reaching maternal mortality rate of 475 and infant mortality at 65 (MDHS, 2010). The maternal mortality rate of 475 represents a significant down trend as compared to the 2004 MDHS estimate of 984 despite it being still unacceptable level (MoH, 2014a:144). Hence, maternal deaths remains a greater challenge not only for Malawi but across the globe despite declining trends with an estimated reduction of 75 percent between 2009 and 2015 (Hogan *et al.*, 2010:1609). With regards to the IMR, Malawi is among the countries that have registered significant reductions in the IMR considering the 2004-2015 MDGs targets with the country's IMR at 72 per 1000 live births (UNICEF, 2014:10)

6.3.2 Descriptive analysis on maternal and infant mortality

The descriptive analysis for the maternal deaths is based on the data from 2011 to 2014 and for the infant mortality, the analysis is based on the data between 2005 and 2011. For Malawi, the available data at district level between 2011 and 2014 shows that some districts recorded maternal deaths as low as one while for the IMR the minimum registered at district level was twenty as illustrated in Table 6.1.

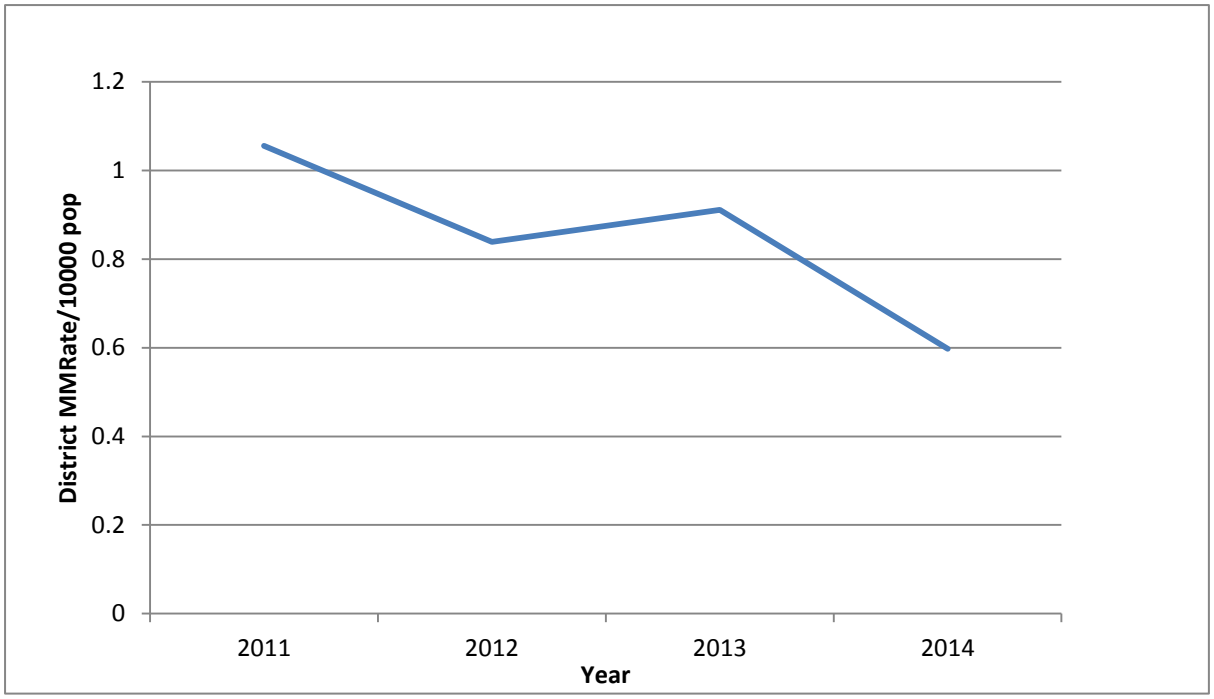
Table 6.1: MMR and IMR 2011 - 2014

	N	Minimum	Maximum	Mean	Std. Deviation
Maternal deaths	108	0.73	6.862	.8517	0.858
IMR	53	20	145	69.92	24.889

Table 6.1 shows that at district level, the maximum maternal mortality rates that were experienced were 6.8 and a minimum of 0.73 per 10000 reproductive age population. The districts that reported higher maternal mortality rate on average were Nsanje, Ntchisi, Nkhotakota, Chikwawa and Mangochi and those that registered the

lower MMRate were Chiradzulu, Mulanje, Rumphi, Blantyre and Thyolo. The districts of Chitipa, Nkhata Bay, and Rumphi were among those that registered low IMR as compared to districts of Mulanje, Dedza, and Phalombe as can be observed from the district distributional by category table in Appendix D1. The MMR at district level is presented in Figure 6.1.

Figure 6.1: MMRate/10000 reproductive age population 2011-2014

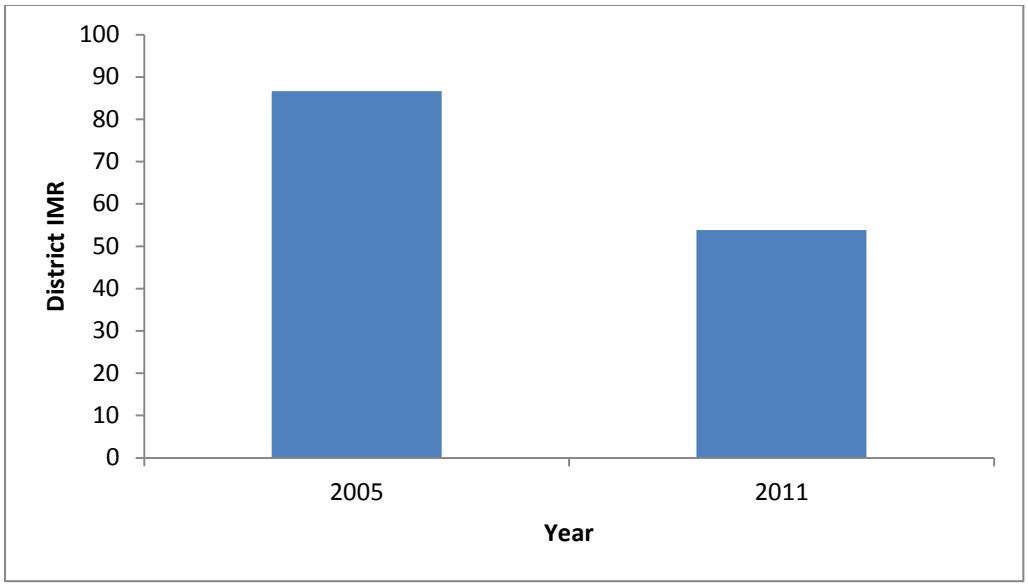


Source: Author's calculations (Data from Ministry of Health HMIS)

Figure 6.1 shows a trend in MMR at district level between 2011 and 2014. The District MMRate has been declining between 2011 and 2014 with however a slight increase between 2011 and 2012. The increase as later discussed in the study might have been contributed by higher dropout rates in 2011 and 2012 among other key factors being discussed as key toward to increasing maternal deaths. The slight increase might have also been as a result of the improved data collection at district level emanating from the reforms under SWAp support on improving data collection and management (MoH, 2012:69).

On IMR trend between 2005 and 2011, there has indeed been a steady decline as also discussed in the childhood mortality outcomes in section 4.8.1. The District IMR is presented in Figure 6.2:

Figure 6.2: District IMR between 2005 and 2011

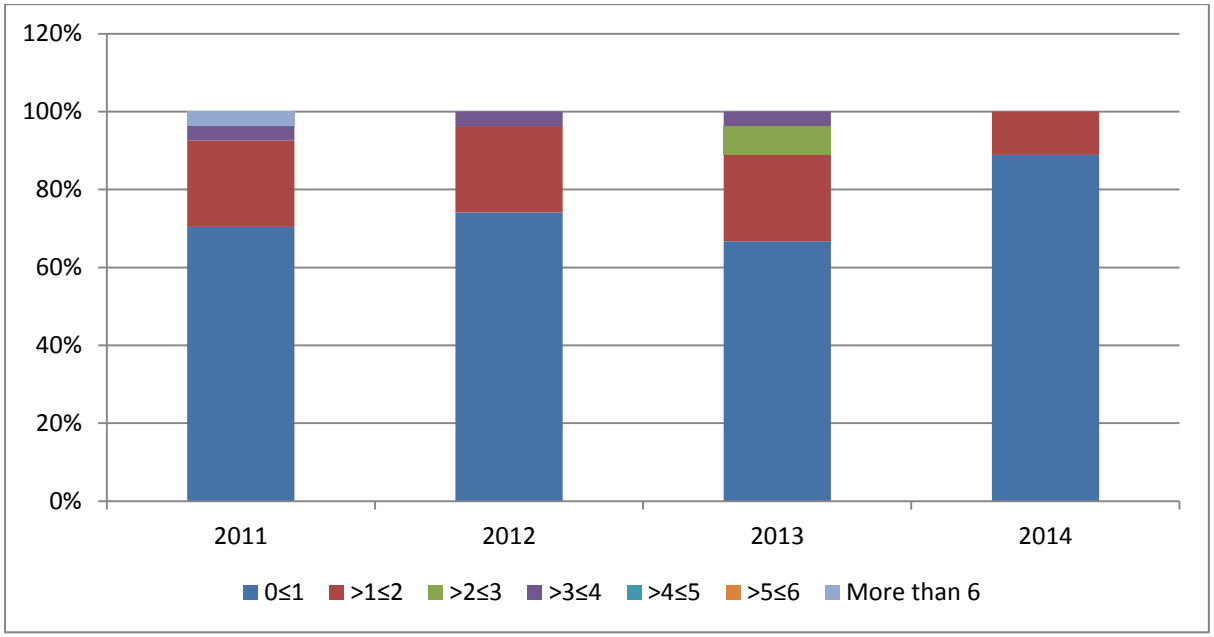


Source: Author's calculations (Data from Ministry of Health HMIS)

As presented in Figure 6.2, the average district IMR in 2005 was 86; however, the 2004 MDHS data recorded 76 per 1000 live births (NSO, 2004). In 2011, the IMR at district level is 53 and shows a corresponding decline from the 2010 MDHS, which were 66.

In analysing further the MMRate district distribution, Figure 6.3 shows how the categories contribute to the overall deaths that were registered from 2011 to 2014:

Figure 6.3: Maternal Mortality (per 10,000 reproductive age population) Distribution at District Level (2011-2014)

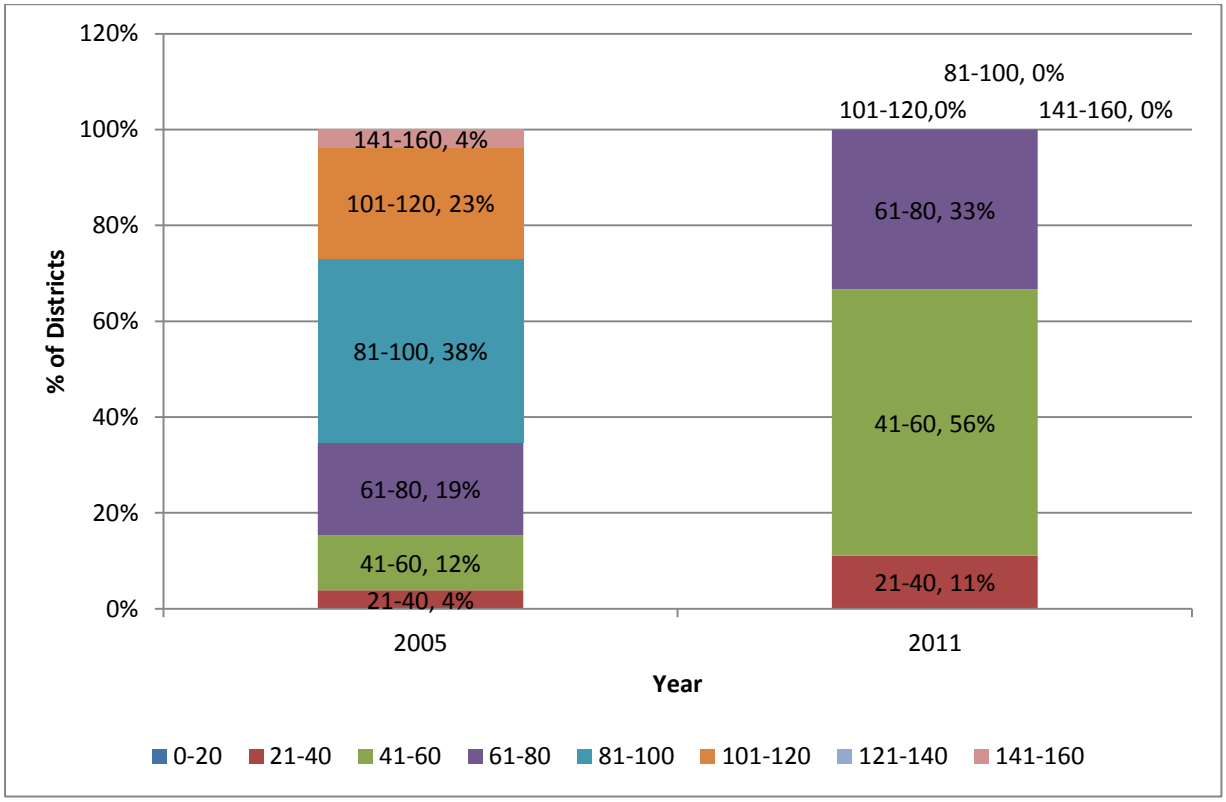


Source: Author's calculations (Data from Ministry of Health HMIS).

The district distribution illustrated in Figure 6.3 shows that on average 70 percent of the districts between 2011 and 2014 have been registering MMRates of less than one. The figure also shows that the year 2014 had over 80 percent of the districts in this category. The highest recorded MMRate category is the MMRate between one and two, which has also been decreasing over the years. The highest category of the maternal mortality rate of more than six was registered in 2011. The distribution table provides further insight on the decreasing MMRate over the years as most districts have been falling under the least category of the district MMRate of between zero and one.

The IMR district distribution is presented in Figure 6.4, however, more details on specific district with associated category are provided in the appendix D1:

Figure 6.4: Infant Mortality Distribution at District Level (2005-2011)



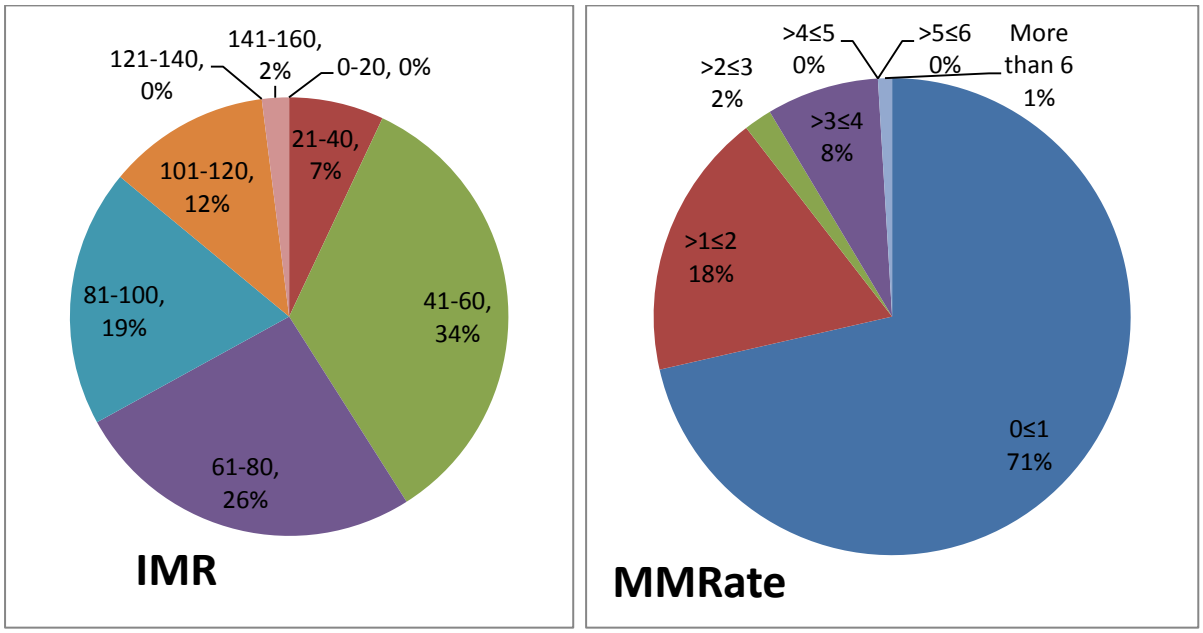
Source: Author's calculations (Data from Ministry of Health HMIS).

The data shows that 38 percent of districts in 2005 had IMR in the 81 to 100 category, seconded by 101-120 category with 23 percent of the districts, 19 percent in the 61-80 and 4 percent was the least for both 21 to 40 category as well as the 141-160 categories. However, in 2011, 56 percent of the districts were in the 41- 60 category, 33 percent in the 61-80, 11 percent in the 21-40 and none in the lowest 0-21 category. As presented in Appendix D1, the data shows that between 2005 and 2011, the districts of Chitipa, Rumphi and Karonga, all in the northern region had the least levels of infant mortality ratio with Chitipa being the least. The districts of Karonga in the north, Thyolo and Mulanje in the southern region had the higher levels of infant mortality ratio with Mulanje district having the highest.

The district distribution entails that districts in the country had registered differences in both maternal and infant deaths despite the maternal mortality being more skewed

towards the lowest category of 0 to 20. On average, the distribution for the maternal mortality and the IMR are summarised in Figure 6.5 as follows:

Figure 6.5: IMR and Maternal Mortality Average Distribution at District level

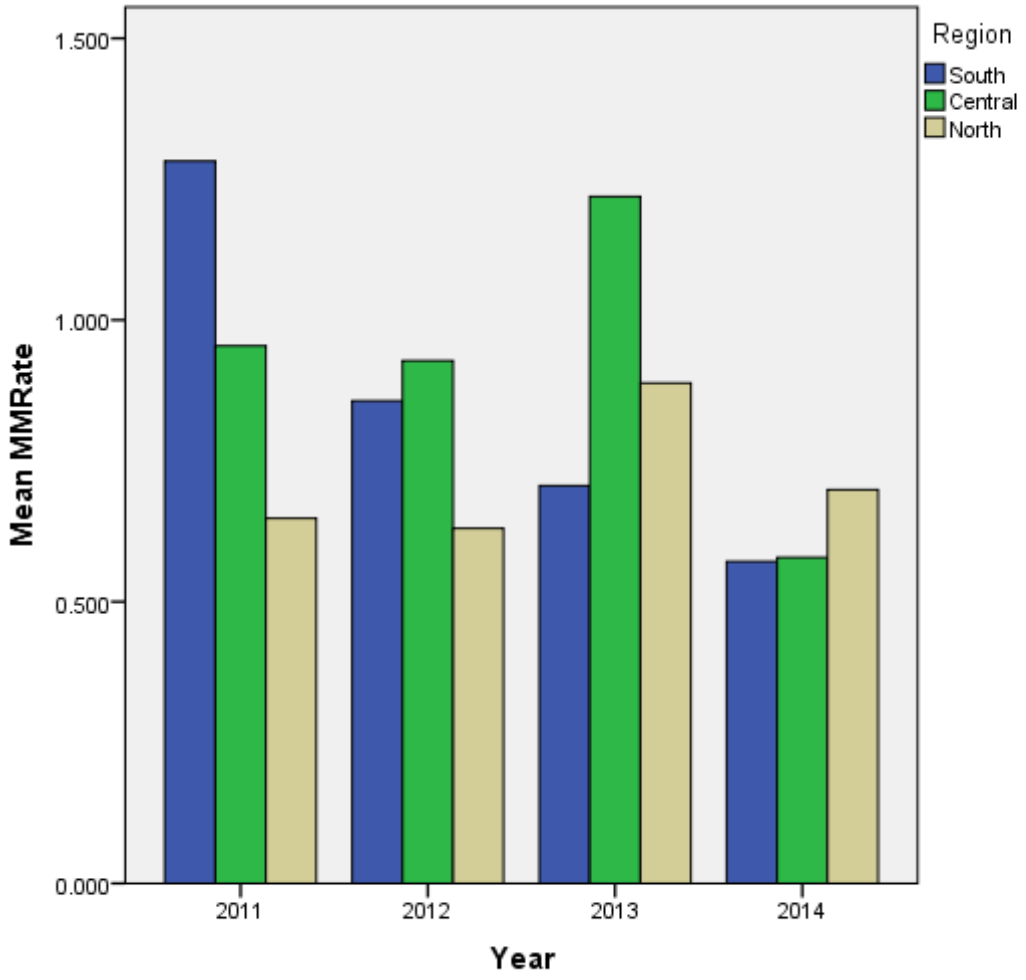


Source: Author's calculations (Data from Ministry of Health HMIS 2005-2014).

As presented in Figure 6.5, the average for the 2005 and 2011 IMR, 34 percent of the districts had registered infant mortality ratio within the 41-60 category, 26 percent in the 61-80 and the least was the 21-40 category, which had seven percent. This however was different in the maternal mortality rate where most of the districts skewed towards the 0≤1 category with on average 71 percent of the districts and being seconded by the category of more than one but less than or equal to two which is on average 18 percent of the districts. It should be noted that Malawi as a country has been registering a steady decline in both maternal and Infant Mortality rates between 2005 and 2014 (MoH, 2012:21-22; MoH, 2014:69).

As Malawi falls in three regions, namely south, central and the north, a regional comparison is presented in Figure 6.6 where the regional average maternal deaths are presented with an aim of establishing any significant differences on the maternal deaths during the period 2011 to 2014.

Figure 6.6: MMRate regional yearly statistics (2011-2014)

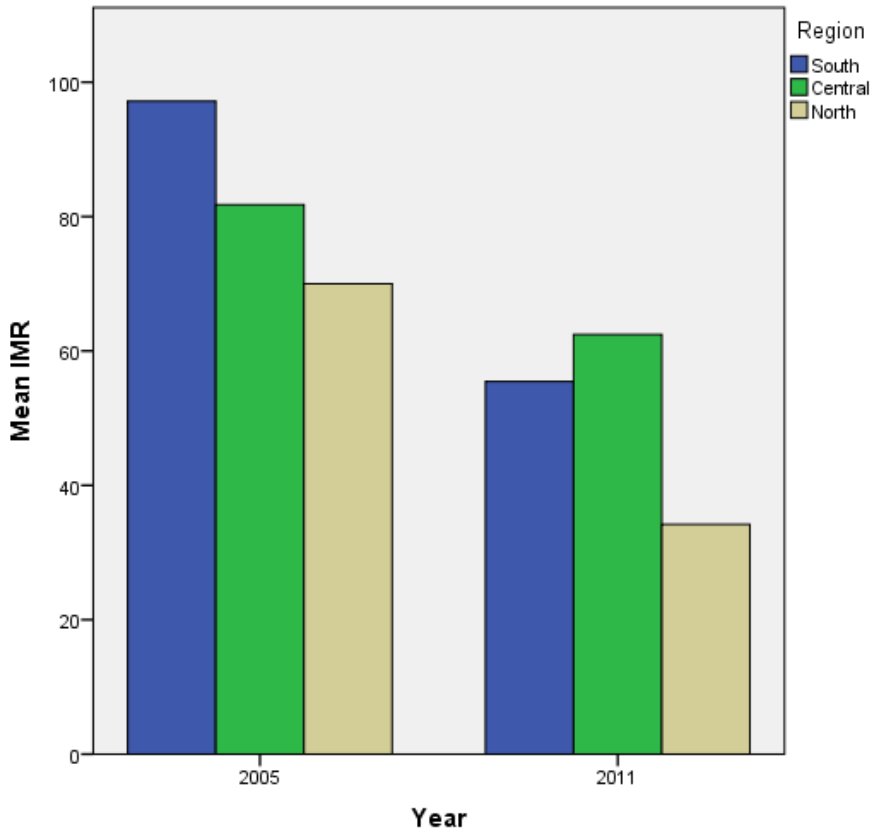


Source: Author's calculations (Data from Ministry of Health HMIS 2011-2014).

Observing from Figure 6.6, the average maternal deaths for the central region were higher along the years as compared to the southern and northern regions. The southern region had higher maternal deaths in 2011 and 2012 in comparison with the north however, in 2013 and 2014, the north registered higher average maternal deaths than the south. The southern region however has overall shown a steady decline in the registered maternal deaths. The registration of higher maternal deaths in 2013 could be as a result of not only in data collection improvements (MoH, 2012:69) but also the established redefinition of Traditional Births Attendants (TBAs) in the country where all home deliveries (accounting for 24 percent of total deliveries) were being discouraged hence hospital based deliveries being encouraged and registered increase (DHS, 2010; MoH, 2014:116).

With the IMR, a steady decline is observed across the regions of the country as presented in Figure 6.7.

Figure 6.7: Infant Mortality Ratio regional statistics (2005 and 2011)



Source: Author's calculations (Data from Ministry of Health HMIS 2005-2011).

As presented in Figure 6.7, there was a steady decline in the IMR between 2005 and 2011. The southern region however had higher average IMR in 2005, as compared to the other regions with the north as the least. In 20011 however, the central had the registered on average higher IMR while the south was second with the north as the least.

6.3.3 Independent Sample Test for the 2005 and 2011 IMR

Using the 2005 and 2011 District Infant Mortality Ratio, the study conducted an independent T-test in order to ascertain as to whether there was a significant difference between these two years considering that the data available was only for the two years. Firstly, table 6.2 provides the mean differences between 2005 and 2011.

Table 6.2: Average IMR at district level for 2005 and 2011

	Year	N	Mean	Std. Deviation	Std. Error Mean
IMR	2005	26	86.62	23.010	4.513
	2011	27	53.85	13.527	2.603

Source: Author's calculations (HMIS 2005-2011 data)

Table 6.2 shows that the average IMR in 2005 was 87 and for 2011 was 54 with an inclusion of Neno district, which was not yet district in 2005 and was being counted under Mwanza district. In further ascertaining the mean IMR differences between 2005 and 2011, a t-test was conducted for the variances between these years under consideration and the results are presented in Table 6.3.

Table 6.3: Independent Sample t-test for 2005 and 2011 IMR

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95 percent Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	3.233	.078	6.348	51	.000	32.764	5.161	22.402	43.125
Equal variances not assumed			6.289	40.135	.000	32.764	5.210	22.236	43.291

Source: Author's calculations (Data from Ministry of Health HMIS 2005-2011 data).

The Levene's test of equality in variance is used to decide whether to use the statistic given when we assume equal variance or when the Levene's test rejects the equal variance assumption, then the statistic used is the one given under equal variance not assumed. In the test given in Table 6.3. Using the Levene's Test, the null hypothesis of equal IMR variances between 2005 and 2011 is accepted as the p-value is 0.078, which is higher than 0.05 for the 5 percent significance level. Therefore, the results of the t test will be considered under the equal variance assumed. . For the t –test the t-statistic of 6.348 has a p-value of 0.000, which is significant at 1 percent leading to the rejection of the null hypothesis that the means

between these years are the same. In other words, the mean difference of 32.7 is statistically significant and that between 2005 and 2011, the IMR rates had significantly reduced.

6.3.4 Independent T-test for the regional Maternal Mortality and Infant Mortality Ratio variances

With the variances observed under the three regions of the country, an independent t-test was also conducted in order to compare the mean differences. The test is to establish if regional mean differences were significant. The regional MMRate and the IMR averages are presented in Table 6.4:

Table 6.4: MMRate and IMR average regional statistics (2011-2014)

	Region	N	Mean	Std. Deviation	Std. Error Mean
Maternal Mortality Rate	South	52	0.85397	0.966043	0.133966
	Central	36	0.91982	0.845194	0.140866
	North	20	0.71631	0.545336	0.121941
Infant Mortality Ratio	South	25	75.48	25.731	5.146
	Central	18	72.11	15.064	3.551
	North	10	52.10	30.603	9.678

Source: Author's calculations (HMIS 2005-2014).

As presented in Table 6.4, the central region had the highest average maternal deaths of 0.92 as compared to the southern region, which had 0.85, and the northern region, which recorded an average of 0.72 maternal deaths per 10000 reproductive age population. On IMR, the southern region registered the highest infant mortality ratio of 75.48, while the central region had an average of 72.11 with the north as the least with 52.1.

An analysis to compare the differences between the regions was conducted by using an independent t-test and is presented in Table 6.5. This was conducted to ascertain further on the significance of the observed regional differences.

Table 6.5: T-test Results for the Regional Maternal Mortality and Infant Mortality Ratio (2005-2014)

		Regions for comparison					
		South and central		South and north		Central and north	
	Null Hypothesis	t	Sig. (2-tailed)	t	Sig. (2-tailed)	t	Sig. (2-tailed)
MMRate	Equal variances not assumed	.760	.450	.760	.450	1.092	.280
Infant Mortality Ratio	Equal variances assumed	0.497	0.622	-	-	2.334	.028
	Equal variances not assumed	-	-	2.133	.051	-	-

Source: Author's calculations (HMIS 2005-2014).

As presented in appendix E2, the equal variance assumed in the Levene's test is rejected hence the use of the equal variance not assumed. The results in Table 6.5 show that maternal mortality variance between the regions of the country were not significantly different. The t-statistic of 0.760 between the southern and central as well as the south and northern regions, and the t-statistic of 1.092 between C\central and northern regions are statistically not significant at 10 percent. This implies that their mean variances between 2005 up to 2011 were not as significant. This demonstrates how the aggregating data at a higher level for example regions, may underestimate the differences as compared to analysis at a lower level or units for example between districts as will later be discussed later under the MMRate regression results.

On the IMR variances, using the equal variance assumed between south and central, and central and north (appendix E5 and E7), the IMR variance between the south and the central regions are not statistically significant. This is demonstrated by the t-statistic of 0.497 and a p-value of 0.622. However, the variance between the central and north are statistically significant. This is demonstrated by the t-statistic of 2.334 with a p-value of 0.028 hence statistically significant at 5 percent. There is also a statistically significant IMR variance between the southern and the northern regions by accepting and using the equal variance not assumed assumption

(appendix E6). The table in summary provides information that between 2005 and 2011, the variances between the regions of the country were not statistically significant in the case of MMRate and statistically significant in the case of IMR except between the southern and the central regions. This calls for a further analysis by considering the variances between the districts MMRate and IMR to appreciate the MMRate and IMR differences between the years of study and the socio-economic factors contributing to such differences.

6.3.5 Relationship between District MMRate, IMR with socio-economic factors

The maternal and infant deaths differences as measured by the MMRate and IMR between districts of the country can further be analysed by considering the socio-economic factors in the districts. These socio-economic factors under investigation are maize output measured in metric tonnes and its average price (in Kwacha), percentage of people employed in the agricultural and fisheries industry, population, percentage of female headed households, primary school drop-out rate, female literacy rate and poverty rate as measures by an income poverty line. All these socio-economic factors are measured at district level. The analysis is conducted by considering the association of these socio-economic factors with the maternal mortality rate and infant mortality ratio also measured at district level. The basic correlation results give an indication on the envisaged relation for some of the social economic factors as demonstrated in Table 6.6:

Table 6.6: Correlations of MMRate, IMR with socio-economic factors (2005-2014)

	Maternal Deaths		Infant Mortality Ratio	
Socio-economic variable	Pearson Correlation	p-value	Pearson Correlation	p-value
Maize Output (in metric tonnes)	.459**	0.000	0.024	0.865
Maize average Price	-0.035	0.717	-.571**	0.000
Employment rate (Agriculture & fisheries	-	-	-.610**	0.000
Population	0.571**	0.000	0.146	0.298
Female headed household	-	-	0.279*	0.043
Dropout rate (Primary school)	0.244*	0.011	0.663**	0.000
Female Literacy Rate	-	-	-.476**	0.000
Poverty level (percentage)	-	-	0.129	0.358

**. Correlation is significant at 1 percent level

*. Correlation is significant at 5 percent level.

Source: Author's calculations (NSO WMS and MOH HMIS 2005-2014).

The correlation results in Table 6.6 show that there is association between the maternal deaths and maize output, population and primary school dropout rate. The table also shows correlation between the IMR with maize average price, employment rate in the agricultural sector, level of female-headed households, primary school dropout rate and female literacy level at various significance levels.

There is a positive and significant association at one percent between maize output and maternal deaths meaning that high levels of maize output are associated with high maternal deaths at district level. Higher maize output ought in general terms to be associated with better food security and better health and subsequent low death rates (Ignacio *et al.*, 2014:2068). This in considering maternal deaths is especially critical during development of pregnancy as chronic stress emanating from food insecurity would affect the pregnant women health (Klawetter, 2014:134) and compromised nutrition status of both mothers and infants (Bowie & Geubbels, 2013:16). In Malawi, maize is the staple food of the country and better output signifies food availability and in general terms signifies food security for the nation as it is synonymous with access to maize (Chirwa, 2008:13).

Maize output does also further signifies availability of good rainfall patterns as far as Malawi is concerned as most maize farming is rain fed apart from the irrigation systems which are being developed. In Malawi, malaria incidences thrives with higher rainfall patterns and transmission is greatest during the rainy season and in the low-lying areas (MoH, 2014:164). This is mainly from the associated bushes, swamps and stagnant waters conducive grounds for mosquito breeding and this brings a high risk of malaria which is one of the major killers in Malawi. The higher malaria risk hence is a risk factor for higher deaths among many Malawians and is one of the risks among pregnant women and children. According to 2010 Emergency and Obstetric Neonatal Care (EmONC) Assessment report, malaria was among the major leading indirect causes of maternal deaths in Malawi (MoH, 2010:116). Therefore, the positive correlation indicates that there is a trade-off, with higher levels of maize production, women are also dying and it does point out to the need of controlling malaria spread during higher rainfall periods that in Malawi is a factor associated with bumper maize harvest.

The average price of maize has shown a negative relationship with the IMR statistically significant at one percent. The low maize prices in Malawi signify a low-income base for subsistence farmers in Malawi most of whom depend on maize. The low maize price eventually affects the general income of households and subsequent Social Economic Position (SEP) of a significant population most of which is the rural population. Studies have shown that low socio economic position is one of the risk factors on health as a better economic position provides easy access to health commodities (WHO, 2010:30). Furthermore it anchors proper nutrition diets essential for both maternal and infant health in contrast to low income which compromises the nutritional status as well as access to medical care (Black *et al.*, 2013:427). Lower household income is hence a risk factor towards both higher infant and maternal mortality (Lindsay *et al.*, 2012:534). The positive association of employment in agriculture and fisheries with infant mortality ratio is also on the similar basis

Efforts in checking population growth are one of the factors considered key in the fight against persistent higher maternal mortality. In Ethiopia, the population growth, has been among the critical factors contributing to the persistent higher maternal mortality for the past three decade mainly due to the services compromises emanating from higher population and physician ratio (Berhan & Berhan, 2014:1). The table has also shown that higher population growth rate is associated with higher maternal deaths. High population over the past decade has been one of the key demographic factors overstretching both human and financial resources not for health but across sectors. In most hospitals in Malawi, congestion is a major issue affecting the quality of health services in the country, most hospitals are overcrowded (MoH, 2014a:1) and maternal health services have also not been spared.

The benefits of education on health outcomes can never be over-emphasised, as most researches have shown that it contributes positively to improved health outcomes and the reduction in maternal mortality (WHO, 2003; WHO, 2010, Marmot & Wilkinson, 2011; Rahman et al., 2015). This has been demonstrated through maternal education (Rahman *et al.*, 2015:173) from a case study in Bangladesh, general formal education contributing positively to health outcomes (WHO, 2010:31) as well as high levels of female population as it foster positive effect towards materiality, high children survival rates and improved health in mothers (WHO, 2003:55). The statistically significant negative association of female literacy rates provides similar pathways as their ability to read empowers them and households in making decisions towards improved health. However, primary school dropout is positively associated with both maternal and IMR. The higher primary school dropout entails higher maternal deaths and IMR. In other words, high levels of primary school dropout would be a concern among countries like Malawi who are still consolidating the gains in the fight against high levels of maternal mortality.

Poverty rate and female-headed household have also been shown in the Table 6.6 as associating positively to the IMR. There has been empirically strong positive association between households that are vulnerable like female-headed households and general poverty levels with child mortality. A study in Indonesia showed a risk of child mortality in the more vulnerable group for example the poorest group was

measured to be higher compared to that of the able to provide and richest group (Graham *et al.*, 2004:23). Most female-headed households fail to provide the basic households needs especially among the rural communities in Malawi, which are also highly trapped in the multi-dimensional poverty snare. The poverty (income expenditure) significance however is in contrast with Malawi where, Bowie (2006) by using the sisterhood method finds little difference in maternal and child mortality deaths between the rich and poor. This can be attributed to the easy accessibility of reproductive health services such as immunisations (EPI) and antenatal care which renders poverty relatively as not a significant factor (Bowie, 2006:12).

6.3.6 Regression analysis

In analysing further the association between the maternal deaths and social economic factors across the districts, the following regression analysis was conducted. The model uses the district maternal deaths from 2011 to 2014. The general model specification is given as follows:

$$\mathbf{DHO}_{it} = \boldsymbol{\beta}_0 + \sum_{i}^{n} \boldsymbol{\beta}_i \mathbf{X}_{it} + \ \boldsymbol{\mu}_i$$

Where:

DHO is the district health outcome and in this case maternal deaths or IMR measured at district level and $\mathbf{X}_{it}$ representing the socio-economic factors also measured at district level with $\boldsymbol{\beta}_0$ as an intercept.

6.3.6.1 The use of Hausman Test

The Hausman Test is conducted to test whether the use of Random Model is appropriate in the pooled variables as the study implores the Random District Effect Model from the observed significant differences in the maternal deaths and IMR. In other words, it tests whether the assumption that the error components are not correlated and that the random effects are not correlated with one or more specified independent variables in the model holds. The hypotheses for the model is presented are as follows:

H_0: The ECM and FEM estimators do not differ substantially

H_1The ECM and FEM estimators differ substantially

The two equations are hence specified as follows:

$$\boldsymbol{MMRate_{it=}\beta_0 + \beta_1 MaizeProd_{it} + \beta_2 Pop_{it} + \beta_3 DropoutRate_{it} + \varepsilon_{it}} \quad (\mathbf{1})$$

Where:

MMRate is the Maternal Mortality Rate, MaizeProd is the maize output in metric tonnes, Pop is the district population, DropoutRate is the primary school dropout rate all measured at district level. The Infant Mortality Ratio regression is also presented as follows:

$$\boldsymbol{IMR_{it=}\beta_0 + \beta_1 MaizeProd_{it} + \beta_2 Emp\ Agr\&Fish_{it} + \beta_3 LitercyF_{it} + \beta_4 DropRate_{it} + \varepsilon_{it}} \quad (\mathbf{2})$$

Where:

IMR is the district infant mortality rate, MaizeProd is the district maize production in metric tonnes, Emp Agr&Fish is the district employment rate in the agriculture and fisheries industry, LiteracyF is the district female literacy rate, Dropout Rate is the district primary school dropout rate. The regression is specified as Hausman Test is conducted on a regression.

The results of the test are presented in the Table 6.7:

Table 6.7: Results for Hausman Test

Equation	Chi-Square. Statistic	Chi-Square. Degrees of freedom.	P-value
Equation 1	1.218853	3	0.7485
Equation 2	3.847801	4	0.4270

As stated earlier, the null hypothesis for the Hausman test is that the FEM and the ECM do not differ substantially. The results in Table 6.7 show that the estimated chi square value for equation one at three degrees of freedom is not statistically

significant at one, five or ten percent significance level. This leads to a conclusion that the null hypothesis cannot be rejected hence the use of random effect model is more preferred than fixed as the assumption that random effects are not correlated with the specified repressors in the model holds as discussed earlier in section 5.4.1. The similar results are also found for the infant mortality ratio model at four degrees of freedom as the model uses four regressors for its socio-economic factors. The results hence lead to a conclusion that the Random District Effect Model is appropriate for both maternal and infant mortality analysis. For more details, the STATA results output for the maternal deaths and IMR regression are presented in Appendix A3 and A4 respectively.

6.3.6.2 The use of Breusch-Pagan Test

The models were further subjected to the Breusch-Pagan Lagrange multiplier (LM) test to appreciate on the presence of random or fixed effects. The LM test hence helps to enforce on the decision of using either a random effects regression or a simple OLS regression. The null hypothesis in the LM test is that variances across entities are zero. In other words, it is the inference of no significant difference across units (i.e. no panel effect). In this model hence the hypothesis is presented as follows:

H_0: No random effects on the district maternal deaths or the IMR

H_1: Random effects available on the district MMRate or the IMR

The results of the test are present in Table 6.8.

Table 6.8: Results of Breusch and Pagan (LM) Test on MMRate and IMR

Equation	Chi Square Statistic	P-value
Equation 1	8.24	0.0021
Equation 2	85.24	0.0032

The results in Table 6.8 show statistically significant Chi square values for both equations. With the chi square of 8.24 for maternal mortality equation and 85.24 for

the IMR equation both at one degrees of freedom, the null hypothesis is rejected at one percent significance level. This is demonstrated by the statistically significant p-values of 0.0021 and 0.0032 for equation one and two respectively. The results hence confirm the presence of random effects in the model and further reinforcing that the random effect model is appropriate. In other words, there is evidence of significant differences across districts on the maternal and infant deaths and are associated with the selected socio-economic factors. This means that the impacts of these socio-economic variables are not the same across the country and may vary accordingly from one district to another.

With the confirmation that the Random District Effect Model (RDEM) is appropriate and the availability of the random effects, the regression is therefore specified and conducted as follows:

$$\boldsymbol{MMRate_{it=}\beta_0 + \beta_1 MaizeProd_{it} + \beta_2 Pop_{it} + \beta_3 DropoutRate_{it} + \varepsilon_{it}} \qquad (\mathbf{1})$$

Where:

MMRate is the Maternal Mortality Rate, MaizeProd is the maize output in metric tonnes, Pop is the district population, DropoutRate is the primary school dropout rate all measured at district level. The Infant Mortality Ratio regression is also presented as follows:

$$\boldsymbol{IMR_{it=}\beta_0 + \beta_1 MaizeProd_{it} + \beta_2 Emp\ Agr\&Fish_{it} + \beta_3 LitercyF_{it} + \beta_4 DropRate_{it} + \varepsilon_{it}} \qquad (\mathbf{2})$$

Where:

IMR is the district infant mortality rate, MaizeProd is the district maize production in metric tonnes, Emp Agr&Fish is the district employment rate in the agriculture and fisheries industry, LiteracyF is the district female literacy rate, Dropout Rate is the district primary school dropout rate, and $\boldsymbol{\varepsilon_{it}}$ is the composite error term on both equations. The regression results are presented in Table 6.9.

Table 6.9: Regression Results Maternal Mortality Regression

	Regressors	Coef.	Z	P-value	Wald chi2	P-value
Equation 1	Maize Output	7.94E-06	0.3	0.766	32.39	0.0000
	Population (Per 10000 population change)	0.354	2.66	0.008		
	Dropout rate	0.934893	2.75	0.006		
Equation 2	Maize Output (per 10000 metric tonnes)	0.513	2.2	0.028	97.58	0.000
	Employment Rate (Agriculture and Fisheries)	-0.3615401	-5.29	0.000		
	Female Literacy Rates	-0.5170696	-2.42	0.015		
	Dropout rate	1.537415	2.11	0.035		

Source: Authors calculations (NSO WMS and Ministry of Health HMIS).

The results in Table 6.9 show that the model specification is appropriate as evidenced by the Wald Chi (2) statistic of 32.39 for the maternal mortality equation and 97.58 for the IMR equation, which are both, statistically significant at one percent. This is demonstrated by the p-values of 0.000 in both equations. The statistically significant Wald Chi (2) statistic confirms the goodness of fit for the model, which entails efficient and consistent associated coefficients.

The model results have indicated that there is a significant effect towards the maternal deaths in the country as measured by the district MMRate from a change in population and primary school dropout rate. This is demonstrated by the significant p-values of 0.008 and 0.006 at one percent significance level. The results in Table 6.9 show that a unit increase in population (translated as 10000 population increase) at district level, has a 0.35 unit increase effect on the MMRate. Furthermore, the MMRate is also impacted by the primary school dropout where a unit change (percentage change) has a corresponding effect of 0.9 unit change in the MMRate.

On IMR, the results in Table 6.9 show that maize output, employment in agriculture and fisheries industry, female literacy rate and primary school dropout rate have significant effect of the district IMR. This is demonstrated by the p-values of: 0.028 for maize output which is significant at five percent significant level; 0.000 for employment in agriculture and fisheries which is significant at one percent significant level; 0.015 for female literacy rate which is significant at five percent significant

level; 0.035 for primary school dropout rate which is also significant at five percent significant level. The results entails these socio-economic factors have a significant effect on the fight against the higher IMR. As demonstrated in Table 6.9, a unit increase in maize output (10000 metric tonnes in relative terms) has a 0.5 unit increase effect on the IMR. On employment levels, a unit change in the employment rate (percentage in relative terms) has a 0.36 unit change effect on the IMR. In other words, an increase in the employment levels would help in reducing the IMR as the increase in the employment arte in agricultural and fisheries industry is showing a negative effect on the IMR. This is also the case with the female literacy rates where a unit increase (percent in relative terms) has a 0.5 unit decrease effect on the IMR. However, increase in the primary school dropout rate a unit change in the primary school dropout rate (percentage in relative terms) has a 1.5 unit change effect in IMR. In other words, an increase in primary school dropout is contributing to increase in IMR at district level. The results further demonstrate that despite the dropout rate significantly contributing to the rise in maternal deaths and IMR in Malawi, the effect of the primary school dropout is more on the IMR as compared to the maternal deaths as the infants lives are more delicate hence higher risk for dying as compared to the mother.

These results imply that a significant impact can be archived by improving some economic factors in certain districts as compared to the others. For example in districts like Nsanje, Ntchisi, Nkhotakota, Chikwawa and Mangochi with higher maternal mortality rate, a deliberate interventions to reducing the primary school dropout or improving employment in agriculture sector would on average impact more as compared to Chiradzulu, Mulanje, Rumphi, Blantyre and Thyolo holding other things constant. This is also the case with IMR on districts like Mulanje, Dedza, and Phalombe as compared to Chitipa, Nkhata Bay, and Rumphi holding other things constant.

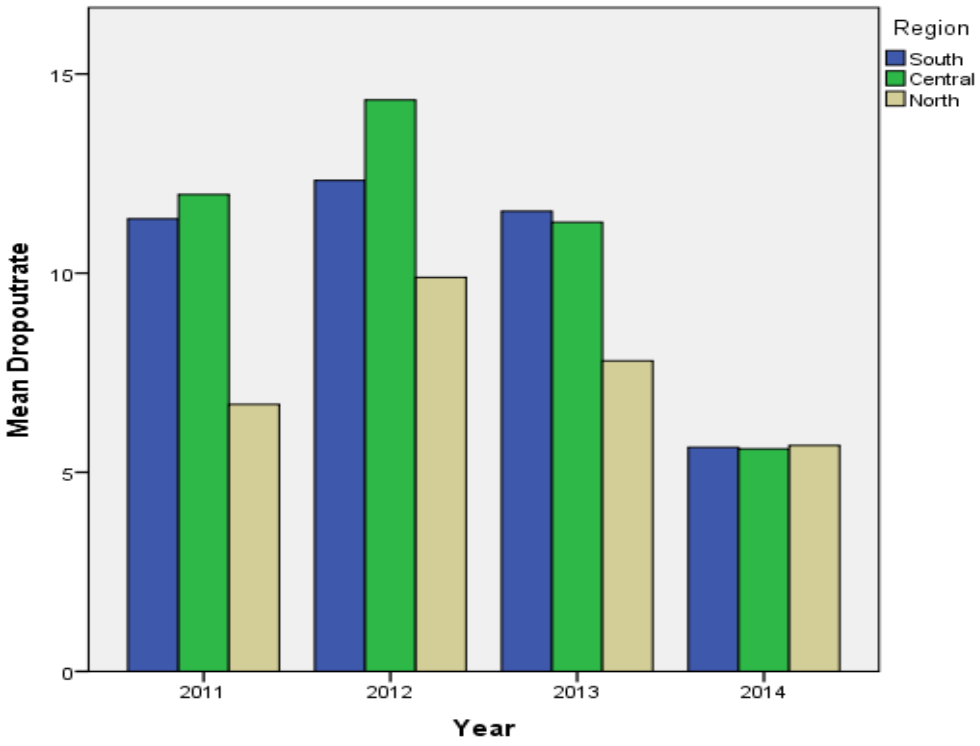
These socio-economic factors have their unique pathways in affecting the MMR and IMR. Population growth at district level which been shown to be a statistically significant factor in the MMR model, has a negative effect on both financial and human resources. The increase in population in most developing countries has no corresponding increase in resources and amenities like health facilities capacity

which entail compromises the quality services due to overstretched human resource and medical equipment (Berhan & Berhan, 2014:1). This is the case in Malawi where most hospitals are wrapped in poor quality services due to congestion and over-stretched resource both human and financial (MoH, 2014a:1). Such environment has proved to be risk for maternal health services.

Dropout rate with increase in teenage marriages especially less than 20 years of age can lead to more children that are not only underweight as compared to those in the age group 30 to 39 (NSO, 2010:142) but also perpetual risk as the most teen age marriages struggle income wise which according to MDHS (2010) shown than low income is a risk factor for infant underweight. Birth weight is one of the important indicators for child health in minimising early childhood morbidity and mortality as most children whose birth weight is less than 2.5 kilograms, in other words considered smaller than average' are considered to have a higher-than-average risk of early childhood death (NSO, 2010:117).

Looking at the dropout trend in Malawi between 2011 and 2014 by regions of the country, a general decline was experienced from 2012 as presented in Figure 6.8.

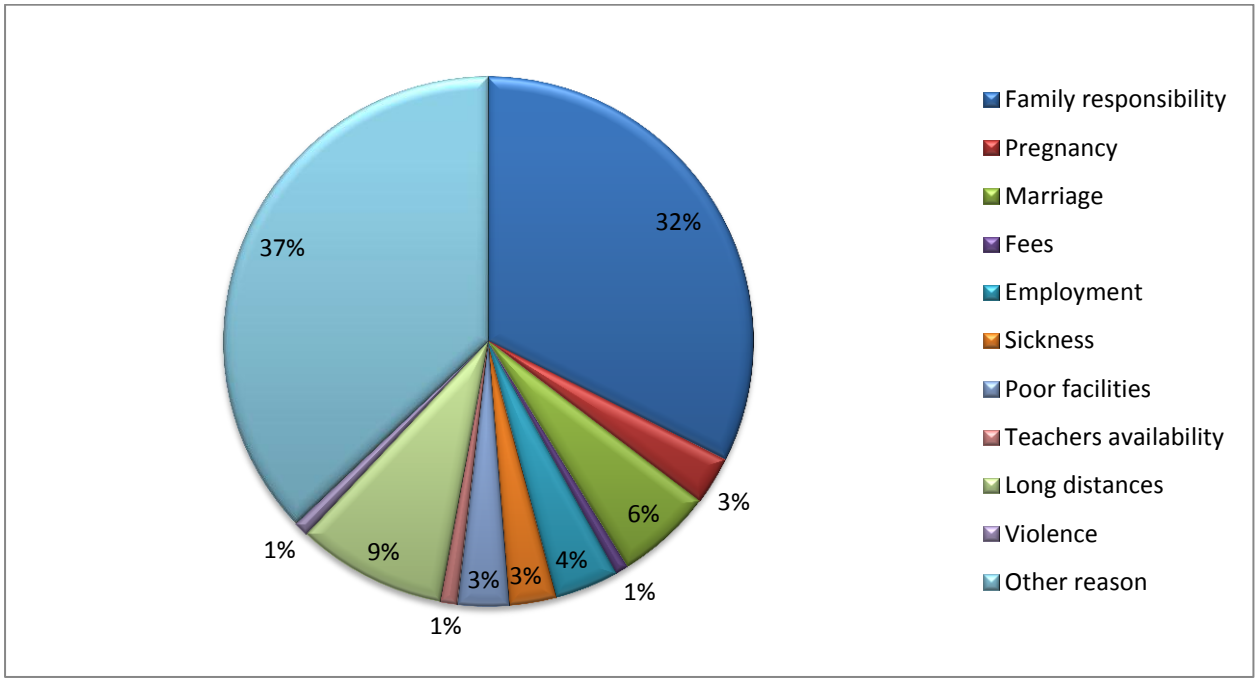
Figure 6.8: Primary school dropout rates by regions 2011-2014



Source: Author's calculations (GoM, EMIS reports 2011-2014).

Figure 6.8 shows that dropout rates were significantly higher in the central region compared to the other regions. There was in general a higher dropout rate 2011/12 with a later decline in 2013 and further in 2014. This can be related with the regional analysis in figure 6.3.4 where maternal deaths were experienced more in the central region of the country specifically highest in 2013 a subsequent year after higher primary school dropouts and with a corresponding decline in 2014. To further analyse the primary school dropout effect, the reasons of these dropouts are presented in Figure 6.9.

Figure 6.9: Reasons for primary school dropout 2011-2014



Source: Author's calculations (Data from EMIS 2011-2014).

As presented in Figure 6.9, pregnancy and marriage reasons of dropping-out constituted nine percent of the reason for primary school dropout between 2010/11 and 2014/15 school calendar years. Apart from family responsibilities, the EMIS in 2011-2014 reports show that long distances, poor facilities, violence and unavailability of teachers were the main reasons for those between standard one and four, while the rest of the reasons were dominant among those above standard four and mostly teenagers. This entails that over 50 percent of the dropouts are likely to increase teen-age marriages as the rest of the reasons of dropping out was

among the teenagers and most of which are likely to end up into early marriages. In Malawi, culture especially on perception of girl child education also plays a role in contributing to higher dropout especially among girls (Chimombo, 2000:19). Most of these early marriages are often times that not unsupported and vulnerable hence a risk factor for both the pregnant woman and the child to be born. The implication is that these adolescent girls who give birth are at greater risk of prolonged and obstructed labour and delivery as well as maternal mortality and morbidity (Unicef, 2010:8). In sub-Saharan Africa, girls in poor communities are three times likely to get married before the age of eighteen (UNICEF, 2010:8). The implication is that these adolescent girls, who give birth are at greater risk in turn, have their children often faced with elevated risks of mortality, ill health and under-nutrition, and they are more likely to be excluded from health care and education, thus perpetuating the negative cycle, generation after generation. The leading causes of under-five deaths are pre-term birth complications (17 percent); pneumonia (15 percent); complications during labour and delivery (11 percent); diarrhoea (9 percent); and malaria (7 percent). Under-nutrition contributes to nearly half of all under-five deaths (UNICEF, 2014:12). Most teen age marriages as a result of primary dropouts falls in these vulnerable marriage traps and would indeed contribute highly to high maternal and infant mortality ratio in the country. The country registered a 5.1 percent decline in the primary school dropout between 2005 and 2011 as presented in Table 6.10.

Table 6.10: Primary school dropout means 2005-2011

	Year	N	Mean	Std. Deviation	Std. Error Mean
Dropout Rate	2005	26	15.78	3.889	.763
	2011	27	10.70	3.117	.600

The independent t-test as presented in Appendix E1 by accepting the equal variance not assumed hypothesis, shows that the mean dropout rate variance between 2005 and 2011 was indeed significant as demonstrated by a p-value of 0.000, which is significant at one percent significance level. The results show that the 5.1 percent decline in the primary school dropout was statistically significant and such a decline is significantly associated with the fight against high infant mortality ratio in the

country as demonstrated by the significant dropout rate coefficient in the IMR regression model. As per the IHS3 report, primary school dropout rate not significantly different between the urban and the rural population of the country (NSO, 2012:36). This implies that the impact of the primary school dropout rate is across irrespective of the area being urban or rural hence the district comparison offers a more relevant setting for analysis.

Maize output has also shown a significant relationship in the IMR model however not significant though positive in the maternal deaths model. As earlier discussed in the general correlations section 6.3.4, in Malawi, malaria incidences thrives with higher rainfall patterns, which is also synonymous with better maize output. The results in the IMR model show that increased maize output at district level is associated with expected increase in malaria incidences, which is one of the risk factor among infants in the country. In Malawi, malaria is ranked fourth among causes of death, accounting for 8 percent of mortality (Bowie, 2011). It is the leading cause of morbidity and mortality in children under age 5 and among pregnant women (MoH, 2010:116). In sub-Saharan region, malaria is regarded as one of the leading cause. A 2014 UNICEF report indicates that malaria, pneumonia, and diarrhoea accounted for about 1.3 million under-five deaths, in other words about 40 percent of the under-five deaths (UNICEF, 2014:12). The model has hence shown that the benefits of maize output whose access is equated to food security in Malawi (Chirwa, 2008:13) is being outweighed by the associated malaria effect on IMR at district level.

As most households in Malawi are dependent on agriculture, with maize being the main source of subsistence income, higher maize prices are likely to improve their general levels of income. Improved income among households is generally associated with improved health outcomes. In Malawi, 85 percent of the population is engaged in agricultural activities, with 94 percent in the rural and 38 percent in the urban areas (NSO, 2012:130) Employment in the agriculture sectors is the major source of employment among the poor Malawians and mostly in the rural where 85 percent of the population resides (NSO, 2012:8). Employment in agriculture hence offers subsistence income and helps to improve the social economic position of the household which contributes to the improved access to health commodities and subsequent health outcomes (WHO, 2010:30). Improved child health through

improved income is mainly through improved access to better diet for the children averting malnutrition and being underweight, which are considered to be the leading causes of child deaths in low income countries (Black *et al.*, 2013:427). Despite most public facilities in Malawi being free at point of delivery, there are still costs related to accessing medical care relating to transport as well as paying health facilities within reach. The MDHS (2010) has shown that infant survival is better among households with improved income as compared to those with low-income levels. The improved household income hence alleviates the risk towards higher infant deaths (Lindsay *et al.*, 2012:534).The significant contribution from the employment rate in the agriculture and fisheries sector towards improved infant mortality ratio also entails the role of women in the childhood mortality as in Malawi most agricultural industry employment is dominated by women (NSO, 2012:136).

The significant role female literacy play in reducing the infant mortality deaths even at district level can never be overemphasised. The improved literacy levels among women has been demonstrated as being associated with the improvement of health outcomes like nutritional levels and anaemia in which is common in children between the age of 6 to 12 months, as women are likely to translate the nutritional knowledge gained into action at household level (NSO, 2010:143). This would translate into improved in general health status in children and consequently reduced deaths among the infants. Apart from high general education level itself being an important determinant of access to among other services; family planning, institutional deliveries and obstetric care services which are integral part of child health (Bowie & Geubbels, 2013:23), women that are literate shows a better response to reproductive health education better that illiterate ones, in terms of use of dietary knowledge, medical care access for children as well as vaccination (NSO, 2010:119). The results are inconsistent with other studies that have previously shown that increase in female literacy rate lead to decrease in the infant deaths (WHO, 2003; WHO, 2010, Marmot and Wilkinson, 2011; Rahman et al., 2015) most of which are preventable (UNICEF, 2014:2). A study also for Malawi, Tanzania and Zimbabwe found that nutritional education and women education beyond primary provides even further significant and sufficient base for improved nutrition (in all three measures) in infants (Makoka, 2013:3). In Malawi, female literacy levels have between 2005 and 2011, moved from 56 percent to 64 percent and the mean difference is significant from the

t-test (appendix E8) with a mean difference of 8.2 percent significant at five percent significant level.

Research has also shown that higher institutional delivery rates recorded in Malawi districts, are among women with higher female literacy rates (Bowie & Geubbels, 2013:23). The hospital deliveries help early detection of any child exposure to risk hence would reduce morbidity and mortality among infants. Furthermore, literacy among women provides significant influence over the household as family planning is likely to be implemented among families whose women are literate (NSO, 2010:67). Literate women have their empowerment on health enhanced which is ability to gain control on the decisions affecting their health (Nutbeam, 1998:344). In other words, the level of empowerment on health is much more evident when they are literate especially on family planning matters. Family planning provides a platform for informed decisions, which can affect the household for example child spacing, which consequently has a bearing on the household children support and health status.

In summary, the socio-economic antecedents that have shown a significant effect on maternal deaths and infant mortality ratio in the two models are maize output which has been related to increased rainfall pattern and associated malaria incidences; maize average price as its pathways related to income and socio-economic position; primary school dropout as most teenage marriages are vulnerable; and female literacy rates where women empowerment is displayed. In other words, higher maternal deaths will be experienced in a household with low-income levels and in a district where there are low female literacy rates. Within countries, relative wealth, education, and location are key – a child's risk of dying increases if she or he is born in a remote rural area, into a poor household or to a mother with no education (UNICEF, 2010). The results from the IMR model have shown that for Malawi as well, the infant risk of dying increases with the child born in the primary school dropout household, born to an illiterate mother, and low income household.

6.4 DISEASE BURDEN: MALARIA MORTALITY

6.4.1 Introduction

The second section of analysing the health outcomes in relation to socio-economic factors is based on the disease burden specifically in terms of malaria mortality rate both for all ages as well as for the under-fives. The discussion will consider descriptive analysis, priori association with specific socio-economic factors and a regression analysis from which socio-economic antecedents to the health outcomes will be established.

Malaria continues to be the number one killer among the children under five years of age and also continues to be increasing the morbidity rates among those above the age of five (MoH, 2014a:164). Worldwide, malaria ranks fifth among causes of death from infectious diseases (WHO, 2013:ix). It is estimated that as many as 3.4 billion people live in areas at risk of malaria in 109 countries or territories. WHO 2013 World Malaria Report estimates that 207 million cases of malaria occurred globally in 2012 with 627,000 deaths. Most of the cases (80 percent) and deaths (90 percent) occurred in sub-Saharan Africa, and most of the deaths (77 percent) were in children under age five.

Malaria poses a major health burden for Malawi. The disease ranks fourth among causes of death, accounting for 8 percent of mortality (Bowie, 2011; MoH, 2014a:164). It is not only the leading cause of morbidity and mortality in children under age 5 and among pregnant women but a risk factor for the entire population as Malawi experiences on average six million episodes of malaria annually (MoH, 2011; MoH, 2014a:164).

6.4.2 General descriptives on Malaria Mortality Rates in Malawi 2005-2011

The malaria under-five and all ages mortality rate across the country for the years under investigation shows that the malaria caused deaths as measured per 100, 000 population varied from one district to another. The general outlook is presented in Table 6.11:

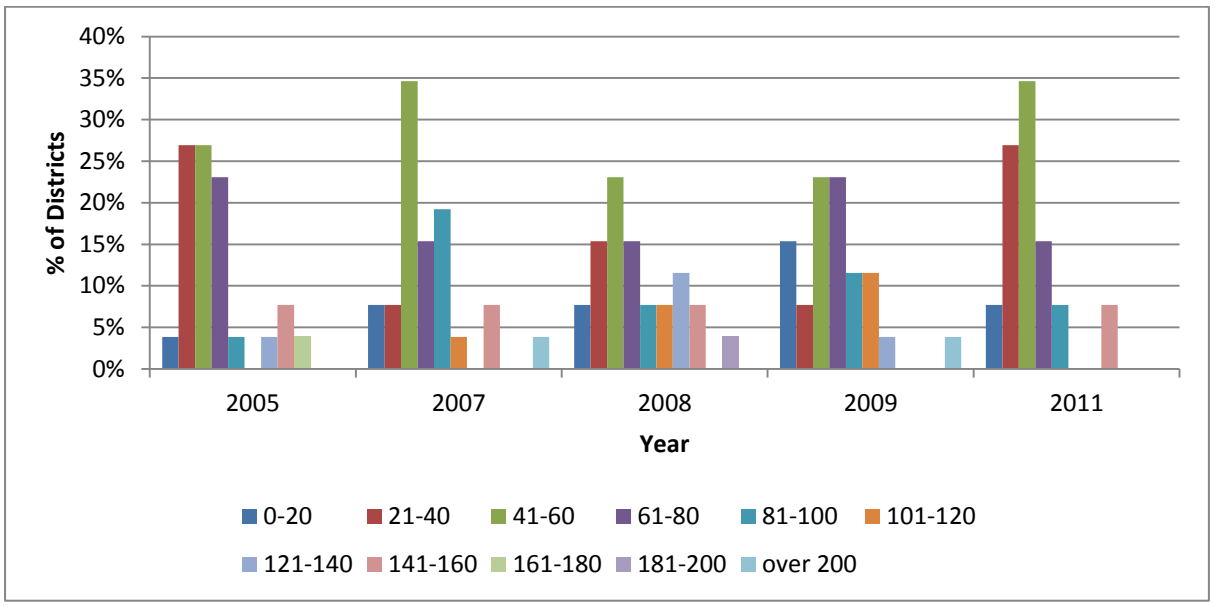
Table 6.11: Malaria mortality rate in Malawi at district level from 2005-2011

	N	Minimum	Maximum	Mean	Std. Deviation
Malaria mortality rate (all ages)	130	12	211	68.01	40.377
Under 5 Malaria Mortality rate	130	6	115	38.01	22.188

Source: Author's calculation (Data from MoH HMIS 2005-2011).

As shown in the Table 6.11, between 2005 and 2011, the minimum district malaria mortality rate was 12 and maximum was registered at 211 per 100,000 population while the under-five Malaria Mortality rate was between 6 and 115 per 100000 population. The variances between some districts were significantly high; however, the mean Mortality rate was 68 for the all ages and 38 for the under-five. In categorising the malaria mortality rates in a range of 0-20, the districts' distribution is presented in Figure 6.10.

Figure 6.10: Districts general malaria mortality rate distribution 2005-2011

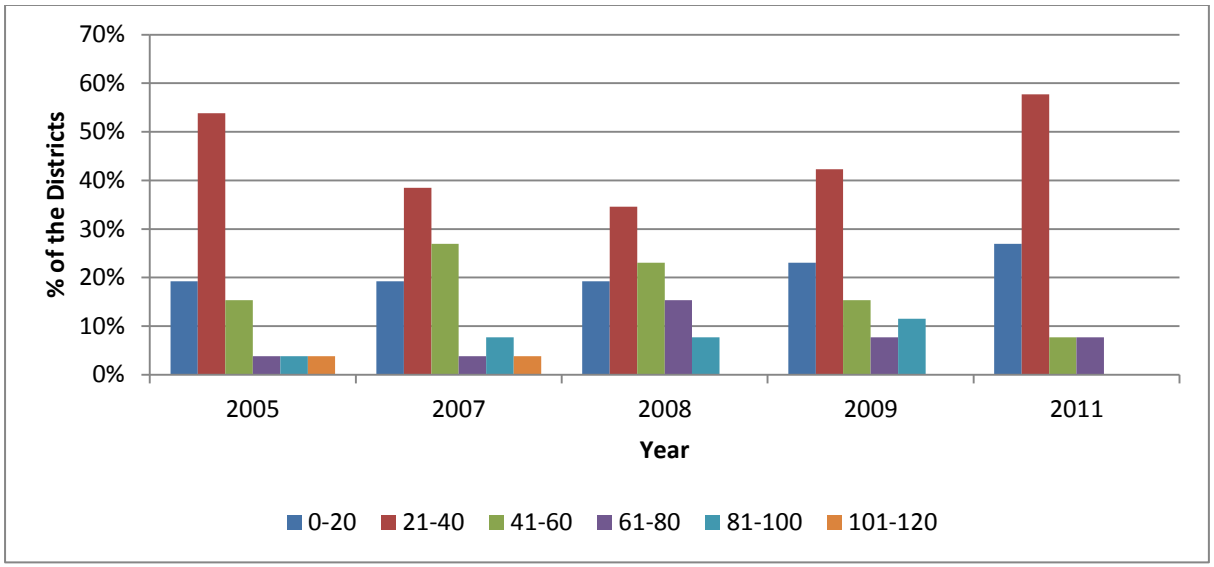


Source: Authors calculation (MoH, HMIS data 2005-2011)

As presented in Figure 6.10, in 2005, on average, the general Malaria Mortality Rate in most districts were in the 21-40, 41-60 and 61-80 categories while in 2007, it was

the 41-60, 61-80 and the 81-100 categories. In 2008 and 2009, over 50 percent of the districts evenly registered the malaria mortality rate in the 0-20, 81-100, 101-120, the 121-140 and 141-160 categories while 21-40 and 61-80 was registered by 30 percent of the districts. In 2009, the lowest category had 15 percent of the districts, and the 41-60, 61-80 was registered by 46 percent of the districts while in 2011, and the lowest category was only registered by less than 10 percent of the districts. The districts that have consistently been on a relative higher category include Ntcheu, Nsanje, Mwanza, Nkhata Bay, Mchinji and Mangochi. On the lower categories are districts like Lilongwe, Chiradzulu and Mwanza. The district distribution entails that in Malawi, the malaria death rates are not only concentrated in one category but also that districts registers different rates across the country. In other words, there are meaningful differences, which can be investigated further when establishing the contributing factors. However, apart from the socio-economic factors contribution, the malaria caused deaths are also highly influenced by the prevalence rate, which is highly affected by weather and terrain according to 2012 Malawi Malaria Indicator Survey Report (MoH, 2012:34). The implication is that areas in highlands and lower temperature levels like Chiradzulu and Dedza levels are likely to experience lower prevalence rate than those in higher temperature and along water bodies like Nsanje and Nkhata Bay. More details are provided in appendix D2 for district specific details. A similar distribution across the categories is also observed in the under-five malaria death rates as presented in Figure 6.11.

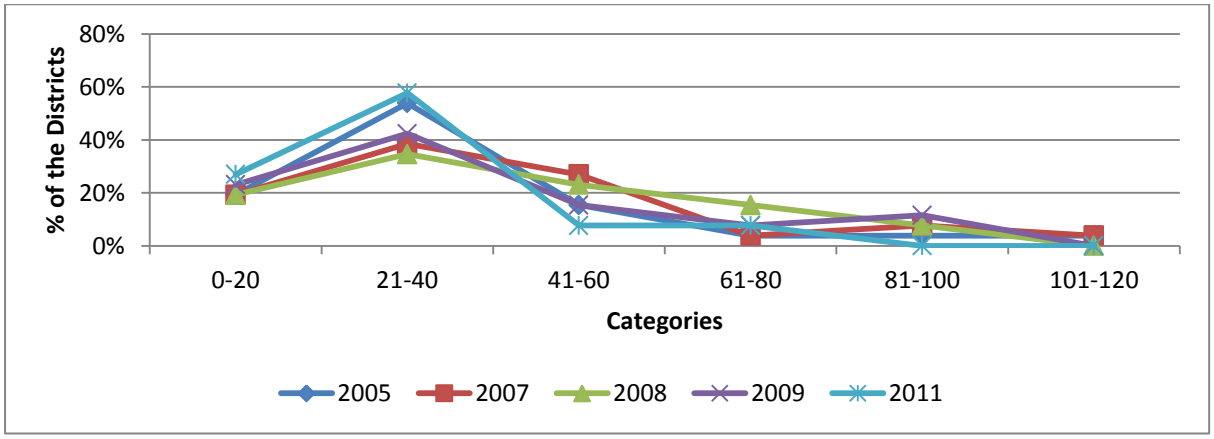
Figure 6.11: Districts Under-five malaria mortality rate distribution 2005-2011



Source: Authors calculation (Data from MoH, HMIS 2005-2011).

The under-five Malaria Mortality rate in the 21-40 category is observed with a steady decline from 2005 to 2008 however, it registered increase in 2011. On the other hand, the second highest registered category of 0-20 is observed to be showing a steady trend however, an increase is observed form 2009. In general terms, most districts registered under-five Malaria Mortality rates in the 41-60 category followed by the 0-20 and the 61-80 as presented in Figure 6.12:

Figure 6.12: Districts under-five malaria mortality rates distribution by categories 2005-2011

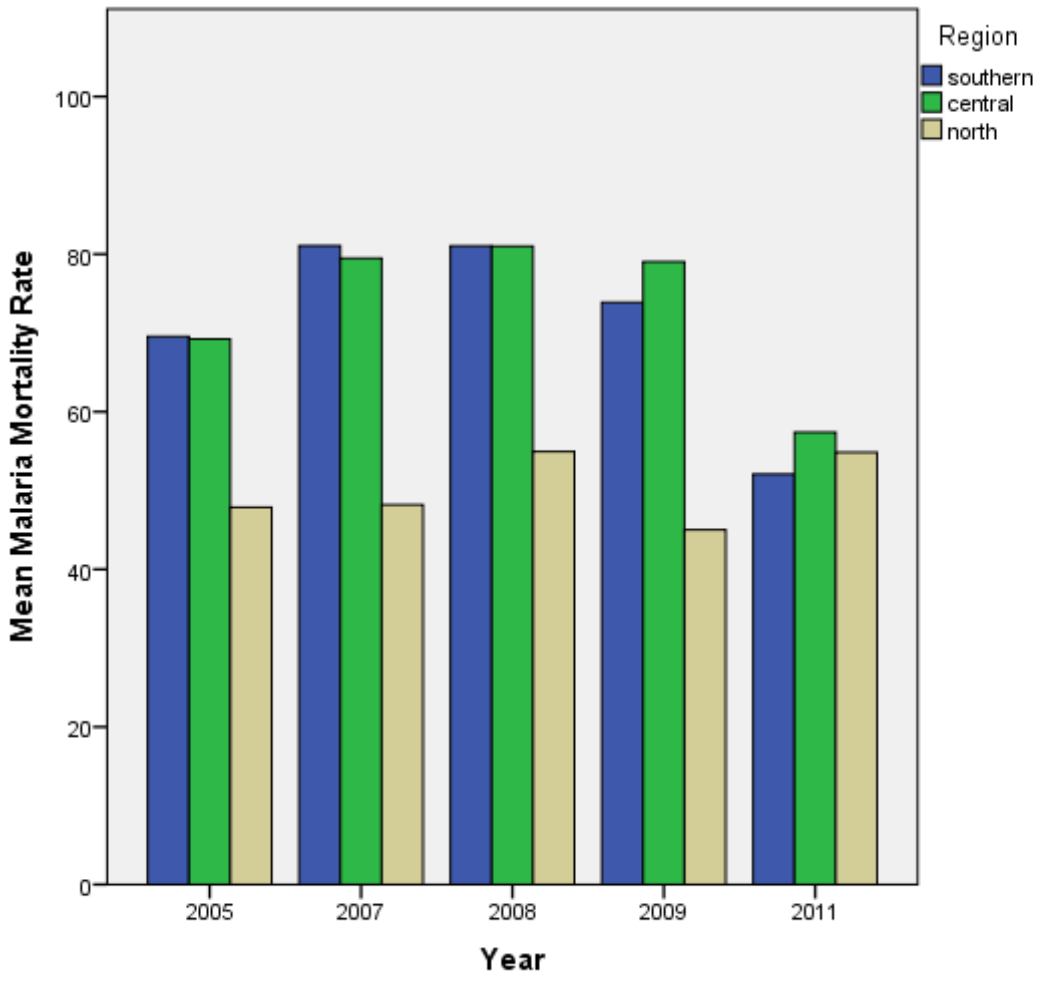


Source: Author's calculations (MoH, HMIS 2005-2011)

As presented in Figure 6.12, apart from the relative concentration in the 21-40 under-five Malaria Mortality Rate category, the trend by category has been in a similar pattern for the years under consideration. Most of the districts that reported higher Malaria Mortality Rate are also the have also been reporting higher Malaria Mortality Rate as presented in appendix D3. However analysing the Malaria Mortality rate by regions, the data shows that the regions registered a mixed trend across the years.

With the Malaria Mortality rate for all ages, the trend shows that the regions experienced a general decrease between 2007 and 2011 as presented in Figure 6.13.

Figure 6.13: Malaria Mortality rates at regional level 2005-2011

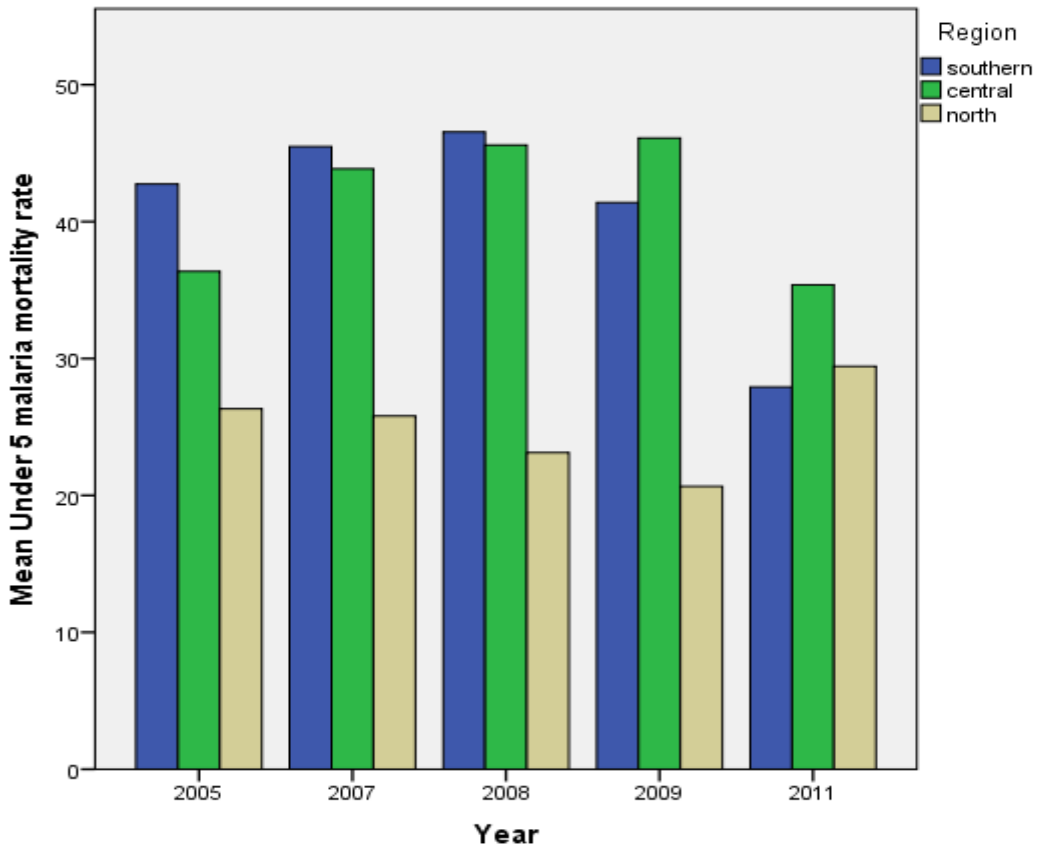


Source: Author's calculations (Data from MoH, HMIS 2005-2011).

As presented from in Figure 6.13, southern region shows a general decrease in 2009 while the Central region shows a decline in the malaria caused deaths in 2011, the Northern region had in increase in 2008 followed by a decline in 2009 however, in 2011, and the region did also register an increase in the malaria caused deaths. The central and southern regions have had their average Malaria Mortality Rates relatively higher as compared to the north despite their terrains, water body sources and temperatures being not significantly different. The role of socio-economic factors like education levels and literacy rates as further being investigated are likely to be determining the differences. For example, the Northern part of the country has had higher literacy rate levels between 2005 and 2011 from the Welfare Monitoring Surveys 2005-2011 as well as IHS 2 and IHS 3.

A similar pattern is also observed in the under-five malaria deaths across the regions of the country as presented in Figure 6.14.

Figure 6.14: Regional trends in under-five Malaria Mortality rate 2005-2011

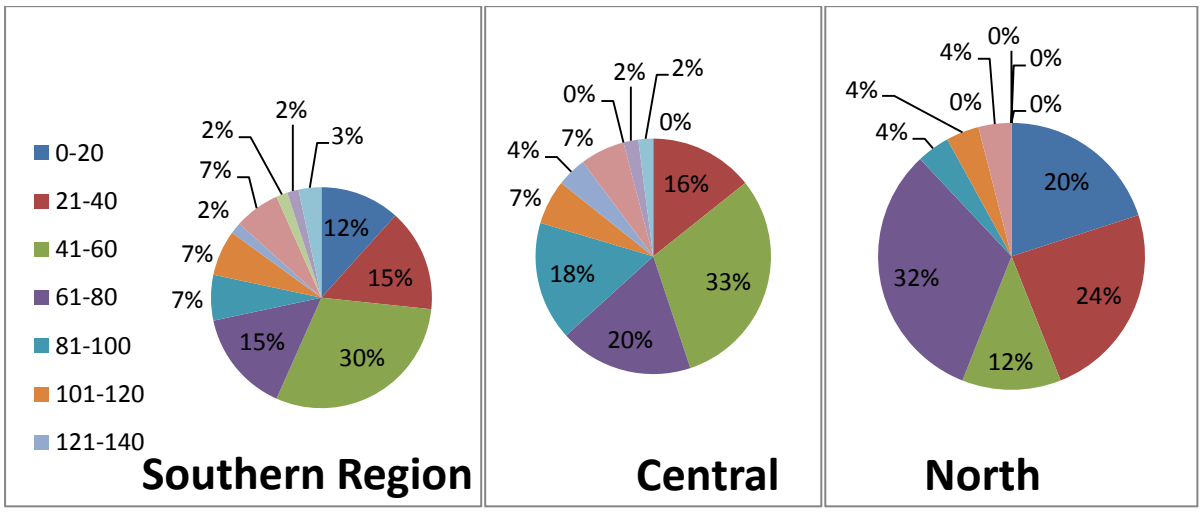


Source: Author's calculation (Data from MoH, HMIS 2005-2011).

The trends show the U5 Malaria Mortality rate has been higher in the central region as compared to south and north, and that the central region experienced a steady increase in the mean U5 Malaria mortality Rate with a drop in 2011 while the southern region experienced a drop in 2009. The northern region however had a steady decline except in 2011 where there was a rise. In general terms the north did experience the least average U5 Malaria Mortality rates as compare to the other two regions.

In considering the regional differences and categorical concentration, Figure 6.15 presents an overall concentration for the period 2005-2011:

Figure 6.15: Average malaria mortality distribution by regions and categories 2005-2011



Source: Author's calculations (MoH HMIS data 2005-2015)

As presented in Figure 6.15, mainly four major categories are observed in the southern and northern regions. These are the 0-20 where the south had 12 percent of its districts while the north has 20 percent of its districts, the 21-40 category where south has 15 percent of its districts and north 24 percent, the 41-60 with 15 percent of the southern region and 32 percent of the north and finally the 81-100 where the south has 12 percent of its districts and the north has 20 percent of its districts. However, in the central, the 21-40 category is registered by 16 percent of the districts, 41-60 observed in the 30 percent of the districts, 20 percent of the district falling under the 61-80 while the 81-100 category was observed by 18 percent of the

districts. The distribution is a consistent with malaria transmission pattern in Malawi which mostly occurs throughout the year in most places with the exception of the mountainous areas in the northern and southern regions (MoH, 2014a:164).

6.4.3 Independent T-test for the malaria mortality rate variances

In analysing further the variances in the districts, the data are further analysed to establish significant variances by regions and districts of the country. The regional average Malaria Mortality rates are presented in Table 6.12.

Table 6.12: The regional malaria mortality rate mean variances 2005-2011

Health outcome	Region	N	Mean	Std. Deviation	Mean difference
U5 Malaria Mortality rate	southern	60	40.82	27.162	0.64
	central	45	41.46	15.826	
	southern	60	40.82	27.162	15.75
	north	25	25.07	12.525	
	central	45	41.46	15.826	16.39
	north	25	25.07	12.525	
Malaria Mortality rate (all ages)	southern	60	71.53	48.065	1.69
	central	45	73.22	33.973	
	southern	60	71.53	48.065	23.36
	north	25	50.17	23.538	
	central	45	73.22	33.973	23.05
	north	25	50.17	23.538	

Source: Author's calculations (Data from MoH HMIS 2005-2015).

The Table 6.12 shows that the regional U5 malaria variance was more between the central and north and least between the south and central region. On general Malaria Mortality Rate, the highest variance was between the south and north with south and central registering the lowest variance. The differences were subjected to an independent t-test, Table 6.13 provides the results:

Table 6.13: Independent T-test for the regional malaria mortality rate variances 2005-2011

		Regions for comparison					
		South and central		South and north		Central and north	
Variable	Null Hypothesis	t	Sig. (2-tailed)	t	Sig. (2-tailed)	t	Sig. (2-tailed)
U5 Malaria Mortality Rate	Equal variances assumed	-.142	.887	2.772	.007	-	-
	Equal variances not assumed	-	-	-	-	4.764	.000
Malaria Mortality Rate (all ages)	Equal variances assumed	-	-	2.114	0.038	-	-
	Equal variances not assumed	-0.212	0.833	-	-	3.334	0.001

Source: Author's calculations (MoH HMIS data 2005-2015)

As presented in the Table 6.13, the under-five malaria deaths have not been significantly different between the south and central regions. This is confirmed by the Levene's test null hypothesis of equal variance assumed which is accepted at one percent significant level (appendix E8a). With a p-value of 0.887 between the southern and central regions, the results imply that the mean U5 malaria mortality rate variance of 0.644 is not significant. The variances however, are significant between the south and north as well as the central and north. Using the equal variance assumed which is accepted at one percent significance level (appendix E8b), the mean variance between the Northern and Northern regions are statistically significant at one percent as demonstrated by p-value of 0.007. In other words, the mean variance of 15.749 between south and north is significant. Between central and north, having accepted the equal variance not assumed assumption (appendix E8c), the result as presented in Table 6.13, show that the mean variance between the central and north of 16.39 is statistically significant at one percent significance level. This is demonstrated by a p-value of 0.000.

A similar observation is also shown on the general malaria mortality rate where there the mean variances between the not statistically significant between the southern and central regions but significant between the south and north as well as between the central and the north. As presented in appendix E9a, using the equal variance not assumed for the south and central, the general malaria mortality variance is not statistically significant. This is in contrast however between the south and central, where having accepted the equal variance assumed assumption (appendix E9b), the mean variance between the regions is statistically significant at five percent as demonstrated by a p-value of 0.038. The same is also observed between the central and north by using the equal variance not assumed (appendix E9c) where the mean variance of 23.05 is statistically significant at one percent significance level as demonstrated by a p-value of 0.001. the variances between the regions demonstrate some prior expectations on the Malaria Mortality Rate variances between the districts as also corresponded by the mean Malaria Mortality district distributions in Figures 6.11, 6.12 and 6.13. These Malaria Mortality differences are being investigated further in light of the socio-economic factors at play in the districts.

6.4.4 Socio-economic factors associated with malaria mortality rates

In analysing the socio-economic factors associated with Malaria Mortality Rate, the following factors were investigated, namely poverty rate, population, dependency ratio, literacy rates and education level attainment as measured at district level. The correlation results for both under five and all ages Malaria Mortality rate are presented in Table 6.14.

Table 6.14: Correlation results for Malaria Mortality rates with socio-economic factors

	U5 Malaria Mortality rate		Malaria Mortality rate (all ages)	
Socio-economic variable	Pearson Correlation	p-value	Pearson Correlation	p-value
Poverty rate	0.161	0.067	-	-
Dependency Ratio	0.242**	0.005	.229**	0.009
Literacy rates	-.428**	0.000	-0.312**	0.000
Female literacy	-.437**	0.000	-	-
Primary Education level	-0.06	0.501	-	-
Secondary and post education level	-.465**	0.000	-	-
Employment (Transport and Communication)	-	-	-0.259**	0.003
Employment (Social and Community Services)	-	-	-0.187*	0.033

**. Correlation is significant at 1 percent level.

*. Correlation is significant at 5 percent level .

Source: Author's calculations (MoH HMIS data 2005-2015).

The Table 6.14 shows that the U5 Malaria Mortality rate is positively associated with poverty and dependency ratio, with poverty showing no significant association. The table also shows that the U5 malaria caused deaths is negatively related to general literacy rates, female literacy rates, and level of education attainment with no significance for primary level education attainment but significantly associated at one percent with the rest.

Most poor households in the sub-Saharan region have been associated with most infectious diseases including malaria and resultant deaths (Bhutta *et al.*, 2014:1). In 2012, malaria approximately claimed 1300 lives every day most of which in the sub-Saharan region (WHO, 2013:ix). This is mainly due to their low access to the vector control intervention measures like ITN and residual spraying with 31 percent in lowest wealth quintile as compared to 48 percent in the highest wealth quintile (MoH, 2012a:23). This is mainly shown by lower percentage of both ownership and use of such preventive measures although efforts to increase the level of free ITNs in the sub-Saharan region was being encourage the numbers being delivered to the population at risk are still below the requirement level (WHO, 2013:x) . Dependency

ratio, which is defined as ratio between the total number of persons in the household outside the economically active age (children under the age of 15 and adults 65 years or older) and the total number of family members (NSO, 2012:15). In other words, the dependency ratio captures the dependants' proportion within a household and its increase entails how much reduced household resource base. The use of preventive malaria measure like ITNs tend to be less where there is increase in household size (MoH, 2012a:23) and with increase in more of uneconomically active, the is expected to be lower.

However, with the malaria data between 2005 and 2011, poverty is not significantly associated with the U5 Malaria Mortality Rate. This in Malawi is mainly due to interventions that target even more the poor households for example residual spraying and access to the mosquito nets during antenatal clinics hence available for the under-fives as well. In considering the use of mosquito nets and residual spraying, the 2012 Malaria Indicator Survey shows that on average, the there was only a difference ranging from 31 to 48 percent on the use of mosquito nets between the low income and wealth quintile however, the use is overall greater on the U5 population as ITNs utilisation decreased with age (MoH, 2012a:26). The report further notes a higher utilisation among the U5, 56 percent in the rural as compared to the 54 percent in urban population. However, despite the not statistically significant association between malaria deaths and poverty, the improved socio-economic position of households has a positive a negative association with the Malaria Mortality Rates. This is shown through the negative association with some levels of formal employment where employment disaggregated by transport and communication as well as community based has a negative association with the Malaria Mortality Rate.

The role of education as one of the critical socio-economic factor pathway in the fight against malaria caused deaths cannot be overemphasised. Studies have indeed shown that most educated households have experience less malaria caused deaths as compared to the less educated as education lowers the malaria risk through improved knowledge and practice (Ayi *et al.*, 2010:1), access to malaria education through the formal education setting (Kobayashi *et al.*, 2007:27). The knowledge gained on malaria prevention as argued further in Kobayashi *et al*., (2007) is even

more effective to the surrounding communities as the information dissemination become more effective. The association in Table 6.14 shows that even for Malawi, increase in general literacy as well as female illiteracy rates have a negative association with U5 malaria mortality rates. This is also true with secondary and post-secondary education. The use of antimalarial drug among pregnant women tend to increase among women that are literate and educated (MoH, 2012a:30). The report further notes that care seeking promptness is more almost two thirds among children in households whose mothers had at least secondary education as compared to no education almost four in ten of the no education households. The negative relationship between the secondary and post-secondary attainment level can also be considered from the income base perspective and those with the secondary or post-secondary education are likely to pay and access quality health services as well as provide adequate nutritional requirement hence averting deaths as compared to those with no education.

However, for further analysis, a regression analysis was employed on the data using a Random District Effect Model in order to investigate the effect of some of these socio-economic factors in considering the difference in the districts of the country.

6.4.5 Regression analysis

A regression analysis was conducted on the socio-economic factors that are related to the Malaria Mortality rates in order to ascertain the random effect nature of the socio-economic factors towards both general and U5 Malaria Mortality Rate at district level. The model used the district level data across the country for the period between 2005 and 2011. The regression model is specified as follows:

$$\boldsymbol{MMR_{it=}\beta_0 + \beta_1 \mathbf{MaizeProd}_{it} + \beta_2 \mathbf{DependRatio}_{it} + \beta_5 \mathbf{LitercyF}_{it} + \varepsilon_{it}} \qquad (\mathbf{3})$$

Where:

MMR is the Malaria mortality rate, MaizeProd is the average maize output at district level measured in tonnes, DependRatio is the dependent ratio, and LiteracyF is the female literacy rate. All the variables are measured at district level.

The under-five malaria mortality deaths rate is specified as follows:

$$\boldsymbol{U5MMR_{it=}\beta_0 + \beta_1 \mathbf{DependRatio}_{it} + \beta_2 \mathbf{Litercy}_{it} + \beta_3 \mathbf{Edusec}\&post_{it} + \varepsilon_{it}} \quad (\mathbf{4})$$

Where:

MMR is the Malaria mortality rate, DependRatio is the dependency ratio, and Literacy is the general literacy rate. The variables are also measured at district level.

6.4.5.1 Hausman Test

The Hausman Test is conducted to test whether the use of Random Model is appropriate when considering the district general malaria mortality rate and the U5 malaria death rate with the pooled socio-economic factors. The hypotheses under these outcomes are framed as follows:

H_0: The ECM and FEM estimators do not differ substantially on the general malaria mortality or U5 malaria mortality rate models

H_1The ECM and FEM estimators differ substantially on the general malaria mortality or under-five malaria mortality rate models

The results of the Hausman test in the all ages and under-five malaria model are presented in the Table 6.15

Table 6.15: Results from the Hausman Test for cross-section random effects

Equation	Chi-Square. Statistic	Chi-Square. Degrees of freedom.	P-value
Equation 3	3.649973	3	0.3018
Equation 4	3.247449	3	0.3550

The results in Table 6.15 show that the estimated Chi square values for three degrees of freedom for both all ages and under-five malaria mortality rate models are not significant as demonstrated by the p-value of 0.3018 and 0.03550 respectively. This leads to a conclusion that the null hypothesis (H_0) cannot be rejected hence the use of random effect model is more preferred than fixed as the random effects are not correlated with the specified regressors in the general and under-five malaria mortality rate models.

6.4.5.2 Breusch-Pagan Test for malaria mortality rate Model

As in the previous analysis, the model is further subjected to the Breusch-Pagan Lagrange multiplier (LM) test to appreciate on the presence of random effects in the specified two models. The LM test will help to decide on the use of the random effects regression. The null hypothesis in the LM test is that variances across districts malaria Mortality Rates are zero. In this model hence the hypothesis is summarised as follows:

H_0: No difference across the districts from the variables effects on malaria mortality rate

H_1: There is a significant difference on how the variables are affecting the malaria mortality rate across the districts

The results for the Breusch and Pagan test are present in the Table 6.16:

Table 6.16: Results for the Breusch and Pagan Test for malaria mortality rate model

	Chi2(1)	P-value
Equation 3	102.78	0.0000
Equation 4	125.25	0.0000

As shown in Table 6.16, with the chi square of 102.78, for the all ages malaria mortality rate and 125.25 for the under-five malaria mortality rate, the null hypothesis is rejected at one percent significant level as demonstrated by the p-value of 0.0000 in both models. This hence leads to a conclusion that random effects are present. In other words, there is evidence of significant differences on both the general and the under-five malaria mortality rate, which can be related to the specified socio-economic variables.

With the confirmation of the presence of random effects in the models and the confirmation on the use of random effects model, a regression for the Random District Effect Model is now conducted and the results are presented in Table 6.17 for both equations.

Table 6.17: Regression results for the malaria mortality rate

	Regressors	Coef.	Z	P-value	Wald chi2	P-value
Equation 3	Maize Output (per 10,000 metric tonnes)	0.183	0.46	0.646	15.6	0.0017
	Dependency Ratio	59.62558	3.11	0.002		
	Female Literacy Rate	-0.7437994	-2.32	0.020		
Equation 4	Dependency Ratio	32.616	2.88	0.004	18.22	0.0004
	Literacy Rate	-0.458	-2.02	0.043		
	Secondary & post	-0.209	-0.81	0.417		

Source: Author's calculations (Data from MoH HMIS data 2005-2015).

The regression results in Table 6.17 show that the model specification is reliable. This is demonstrated by the statistically significant Wald Chi Square 15.6 and 18.22 for equation 3 and 4 respectively at one percent significant level. This is demonstrated by the p-values of 0.0017 and 0.0004 respectively. The results imply that can be relied upon and provides consistent and efficient coefficients from the specified Random District Effect Model.

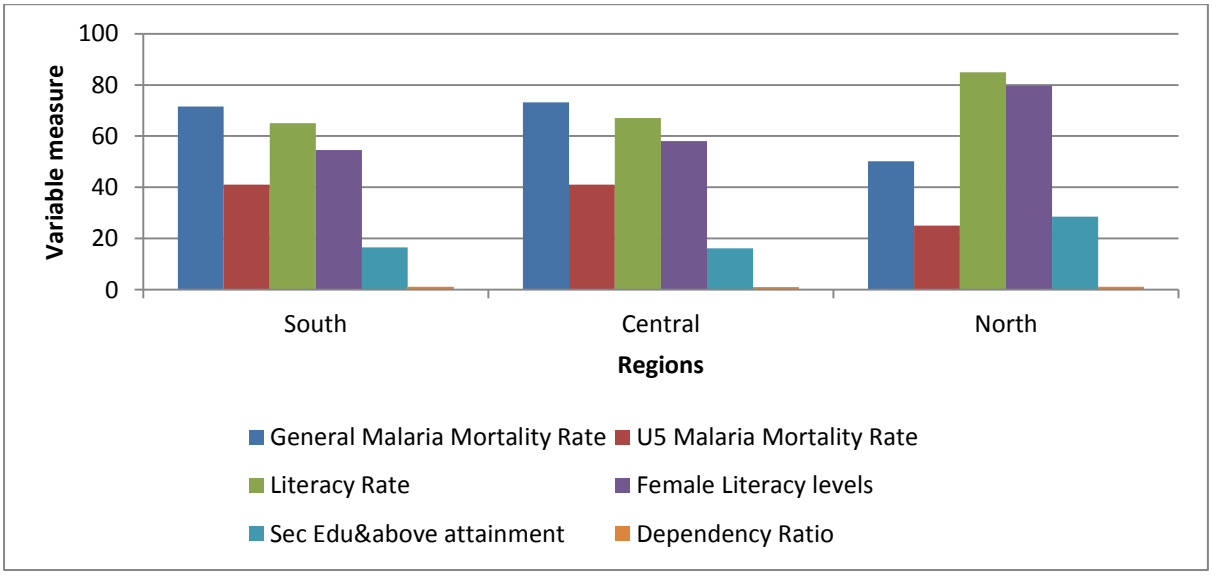
The Table 6.17 indicates a statistically significant positive relationship between dependency ratio and general malaria mortality rate at one percent significant level as demonstrated by a p-value of 0.002. There is a significant positive relationship between the dependency ratio and the U5 Malaria Mortality Rate at one percent significant level as demonstrated by a p-value of 0.004. The results imply that a unit change in the dependency ratio brings about a 0.59 unit change in the general Malaria Mortality Rate. In the U5 malaria mortality model, the results demonstrate that a unit change in the dependency ratio affect under-five malaria mortality rate by a 32 unit change. The dependency ratio measures economic dependability of non-economically household members. The increase in dependency ratio affect the resource base of the household due to the increased number of economically active members of the household and in turn renders members of the household more vulnerable to malaria attack through lesser use of vector preventive malaria methods like ITNs (MoH, 2012a:23) as well as their weakened social economic position. The resultant proportional low income provides a further risk both from poor nutritional

requirements which malaria easily become more detrimental leading to deaths especially among the under-fives (Bhutta *et al.*, 2014:1) as well as the poor health care seeking which is more among low income households.

The results further indicate a significant role by literacy rates in both general literacy rates towards the under-five malaria mortality model as well as female literacy rates for the general malaria mortality model. These socio-economic factors have shown a negative relationship in both models. The under-five malaria mortality model shows that a unit increase in general literacy rates, the under-five malaria mortality rate is reduced by 0.46 units which is significant at five percent significant level as demonstrated by a p-value of 0.043. On the general malaria mortality model, the results are statistically significant at five percent significance level as shown by the p-value of 0.020. In other words, the model shows that a unit increase in the literacy levels of women (percentage in relative terms), contributes to the reduction in the deaths being caused by malaria as shown by a 0.74 unit decrease in the general malaria mortality rate. This corresponds to the use of ITNs and antimalarial drug which have been shown to be more among literate and educated women as well as the improved care seeking behaviours in these categories (MoH, 2012a:30). In other words it helps bring the malaria knowledge into practice (Ayi *et al.*, 2010:1). This hence spells out further the role women plays in the fight against the malaria mortality rates.

The maize output has also shown the positive relationship with the general malaria mortality rate however, it is not significant in the model results. The factor was later investigated as regard to the malaria prevalence later in the study. The other socio-economic factors in the models are further being analysed on the regional basis in considering the mean variances across the regions as presented in Figure 6.17.

Figure 6.17: Comparison on malaria morbidity rate and socio-economic factors 2005-2011



Source: Author's calculations (Data from M0H HMIS and NSO WMS).

In considering the socio-economic factors of general literacy rate, female literacy rate, secondary school and post education attainment level and dependency ratio were compared to the mean general and under-five malaria mortality rates. As shown in Figure 6.17, the northern region had lower general and under-five malaria mortality rates as compared to the rest of the regions. This is also confirmed in the 2012 Malawi Malaria Indicator Survey (MMIS) which has shown the northern region as registering less malaria prevalence and deaths in general (MoH, 2012). The figure also shows the corresponding socio-economic factors in the regions with the north demonstrating an overall increased level of female literacy rate as well as the secondary and post education level. The dependency ratio factor is on average the similar across the regions. These factors are further compared using an independent t-test in order to ascertain on the differences and the results are presented in Table 6.18.

Table 6.18: Independent test for the regions on socio-economic factors

		Regions for comparison					
		South and central		South and north		Central and north	
Socio-economic factor	Null Hypothesis	t	Sig. (2-tailed)	t	Sig. (2-tailed)	t	Sig. (2-tailed)
Dependency Ratio	Equal variances assumed	0.65	0.517	-0.167	0.867	-0.936	0.353
Female Literacy Rate	Equal variances assumed	-1.552	0.124	-9.164	0.000	-11.35	0.000
Literacy rate	Equal variances assumed	-.985	0.327	-8.846	0.000	-10.570	0.000
Edu sec and post	Equal variances assumed	0.178	0.859	-5.596	0.000	-6.596	0.000

Source: Author's calculations.

The Table 6.18 shows that at the regional level, the effect of the significant factors of female literacy rates, secondary attainment level by the household head as well as the dependency ratio, the significant difference in the regions can explains the differences in the Malaria Mortality Rates in the country. Using the equal variance assumed assumption in the Leven's Independent T-test, there are no statistically significant mean socio-economical level variances basing on the socio-economic factors specified between the southern and the Central regions as demonstrated by the p-values, which are not significant. However, comparing these two regions to the north, except for the dependency ratio, there are statistically significant variances at one percent as demonstrated by the p-value of 0.000. The results in Table 6.18 may explain the differences in the regions of the country on both general and U5 Malaria Mortality Rates.

The similar analysis can also be replicated considering the districts within the regions. As has been demonstrated in the regression model results, the districts that have experienced higher Malaria Mortality Rates (most of which are in the south and central regions: Appendix D2, D3 and Figure 4.2) by targeting to improve their level of general and female literacy rate, as well as reduction in their dependency ratio, malaria mortality in the country can be improved. A further analysis however on the

secondary and post-secondary level of education attainment, which has not shown a significant relationship in the general Malaria Mortality Rate, model. As most people in this category are likely to get more income as compared to those to have attained lower education level hence able to pay and access quality health services and avert malaria deaths. The question is whether this also the same with suffering from malaria. Despite free health services in the country, but increase in out of pocket expenditure in the country which has increased on average from 5 to 7.4 percent of national health expenditure (MoH, 2014b:21) demonstrate how better education levels from income earnings perspective has a bearing towards improving health outcomes. The secondary and post-secondary factor was further investigated in relation to malaria prevalence in the subsequent section on its role in the fight against malaria.

In summary, a number of socio-economic factors have been demonstrated to have a relationship with malaria mortality rates by considering both general and under-five categories. Among the statistically significant socio-economic factors are literacy rates both general and female literacy rates, secondary education attainment level, dependency ratio, employment rate especially in communication and transport as well as in the community based organisations. However, the Random District Effect Model on malaria mortality rate has demonstrated further that literacy rates and dependency ratio are socio-economic antecedents in the districts of the country. The literacy rate as demonstrated from previous studies and malaria survey shows that through increased use of malaria vector preventive measures, promptness in care seeking, the female literacy rate plays an important role as demonstrated by the established negative relationship hence their significant contribution towards reduction of Malaria Mortality rates. The analysis in the regression model has also shown that dependency ratio greatly impacts the general malaria mortality rate and its decrease at district level can contribute towards the reduction or malaria caused deaths. The interventions towards these socio-economic factors on district level basis are likely hence to improve the health outcomes in the country.

6.5 DISEASE PREVALENCE

6.5.1 Introduction

The final section in analysing the socio-economic antecedents of health outcomes in Malawi using the Random District Effect Model is based on the disease prevalence rates. The disease prevalence analysis provides a fundamental basis for prevention interventions for the disease morbidity and mortality and in this regard on malaria as and tuberculosis, which are among worse killer diseases in Malawi (MoH, 2014a: 156). The discussion was hence based on the malaria and TB prevalence rates as health outcomes across the districts.

6.5.2 General descriptive analysis on malaria and TB prevalence rates

Malawi continues to face a high burden of diseases leading to higher morbidly rate with malaria and tuberculosis among the major communicable diseases (MoH, 2012:23; MoH, 2014:156).

Malaria continues to be the number one killer among the children under five years of age and also continues to be increasing the morbidity rates among those above the age of five. Malaria is endemic throughout Malawi and continues to be a major public health problem (MoH, 2014a:164). It is estimated that Malawi experiences Transmission is mainly determined by climatic factors: temperature, humidity, and rainfall. The extent and distribution of these factors influence the prevalence rate. Transmission is highest in areas of high temperature and frequent rainfall from October through April (MoH, 2012b:2). In 2011 about 6 million episodes of malaria were reported (HMIS, 2011) and in 2012/13 financial year more than 3.7 million cases of malaria were reported (HMIS, 2013). The disease accounts for 34 percent of all outpatient visits and is estimated to be responsible for about 40 percent of all admissions of children under five years old and 40 percent of all deaths in hospitals. The incidence of malaria (suspected cases) declined by about 30 percent between 2010 and 2012, from 488 cases per 1,000 population to 337 per 1,000.

On the other hand TB which is one of the priority diseases addressed by the Malawi Essential Health Package had seen a rapid increase around 1985 mainly due to the

growing the HIV epidemic (MoH, 2012:14). However since 2005, the annual new TB case has declined, reaching about 20,000 in 2013 with the case fatality rate at 8 percent and case detection rate is 63 percent (MoH, 2014a:156).

On general outlook, on the two disease prevalence, between 2005 and 2011, the maximum malaria incidence rate (per 1000 population) was 974 and a minimum of 186, while the maximum TB incidence rate measured per 100, 000 population was 629 and minimum was at 38 as reported in Table 6.19.

Table 6.19: Malaria and TB incidence rates at district level 2005-2011

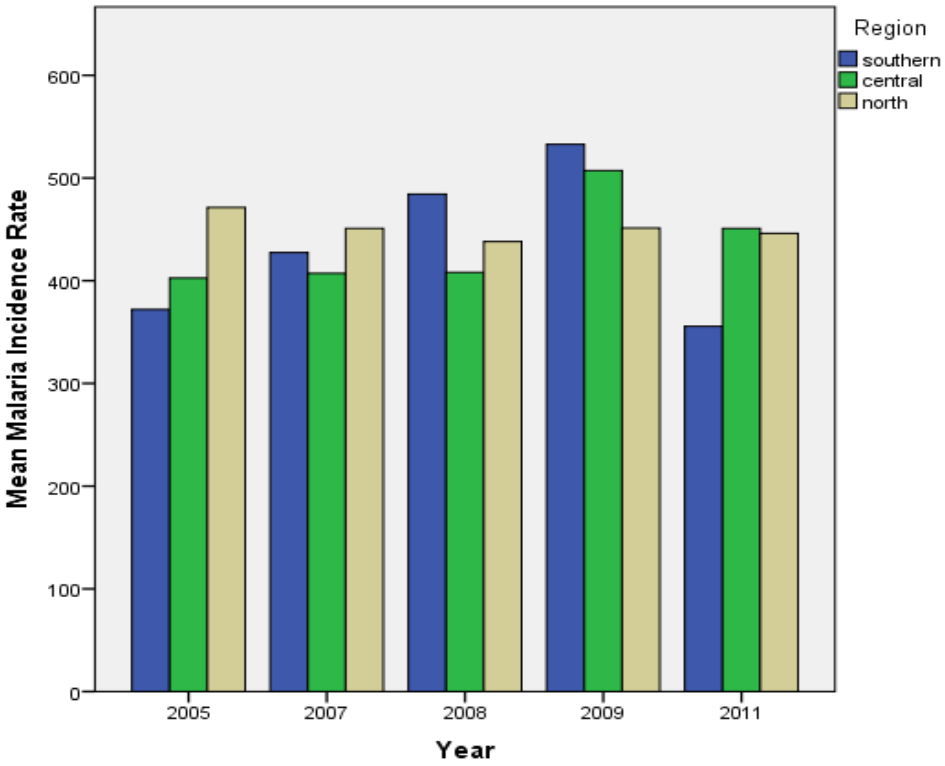
	N	Minimum	Maximum	Mean	Std. Deviation
Malaria incidence rate	130	186	974	438.01	132.825
TB incidence rate	130	38	629	185.33	137.090

Source: Author's calculations (Data from MoH HMIS 2005-2011).

As can be observed from the descriptive summary in Table 6.19, within the years under of the study, the minimum malaria prevalence rate within the years of under the study was about 186 in Rumphi a district in the north in 2007 and a maximum of 974 in Lilongwe in 2009 a district in the central region. The TB minimum prevalence rate was 38 as recorded in Ntchisi district in 2011 a district in the central region of the country and the highest being 629, Mwanza district in 2007 which is in the southern region of the country. On average however, the relatively higher malaria prevalence for the period were registered in Nsanje, Ntchisi, Nkhata Bay, Mchinji and Ntcheu as compared to Blantyre, Thyolo, Zomba and Phalombe. More details are provided in Appendix D4.

As malaria prevalence is a countrywide risk, the regions of the country registered in a more similar pattern over the years under investigation as on average, the regions registered prevalence 350-550. The regional malaria prevalence distribution is presented in Figure 6.18.

Figure 6.18: Regional malaria prevalence distribution 2005-2011

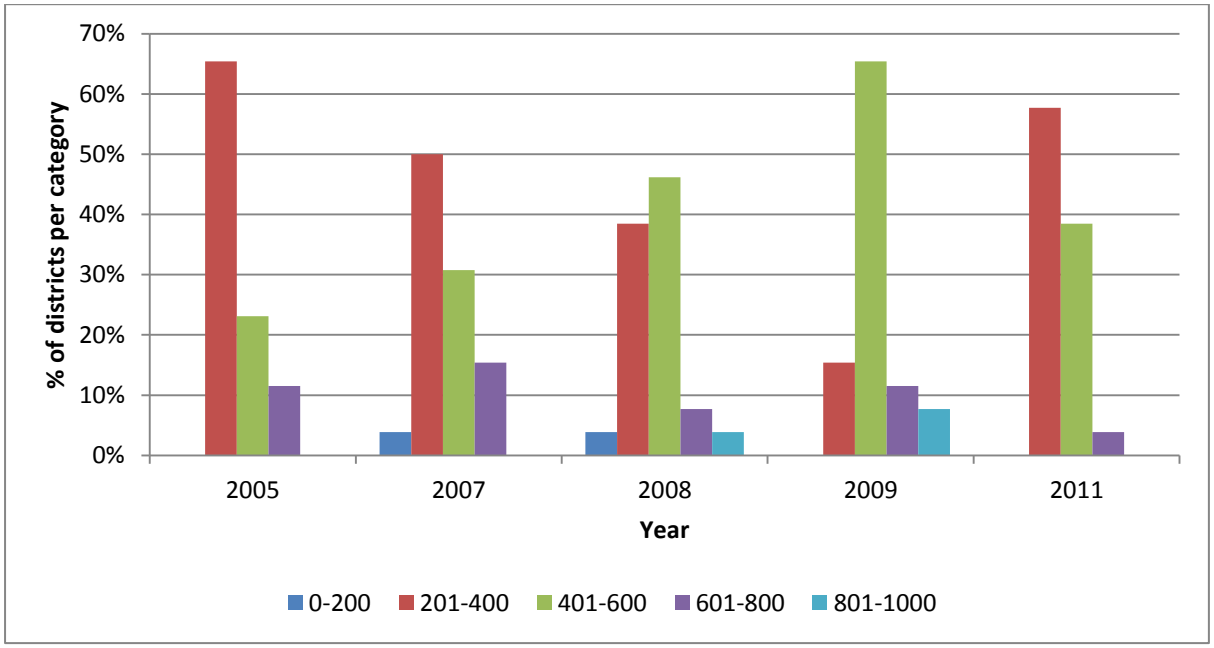


Source: Author's calculations (Data from MoH HMIS 2005-2011).

The regional malaria prevalence distribution indicates that the southern leads in the malaria prevalence rates, with the central trailing and the north the least. The 2012 Malaria Indicator Survey also indicated the similar trend for the regions of the country (MoH, 2012:34). The regional differences show no major differences. However, the districts differences provide a better understanding on the malaria prevalence rate variances hence a further analysing on the prevalence rate at district level.

The study formulated a number of categories on the malaria prevalence rate with a range of 0-200. On district distributional basing on the categories, malaria was highest in the categories of 201-400 and 401-600 as can be observed in Figure 6.19.

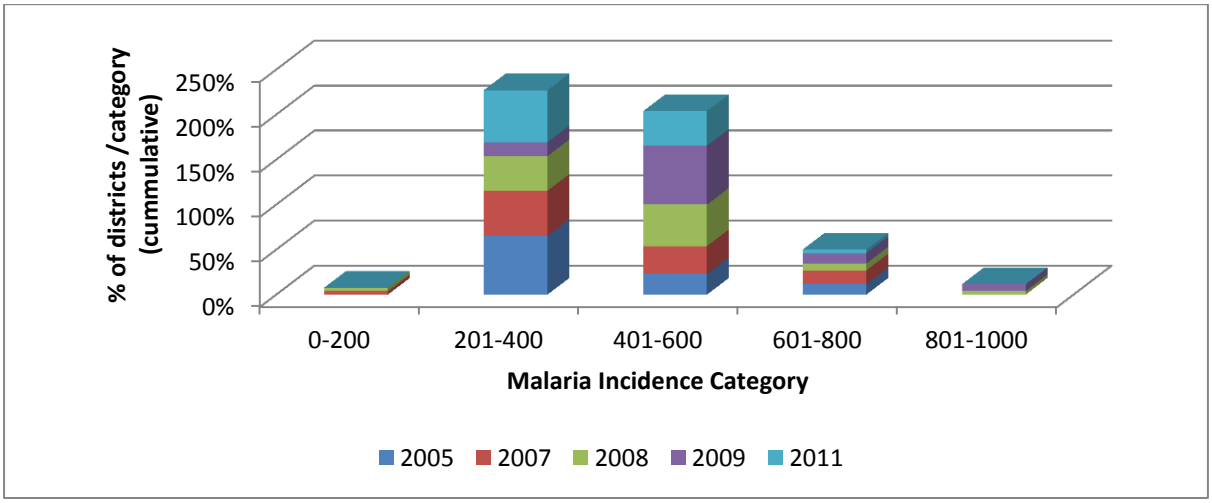
Figure 6.19: Malaria prevalence rate district distribution per category 2005-2011



Source: Author's calculations (Data from MoH HMIS 2005-2011).

The category distribution as presented in Figure 6.19 has a similar pattern for the years in terms of the leading categories that are mainly the 201-400, which was mostly the highest except in 2009, the 401-601 category, which was highest in 2009, and the 601-800 category. The lowest category was experienced in 2007 and 2008 while the highest category was experienced in 2009. The district distribution entails that despite the malaria incidences being a national burden and across the districts, there sufficient differences in the prevalence rate which can be explained by the differences in the socio-economic factors within and between the districts. Further, the district distributions' pattern also demonstrates that the categories as well as the corresponding proportion of the districts were changing from one year to another as shown in Figure 6.20.

Figure 6.20: Malaria categories distribution and proportion of districts 2005-2011

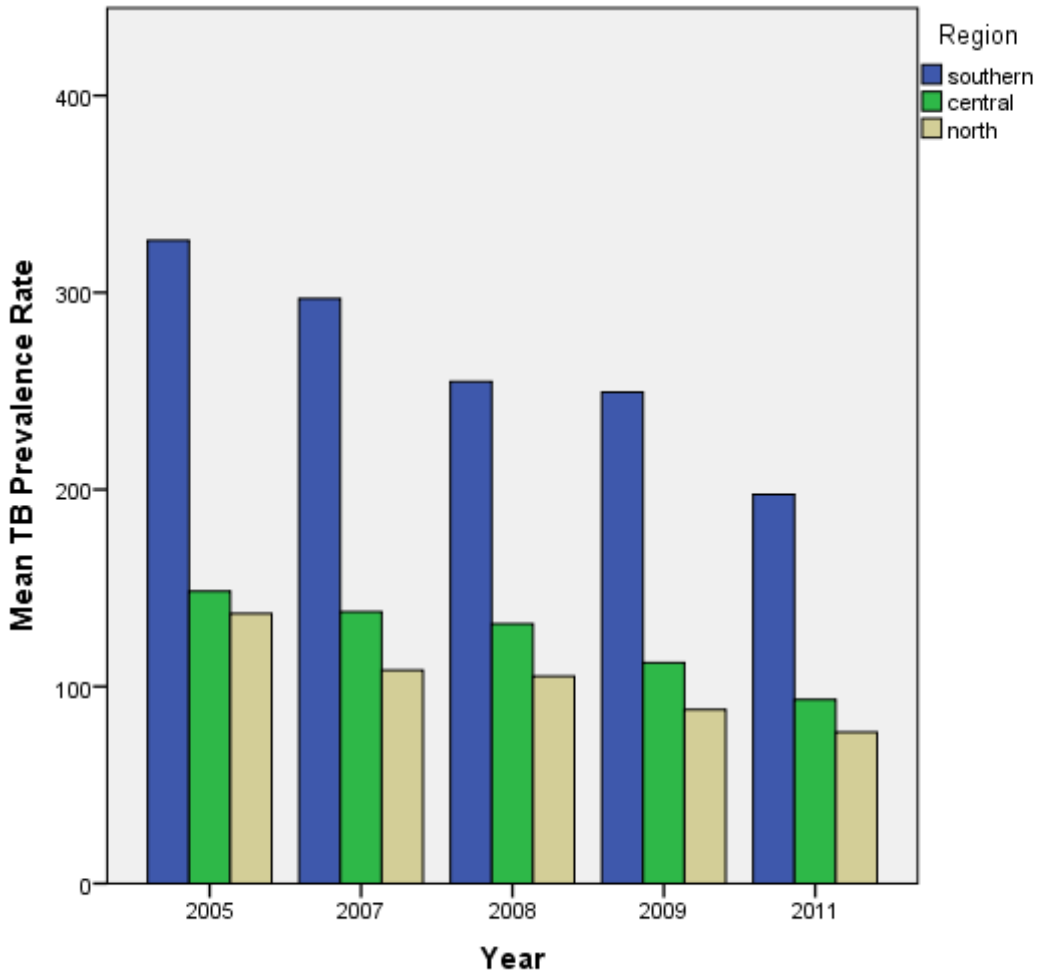


Source: Author's calculations (Data from MoH HMIS data 2005-2011).

As observed from Figure 6.20, the proportion of districts per malaria category changed across the years. For example, the 2001-400 was highly reported in 2005 and 2011 while the 401-600 was higher among the districts in 2009. The malaria prevalence district distribution details are provided further in appendix D4.

The TB district differences is however analysed in comparing the regions as the data shown already wider differences hence the statistically significant differences at regional level provides sufficient evidence for investigating the underlining contributing socio-economic factors on the prevalence differences as first observed from Figure 6.21.

Figure 6.21: Regional TB prevalence rates 2005-2011



Source: Author's calculations (Data from MoH HMIS data 2005-2011).

As presented in Figure 6.21, the southern region has shown to have registered high levels of the TB prevalence rates as compared to the central and northern region. One of the contributing factor in higher prevalence rate in the southern region could be the HIV/AIDS risk factor where most TB data are collected from HIV patients and according to 2010 MDHS, southern region has had on average higher prevalence rate of 15 percent which is twice as much as compared to the central (8 percent) and north (7 percent) (NSO, 2011:197). Over the years however, there has indeed been a steady decline in the prevalence rates across the regions.

6.5.3 Independent T-test for the Malaria, TB Prevalence rate variances

The regional malaria and TB prevalence mean difference between 2005 and 2011 provides an important basis for further investigation and background for envisaged variances in the districts. In comparing the mean prevalence rates variances between the regions, an independent t-test was conducted with a null hypothesis of equal variances. The mean Malaria and TB prevalence rate variances are presented in Table 6.20.

Table 6.20: Malaria and TB Incidence rates across the regions of the country

	Region	N	Std. Deviation	Mean	Mean Difference
Malaria incidence rate	Southern	60	138.568	451.53	16.3
	Central	45	92.719	435.23	
	Southern	60	138.568	451.53	17.07
	North	25	177.845	434.46	
	Central	45	92.719	435.23	0.77
	North	25	177.845	434.46	
TB incidence rate	Southern	60	135.757	265.02	140.271
	Central	45	114.183	124.75	
	Southern	60	135.757	265.02	161.901
	North	25	44.822	103.12	
	Central	45	114.183	124.75	21.63
	North	25	44.822	103.12	

Source: Author's calculations (Data from MoH HMIS 2005-2011)

The regional malaria mean prevalence rates as presented in Table 6.20 are showing minimal as compared to the TB mean prevalence rates. There are bigger differences in the TB prevalence rate between the south and north as well as the south and central as compared between the central and the north. In ascertaining the differences, an independent t-test was conducted and the results are presented in Table 6.21.

Table 6.21: Regional Analysis on malaria and TB incidence rates (2005-2011)

		Regions for comparison					
		South and central		South and north		Central and north	
Variable	Null Hypothesis	t	Sig. (2-tailed)	T	Sig. (2-tailed)	T	Sig. (2-tailed)
Malaria Incidence Rate	Equal variances assumed	-0.032	0.975	-0.475	0.636	-.505	0.615
TB Incidence Rate	Equal variances assumed	5.601	0.000	5.815	0.000	0.907	0.368

Source: Author's calculations (Data from MoH HMIS 2005-2011).

The Independent T-test results show that between the regions of the country, malaria prevalence variances from one region to another were not significant by using the equal variance assumed assumption. This is demonstrated by the t-statistics, which are statistically not significant in comparing the regions as demonstrated by the p-values of 0.975 between south and central, 0.636 between south and north, as well as 0.615 between the central and the north. This however is different from the TB prevalence rates where the difference between the southern and the central region was significant. This is shown by the t-statistic 5.601, which is statistically significant at one percent as demonstrated by the p-value of 0.000. This means that the mean TB prevalence variance of 140.271 between the south and central was significant. The comparison between the south and the north also shows a significant difference as shown by the t-statistic of 5.815, which is statistically significant at one percent as well. The difference between the north and the central however was not statistically significant.

The analysis hence underscores the district variance issue that despite the TB disease affecting the country, the differences among the regions varied from one to another and consequently even among the districts. Despite no significant variances on malaria prevalence, the districts of the country may be experiencing significant difference as earlier observed from the district distribution data in Figure 6.19. This signals the need to investigate further the existence of malaria and TB prevalence variances at district level and the underlying socio-economic factors as one move

from one district to another. In considering the impact social and economic factors may have on malaria and TB burden in the country, a number of factors are considered in the analysing both at regional level and district level.

6.5.4 Socio-economic factors associated with malaria and TB prevalence rates

In investigating further the differences in malaria and TB prevalence rate in the districts of the country, a number of socio-economic factors were analysed. These factors are poverty rates, maize output, dependency ratio, primary school dropout, primary school enrolment, education attainment level, female-headed household and employment in the construction industry. All these factors are measures at district level. The correlations summary for these socio-economic factors is presented in Table 6.22.

Table 6.22: Correlation results for malaria and TB prevalence rate and socio-economic factors 2005-2011

	Malaria incidence Rate		TB Incidence Rate	
Socio-economic factor	Pearson Correlation	P-value	Pearson Correlation	P-value
Poverty Rate	-0.045	0.614	-	-
Ultra poverty rate	-0.071	0.423	0.11	0.213
Maize output	.248**	0.004	-	-
Dependency Ratio	.181*	0.039	-	-
Dropout rate(primary)	0.006	0.948	0.012	0.896
Primary School Enrolment	-.323**	0.000	-	-
Literacy rate	-0.023	0.793	-	-
Secondary school and post attainment level	-0.066	0.456	-	-
Female HHH	-	-	.263**	0.003
Employment (Construction)	-	-	0.08	0.364

**. Correlation is significant at 1 percent level

*. Correlation is significant at 5 percent level

Source: Author's calculations (Data from NSO, and MoH HMIS 2005-2011)

The role of socio-economic factors on malaria and TB prevalence rates is being shown through the relationship as shown by the correlations in Table 6.22. There is

a negative relationship between poverty and malaria prevalence rate however, the relationship is not statistically significant. This may emanate from the fact that the use of the malaria vector control measures is higher among the under-fives and pregnant women, the more malaria prone population group, in the rural population where most poor people in Malawi resides unlike in the urban areas per the 2012 Malaria Indicator Survey (MoH, 2012b:27). This is despite though that most malaria vector control measures like use of ITNs and residual spray have shown to be slightly in general terms lower among the poor, on both ownership and use (MoH, 2012b:21). On the other hand, despite also not significant factor, the general TB incidence rate has shown in other researches that is a poverty related disease. Tuberculosis (TB) is considered to be a disease of poverty (Dubos, 1987) as it is highly association with low socio-economic position (SEP). It is also estimated that most of the countries accounting for accounting for 80 percent of the world's TB cases are classified as low income and that the 98 percent of the 2 million annual TB deaths and 95 percent of the 8.4 million new TB cases occur in developing countries (WHO, 2005). How the poverty shadow is expressed when considering the dependency ratio and female headed household on malaria and TB prevalence respectively.

The Table 6.22 has also shown that maize output and dependency ration are positively associated to the malaria prevalence rates. As earlier discussed earlier, increased in maize output is normally associated with increased rainfall patterns, which provides a favourable environment for the malaria parasite and hence higher incidences. The higher dependency ratio on the other hand demonstrates the how much overstretched household resources due to increase in the non-economically active members in the household can affect the household's access to malaria controlling measures like ITNs or residual spray. This means households in lower wealth quintiles are likely to experience more incidences of malaria.

The factors under education has been shown in the table to be negatively relating to the malaria prevalence rates, namely literacy rate, primary school enrolment and secondary attainment level of education. Education is seen in literature as helping reduce malaria incidences mainly through better use of knowledge in vector control measures, as well as promotion of malaria education especially in primary schools

as education sett ups provides a platform to disseminate malaria control information and practice (Ayi *et al.*, 2010:1). Under such, not surprising though that malaria incidences are expected lower among literate population and where there are more level of children in school.

The positive association has also been shown under TB prevalence rate with employment in construction industry, dropout rate, though non statistically significant and female-headed households. The construction industry employment portrays a kind of risk a risk factor mainly where lack of protective ware on construction sites as well as associated informal mining for example sand and quarry mining which is rising in most parts of the country as informal employment (NSO, 2014:30), does increase the risk for the disease. In other words, the positive association with employment rate is a situation where the gains from income received from the employment is outweighed by the work environment risk.

The increase in female headed households which are mostly vulnerable is a risk factor for the TB disease also as most of such households have poor environment in terms of sanitation. On the basis of that, most TB data are associated with HIV/AIDS data (MoH, 2014a:156), these vulnerable households would already be struggling to provide required balanced diets increasing the chances of the opportunistic diseases like TB. In other words, increase in female-headed households in the districts provides a higher risk for the TB occurrence owing to the vulnerability of the female-headed households, which, due to their inability to provide housing and sanitation, have led to environments conducive for the disease.

6.5.5 Regression analysis

A regression analysis was conducted on the socio-economic factors that are related to the malaria and TB prevalence rates in order to ascertain effect of the socio-economic factors by using the Random Effect model, at district level. The model has used the district level data across the country for the period between 2005 and 2011. The regression models are presented as follows:

$$\begin{aligned} \boldsymbol{MPR}_{it=}\, & \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{Poverty}_{it} + \boldsymbol{\beta_2}\mathbf{MaizeProd}_{it} + \boldsymbol{\beta_3}\mathbf{DependRatio}_{it} \\ & + \boldsymbol{\beta_4}\mathbf{Litercy}_{it} + \boldsymbol{\beta_5}\mathbf{Dropout}_{it} + \boldsymbol{\beta_6}\mathbf{PrimaryEnrollment}_{it} \\ & + \boldsymbol{\beta_7}\mathbf{Sec\&}Post_{it} + \boldsymbol{\varepsilon_{it}} \qquad (\mathbf{5}) \end{aligned}$$

Where:

MPR is the district malaria prevalence rate, Poverty is the district poverty rate, MaizeProd is the maize output at district level measured in tonnes, DependRatio is the district dependency ratio, and Literacy is the district literacy rate, Dropout is the district primary school dropout rate, PrimaryEnrollment is the primary school enrolment level and Sec&Post is the district secondary school and post-secondary school attainment level.

The TB prevalence rate regression model is specified as follows:

$$\boldsymbol{TBPR_{it=}\beta_0 + \beta_1 FemaleHH_{it} + \beta_2 Dropout_{it} + \beta_3 EmploymentCons_{it} + \varepsilon_{it}} \quad (\mathbf{6})$$

Where:

TBPR is the TB prevalence rate, Dropout is the primary school dropout rate, and EmploymentCons is the employment rate in the construction industry sector. The variables are also measured at district level.

6.5.5.1 Hausman Test

The Hausman Test was conducted to test whether the use of Random Model is appropriate when considering the district malaria and TB prevalence rates with the specified socio-economic factors. As earlier discussed in the previous models, the test helps in ascertaining whether the assumption that the error components are not correlated holds. It also helps to the assumption that the random effects are not correlated with one or more specified independent variables in the model holds in the specified model. The hypotheses are as follows:

> H_0: The ECM and FEM estimators do not differ substantially in estimating the socio-economic variables on Malaria or TB Prevalence Rate
>
> H_1: The ECM and FEM estimators differ substantially

The results of the Hausman test in the Malaria and TB models are presented in the Table 6.23.

Table 6.23: Results from the Hausman Test for cross-section random effects

	Chi-Sq. Statistic	Chi-Sq. d.f.	P-value
Equation 5	7.102249	7	0.4183
Equation 6	0.561261	3	0.9052

The results in Table 6.23 show that the estimated Chi square value for seven degrees of freedom (as seven variables are used) for Malaria prevalence rate and for three degrees of freedom for TB prevalence rate is not significant. This is demonstrated by the p-values of 0.4183 and 0.9052 respectively. As the result, this leads to a conclusion that the null hypothesis cannot be rejected hence the use of random effect model is more preferred than fixed as the random effects are not correlated with the specified regressors in the two models.

6.5.5.2 Breusch-Pagan Test for Malaria and TB prevalence rate Model

The model was also further subjected to the Breusch-Pagan Lagrange multiplier (LM) test in order to appreciate on the presence of random effects in the specified models. The LM test will help to decide on the use of the random effects regression. The null hypothesis in the LM test is that variances across districts on the malaria and TB prevalence rates are zero. In this model hence the hypothesis is as follows:

H_0: No difference across the districts from the variables effects on malaria and TB prevalence rates

H_1: There is a significant difference on how the variables are affecting the malaria and TB prevalence rates across the districts

The results of the test are present in the Table 6.24.

Table 6.24: Results for the Breusch and Pagan Test for malaria and TB models

	Chi Square Statistic	P-value
Equation 5	58.47	0.0000
Equation 6	176.22	0.0000

With the Chi square of 58.47 in Table 6.24, for the malaria prevalence rate and 176.22 for the TB prevalence rate, the null hypothesis is rejected at one percent significance level. This is demonstrated by the p-value of 0.0000 in both models hence concluding that random effects are present in the models. In other words, there is evidence of significant differences on both the malaria prevalence rate and the TB prevalence rate, which can be related to the specified socio-economic variables.

A regression was conducted and the results are presented in Table 6.25 for both equations 5 and 6.

Table 6.25: Regression Results for the malaria and TB prevalence rate 2005-2011

	Regressors	Coef.	Z	P-value	Wald chi2	P-value
Equation 5	Poverty Rate	-0.2801441	-0.35	0.723	28.44	0.0002
	Maize Output (10,000 metric tonnes)	4.504	2.35	0.001		
	Dependency Ratio	315.1672	3.34	0.417		
	Primary school Dropout Rate	.7230706	0.37	0.715		
	Primary School enrolment (per 1000 pupils)	-0.809	-2.83	0.005		
	Literacy level	-2.232125	-1.35	0.177		
	Secondary and post attainment level	4.354164	2.29	0.022		
Equation 6	Female Headed HH	.8691471	0.70	0.486	13.10	0.0044
	Dropout Rate	2.17	2.17	0.030		
	Employment in construction	1.013577	1.76	0.078		

Source: Author's calculations (Data from NSO and HMIS2005-2011).

The regression results in Table 6.25 show that the model specification is reliable. This is demonstrated by the statistically significant Wald Chi Square statistic of 28.44 and 13.10 for equation five and six both significant at one percent significance level as demonstrated by the p-value of 0.0002 and 0.004 respectively.

The results in Table 6.25 show that there is a significant negative relationship between the primary school enrolment and malaria prevalence rates at one percent significance level as demonstrated by a p-value of 0.005. There is however a significant positive relationship between maize output and malaria prevalence rate at one percent significance level as shown by a p-value of 0.001, as well as between secondary and post-secondary attainment level and malaria prevalence rate at five percent significance level as shown by a p-value of 0.022. The negative effect of poverty level is not statistically significant as well as the positive effect of dropout rate and literacy rates. On TB prevalence, the results have shown positive effect from the socio-economic factors of primary school dropout which is significant, female headed household and the employment in the construction industry both not statistically significant.

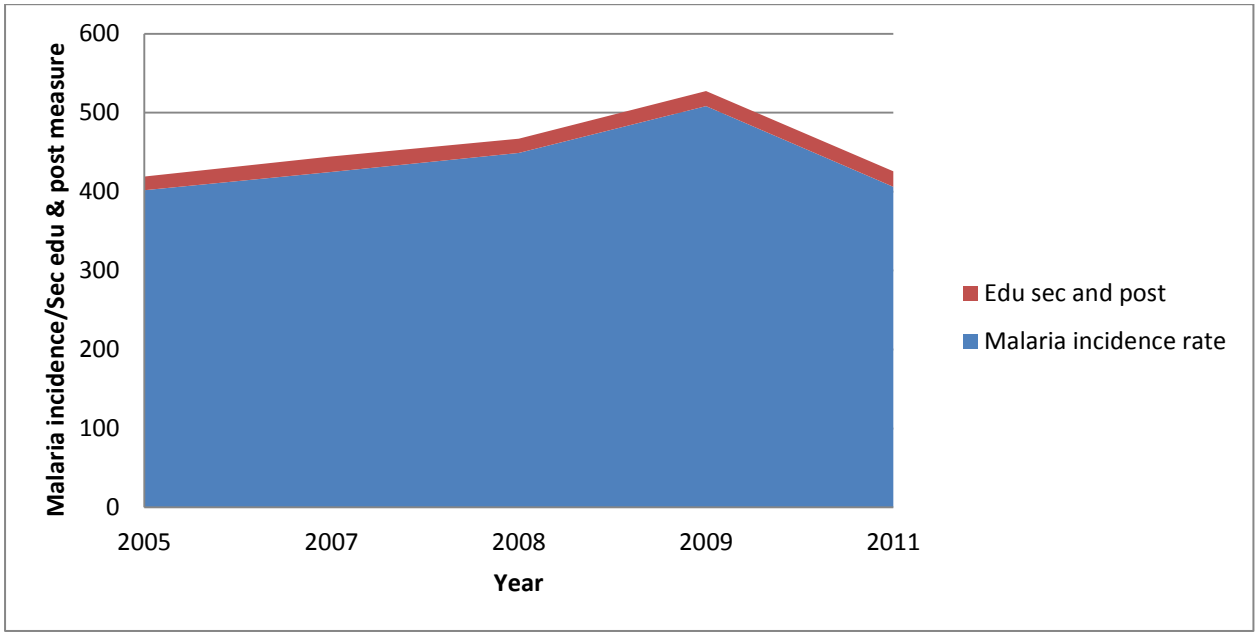
As earlier discussed earlier in details in section 6.3.4, increased in maize output is normally associated with increased rainfall patterns, which provides a favourable environment for the malaria parasite and hence higher incidences. The Malaria Prevalence Model has shown that a unit change in maize output (10,000 metric tonnes in relative terms) brings about a 4.5 unit change in malaria prevalence rate. Furthermore, most rural households have their purchasing power for malaria insecticide lower during the periods where malaria is at pick in transmission as the crops are still in field hence increased dependency ration increases their risk towards malaria (WHO, 2001:2). Malaria incidences in have shown to be rampart among low income household as their access to vector control measure becomes limited (Breman *et al.*, 2004:1).

The role of primary school enrolment towards reduction in malaria prevalence rate at district level is key in reducing malaria incidences as malaria prevention education is integrated through the normal curriculum and hence does help in shaping the knowledge of both the children and their communities (Ayi *et al.*, 2010:1). In Malawi, malaria prevention is part of the curriculum (MoE, 2014) and could also explain the

similar effect. The results have shown that with a base of 1000 enrolment in primary school a unit increases in primary school enrolment (1000 pupils in relative terms); there is a 0.8 unit change in the malaria prevalence rate reduction. The results also agrees with the Ayi *et al*., (2010) findings that have also shown the formal education setting itself provides a conducive environment for dissemination of malaria prevention education messages.

The general literacy level has also been shown in the results to have a negative association with malaria prevalence rate though not significant. Despite the coefficient not statistically significant in the model, a number of researches have demonstrated that high level of literacy especially in women helps reduce the malaria prevalence (Breman *et al.*, 2004:1; Ayi *et al.*, 2010:1; MoH, 2012b; MoH, 2014a). On the other hand, the prevalence rate is rising with the rise in education attainment level especially with secondary and post-secondary level as further demonstrated in Figure 6.22. The possible explanation with such a relationship is on the inconsistent use of the malaria vector control interventions, which may be more among people with higher level of education than expected. The 2012 Malaria Indicator Survey shows that there is an increase in the use of the vector control measures especially ITNs among the vulnerable groups of the under-fives and pregnant women among the rural population where the secondary attainment level is lower as compared in the urban areas where the secondary attainment level is high (MoH, 2012b:27). A general relationship between malaria prevalence and secondary and post-secondary education attainment level is presented in Figure 6.22.

Figure 6.22: Malaria prevalence and secondary/post-secondary attainment level 2005-2011



Source: Author's calculations (Data from NSO and Ministry of Health HMIS).

The study reveals as shown in Figure 6.22 that despite the ownership and usage of mosquito nets being slightly higher among those with higher level of education, this may not be a sufficient factor for the reduction of the malaria incidences rather the issues of consistent usage as well as the residual spray intervention among the people with secondary and post-secondary education attainment level. The IHS3 also reported a greater percentage of fever and malaria among those with tertiary education (59.1 percent), secondary education (44.4 percent), primary education (43.7 percent) and none (42.7 percent) (NSO, 2012:41). The other explanation is on the abuse of the insecticide used for treating the mosquito nets, in Malawi called m'bwezera chitetezo (restore power) which is commonly abused and used for killing cockroaches, cleaning toilets among more educated urban populations unlike in the uneducated instead of treating the nets (MoH, 2014:11). The consistent use of the ITNs by less literate rural pregnant women (MoH, 2012a:27) further explains while there is a greater prevalence among people with secondary and post education level as most rural people are likely to be lesser educated. The 2012 Malawi Malaria Indicator Survey also shows that the northern region which has higher percentage of people in secondary and post-secondary level of education, had the lowest number

of people sleeping under treated nets (62 percent) as compared to the Central region (74 percent) and southern region (68 percent) (MoH, 2013:25) as compared to 2010 MIS where the N\northern region had 48 percent, central with 58 percent and south with 56 percent (MoH, 2010:27). The other contributing factor is that most rural and with lower level of education people have less alternatives as far as accessing malaria services hence more visits to public facilities where nets provided for free especially during antenatal services unlike in private facilities (MoH, 2012a:25). Furthermore, Government and CHAM facilities are likely to have ITNs than most private facilities in the country (MoH, 2014a:169).

On the positive significant relationship between primary school dropout rate and TB prevalence rate, as shown in Table 6.25, the possible explanation is from the vulnerability of most of the teenage marriages as well as the unsafe jobs that most primary school dropout would seek. On teen age marriages, the issue of HIV/AIDS become also as a risk factor where due to abject poverty facing such marriages and a mere primary school dropout, behaviours that can expose them to the HIV virus are more likely for example succumbing to unprotected sex. The ability to negotiate for safer sex as shown in 2010 MDHS has shown to be increasing with level of education and wealth (NSO, 2011:175). Similarly, most people with lower levels education for example primary school dropouts a have demonstrated less promptness in seeking healthcare as compared to those with higher level of education (NSO, 2011:183). As expected, HIV becomes a major risk factor for TB among most primary school dropouts and acts as mediating proximal risk factor, partly but not completely explaining the association of TB and primary school dropout rate (Odone *et al.*, 2013:6). Considering the lower Social Economic Position (SEP) of most of the primary school dropout, the higher TB prevalence is explained from the poor environments that they tend to live. The most commonly used SEP indicators in TB studies are median household income, expenditure, crowding, level of education, and housing quality most of which provides two risk factor categories, namely the acquisition of the infection and the development of the infection (Lienhardt *et al.*, 2003:448). This is the case as development of TB in humans has two stages first where the susceptible person is exposed to an infectious TB case and becomes infected and the second stage where the disease develops. The risk factors hence for infection are different from the risk factors for the development of

disease after infection. The primary school dropout rate is among the risk factors for such development of the disease as most of these fall under low SEP hence increasing their likelihood of TB infection due to immune system impairment mainly from HIV status, low food intake, alcohol consumption among others (Jackson *et al.*, 2006:5; Odone *et al.*, 2013:1).

In contrast however, a research in Zambia, a neighbouring country to Malawi on SEP, shows higher social economic status was positively related to the TB incidence other than the lower social economic status (Boccia *et al.*, 2009:1007). The study was however more skewed to the urban population as being wealthier and the urban high population density playing a key role over and above the benefits of higher economic status. This current study's results however are in line with what the World Health Organisation has indicated that over 80 percent of worlds TB cases and 95 percent of new cases are emerging from the low-income countries and that 95 percent of the total annual deaths caused by TB are in the developing countries (WHO, 2005).

In summary, the malaria and TB prevalence Random District Effect Models have demonstrated the significant effect of socio-economic antecedents of primary school enrolment, dropout rate, maize output and education attainment level specifically the secondary and post-secondary level. It is also worth noting that socio-economic factor of secondary and post-secondary education level of attainment provides a different role between malaria prevalence as compared to malaria mortality. In other words, it has proven that despite that the level of education hence subsequent income may not prevent the suffering of malaria, however, it can prevent the deaths caused by malaria as high level of education which likely lead to high income earnings (Orazemet *et al*., 2007:5), are likely to lead to prompt medical care seeking behaviours. The results imply also that by reducing primary school dropouts, improving primary school enrolments as well as increasing malaria vector interventions in the districts of Ntcheu, Nsanje, Mwanza, Nkhata Bay, Mchinji and Mangochi, significant improvements can be achieved in the fight against malaria as well as TB disease burden.

6.6 CONCLUSION

The results and discussion chapter on the antecedents of health outcomes in Malawi considered a number of socio-economic factors in relation to several health outcome, namely maternal and infant mortality rates, mortality rates where malaria was the main focus for both under five and all ages categories and finally on the disease prevalence with a focus on malaria and TB. The results and discussion chapter has addressed the empirical objective of the study aimed at investigating the relationship and pathways of socio-economic factors and health outcomes at district level and isolating further the critical socio-economic factors being dubbed as socio-economic antecedents in the study, on their level of impact on specific health outcomes.

On the general descriptive, general trends and distribution of the health antecedents has been established with an aim to provide sufficient grounds for using the random district effect model. The aim was to demonstrate that the differences in the health outcomes registered at district level provide a need for further analysis on the associated socio-economic factors. The descriptive analysis has shown that most districts in the country experienced significant different levels in terms of MMRate, IMR, malaria mortality rates and the Malaria and TB prevalence rates. These have been demonstrated by different levels registered from 2005 to 2014 as well as significant differences in the socio-economic level both at district as well as between the regions the districts belong to.

In considering the use of random district effect model, all six regressions were subjected to both Hausman and the Breusch-Pagan test in order to ascertain the model appropriateness. The results did indicate that there are indeed random effects on the health outcomes models and that the random effect model can be employed to provide consistent and efficient estimators.

On the effects, the specified socio-economic factors have on the health outcomes, the maternal and IMR models have revealed that maize output, maize average price, primary school dropout and female literacy rates are the socio-economic antecedents that have shown a significant effect on maternal mortality rate and infant mortality ratio. The results have shown that in Malawi, the infant risk of dying

increases with the child born in the primary school dropout household, born to an illiterate mother, and low income household. This in agreement with the observation that a child's risk of dying increases if she is born in a remote area, poor household to a mother of no education (UNICEF, 2010). These MMRate model has also shown that the risk of a woman dying from pregnant related deaths is higher among the districts that have higher primary school dropouts as well as those associated with high levels of malaria as demonstrated by higher maize output.

The malaria mortality models have shown that literacy rates and dependency ratio are among the critical socio-economic antecedents in the districts of the country. Dependency ratio however, is shown also to greatly impact the malaria mortality rate ranging from 32 unit change in the under-five category to 59 unit change in all ages category for a unit change in dependency ratio. Finally, on malaria and TB prevalence rate the models have revealed that the malaria and TB prevalence random district effect models have demonstrated the significant effect of socio-economic antecedents of primary school enrolment, dropout rate, maize output and education attainment level specifically the secondary and post-secondary level.

The final analysis of the study is to provide the conclusion as guided by the last empirical objective of policy implication and guidance, which is being addressed in the next chapter.

CHAPTER 7

CONCLUSION ON THE SOCIO-ECONOMIC ANTECEDENTS OF HEALTH OUTCOMES IN MALAWI

7.1 INTRODUCTION

The main objective of the study was to investigate the socio-economic antecedents of the health outcomes in Malawi. The focus of this study, therefore, was to investigate and determine how the socio-economic factors of poverty, education, employment, food security, population, and other demographic factors link with health outcomes at district level of the country. A meaningful analysis of health outcomes does require a wider perspective analysis by way of looking at distribution of health outcomes across different categories of people for instance social economic groups (WHO, 2013:12). Furthermore an analysis from one differentiating category of people to another (Kawachi *et al.*, 2002:649) but above all, the intermediate form of interaction.

The study has considered, in its analysis, the uniqueness of the district levels and distribution of income, education, food security and other household demographic characteristics and their relationship with the health outcomes of childhood mortality, maternal mortality, disease morbidity and disease prevalence rates. This has addressed an empirical gap on comprehensive district level analysis of SDH in Malawi, which mostly has been based on socio-economic surveys and reports and limited to specific area or disease. The special contribution of the study is on the comprehensiveness as drawn from the wider district level based analysis, which provides relevant significance of adopting and adapting in approaching socio-economic interventions towards health. It guides the implementation of interventions where some districts' health outcomes can be significantly improved by targeting and adapting initiatives toward the district, based on their key socio-economic factors related to health. The study has hence provided insights towards a scientific framework in improving the health outcomes amidst limited resources developing

countries may face where micro-based (district) initiatives can contribute significantly to health outcome improvement.

In achieving the main objective of the study, a number of specific objectives both theoretical and empirical were formulated. The theoretical objectives of the study were to review the literature on health, both from its determinants and their model premises, which has been discussed in chapters 2 and 3 on literature review. The study also aimed at analysing the trends in health outcomes across the globe, both developed and developing countries, with special attention to the sub-Saharan region in which Malawi is located, and the SDH, in both literature and implications for individual or population health. This was achieved by isolating the linkages between the critical SDH and health outcomes. These have been addressed in chapter two and three respectively.

Empirically, the study aimed at investigating the relationship between the socio-economic factors and health outcomes at the district level. In achieving this objective, the study further isolated the critical socio-economic factors in terms of their impact on specific health outcomes, namely maternal and infant mortality, disease burden, as to allude to policy implication and relevant guidance from the results. The results of the study were presented in such a way that each objective had some descriptive analysis at the beginning of the discussion to provide background on the specified variables on both trends and the general picture. Where a regression has been used, the appropriate diagnostic tests, as discussed in the methodology section, are conducted for the regression. The regression results are then presented followed by a discussion with reference to other studies either on affirmative or contrary point of view. The last empirical objective of policy and guidance is now being addressed in this chapter where summary of results presented and the relevant policy implication and recommendations.

7.2 THEORETICAL AND EMPIRICAL UNDERPINNINGS OF THE STUDY

The study has shown from the literature that the notion of health is complex not only from its definition but also from the factors that determines it. The chapter on health literature has discussed the notion of health by providing an analysis from its various definitions and also by examining the determinants associated. The chapter also

demonstrated how health is measured by providing the health outcome trends both at the global and country levels, mainly under the categories of developed and developing countries.

The definition of health in the study, having considered the biological, biomedical, frailty definitions, has been informed by the WHO definition which entails health as the complete state of physical, mental and social wellbeing however with emphasis on the ability to adapt and self-manage with regards to social, physical, and emotional challenges (Huber *et al.*, 2011:1; Boers & Cruz Jentoft, 2015:2). The definition also provided the basis for understanding the determinants of health. In analysing how the health determinants operate, some models were examined to provide the basis for an operational framework through which these determinants affect people's health. Three models were considered, namely the factor interaction model, which explains how the broad categories of society and environmental factors (upper stream factors) influence the category of individual's socio-economic characteristics such as employment and level of education (downstream factors), which in turn impacts the individual's health and behaviours, psychological state and safety. The study also considered the Whitehead (1991) model, which captures the contribution of sectoral policies to heath objectives, which are seen as beneficial or adverse and the impact increased through the interactive effects between them. The last model was the tetrahedron model, which looks at health as resting on three pillars, hence a pure tetrahedron in promoting resilience and coping with wellbeing and integrity. The three pillars of physical, social and mental health support individual health.

The concept of health further has also been elaborated on in the study by examining the literature on how health is measured. Due to the scope of this study, the measurement of health was confined however to disease burden, which included incidence, prevalence and morbidity rates; and the measure of health as demonstrated by the mortality rates where maternal and childhood mortality rates have been focused. As a way of demonstrating these measures further, the chapter also focused on the health indicators trends in the period 1990 to 2013.

7.3 GLOBAL HEALTH TRENDS AND SOCIO-ECONOMIC DETERMINANTS

The SDH have been discussed from its models aspect as well as the isolated interactive mechanisms on how they define health. The SDH have been defined as conditions in which people live and work. The underlining factors has been that these factors have a powerful influence on health and health related behaviours from the evidence accumulated for the past three decades which has pointed to socio-economic factors having a greater influence on people's health. They thrive on unbalanced existing social gradient as well as inequalities across communities. Some of these factors are income, wealth, and education forming a fundamental influence in shaping a wide range of health outcomes. In understanding these SDH, three models were discuses in the chapter mainly structural level model by Marmot and Wilkinson (2005), the WHO SDH framework and the globalisation and health: selected pathways and elements model by Labonte´ and Torgerson (2010). The role of SHD has hence been evident across the globe and much more in developing countries where the world's poor people do not have access to public health services and personal health care they need. This provides an understanding on how some social factors can account for high disease burden and mortality rate in poverty-stricken countries.

The analysis of the disease burden across the globe has shown to be higher among developing countries especially in the low-income category as compared to the developed countries. With reference to the global disease burden and mortality indicators between 1990 and 2013, and from the Millennium Development Goals, health related indicators performance. It has been established in the discussion that for example communicable diseases especially those associated with poor environment, maternal, perinatal and nutritional problems have been shown as being leading causes of for most instances of ill health in low-income countries and among the poor in the middle-income countries. These are also responsible for the most maternal and childhood mortality and morbidity rate. Furthermore, some health outcome indicators across countries have showing substantial progress for example reduction and decline in under-five and maternal mortality rates most indicators like

HIV and AIDS, TB disease and malaria burden are slowly achieving meaningful progress.

The study has demonstrated that there as indeed an impeccable relationship in the health outcomes at global level being associated with countries' socio economic characteristics. Of the analysed health outcomes, the trends have shown that most countries associated with poor health outcomes have had in general terms poor social economic conditions. For example, the study has analysed high disease burden being experienced in low and medium income countries among which are East Asia and sub Saharan Africa. In these regions most deaths have been caused by preventable infectious diseases like malaria, diarrheal diseases, HIV/AIDS, just to mention a few. In considering mortality rate, specifically under the interest of the study maternal and infant mortality trends, the global trends have further revealed that these health outcomes have also been highly associated with low and medium countries where population growth rate, unemployment rates, low levels of education and literacy are higher compared to most of the developed regions.

In summary, the indications show that, in recent years, there has indeed been improvement in many countries that had the highest rates of mortality despite the large gaps still persisting both among and within countries more especially between the developed and developing countries. Despite such disparities though, the current trends continue to provide a sound basis for intensified collective action and the expansion of successful approaches in dealing with the immense challenges posed by multiple crises and large inequalities in health (WHO, 2013).

7.4 MALAWI PROFILE AND ITS SOCIO-ECONOMIC CHARACTERISTICS

The study based its data analysis, findings and discussion on Malawi socio-economic and health outcomes trends. The country is administratively divided into 28 districts, which fall under three regions of the south, central and north. The district division also entails the distribution of the health services as each district is served by a respective district hospital and several community hospitals and health facilities under them. On the socio-economic factors, Malawi's economy has experienced GDP growth since 2006 with an average real GDP growth rate of seven percent between 2006 and 2010 and later a slump in 2012 of about two percent followed by

a rebound of five percent in 2013 due to a good tobacco season and a strong recovery of growth in manufacturing, construction, and the wholesale and retail trade sectors. The country's inflation rate remains high, due to mostly the uncertainties about the resumption of budget support who mainly contributes up to 40 percent of the national budget.

On population growth rate, the population of the country continues to be growing rapidly and, in just over 40 years, the population has increased from 4 million people in 1966 to 13.1 million in 2008 is expected to grow to 26 million in 2030. This has an enormous pressure on the country's meagre resources and subsequently on the delivery of services among which is health, which in the long run, may affect the country's population health indicators. It also has an impact on the already poverty-stricken country.

This is a country whose over 50 percent of its population is considered poor, with a quarter living in ultra-poverty. The country's poverty is more in rural areas with 57 percent of the rural population poor as compared to the 17 percentage of the urban population. The rural population, by 2012, anchored 28 percentage of its population as ultra-poor while the urban had about 4 percent. The distribution of poverty has a significant influence in shaping the health outcomes disparities across the country. This is from the mere fact that major life shocks leading toward impoverishment, namely hunger, famine, disease, deaths, drought and floods renders the poor vulnerable as they are faces with unhygienic homes, lack of money to pay for their health needs including transport to hospitals or clinics where necessary, lack of food, lack of peace of mind (Conticini, 2004:22). The fact that out-of-pocket expenditure is still increasing in Malawi amidst free health services at point of delivery is a clear indication that household level of income plays a crucial role in shaping the health outcomes.

The other three socio-economic indicators that were considered critical for the study were education, food security and employment. The education system of the country has three tier systems, namely primary, secondary and tertiary. By 2012, the country had almost 20 percent of its population to have reached the primary school certificate as the highest qualification, about 30 percent with junior certificate, less that 20 percent with Malawi School Certificate of Education and about 10 percent

with tertiary education. On general literacy, 6.8 million people are literate, representing a 64 percent literacy rate, with Urban 85 percent while rural 15 percent.

On food security, the situation in the country, by 2012, shows that about 33 percent of the population is very low food secured. That is, about one in every three people lived in severe low food security, 8 percent experiencing low food security and about 2 percent in the marginally food secure category while about 58 percent were considered food secure. In Malawi food security cannot be divorced from crop enterprise of which maize is the main food crop hence its synonymy to food security. The agricultural enterprise also defines the employment levels of the country as most people in the country are employed in the agricultural industry. It has been shown that most people in Malawi are engaged in informal employment, which has 89 percent of the people working and predominantly higher in rural areas, while the formal employment is higher in the urban areas as in rural areas. Employment has also an important role towards the health of households as it provides income, which enables the household's access health services where applicable.

Apart from the social and economic factors of the country, the study also analysed the health sector of the country, on both outcomes and the health care system including health care financing in the country. The health services in the country are provided at primary where community health facilities are main providers, the secondary level, mainly at district and the tertiary level, which is provided by the central hospitals. The country's health outcomes have shown mainly gains with declined levels of childhood mortalities, maternal mortality rate, the disease morbidity and prevalence. Despite such declines however, the country still faces the diseases burden not on from the communicable but as well as from the non-communicable diseases. The delivery of the health care services in the country also faces the challenge of resources both financial and human. The financial resources constraint is mainly on the country's health system dependency on development partners as 68 percent of the health budget is funded by the development partners hence its volatility. This has been shown during the suspension of most of traditional donors to the country's budget support in 2013 and the health sector has not been an exception. The human resource challenge comes in as the vacancy rate in the health sector is still high and the population being underserved. All these socio-economic

factors and health outcomes dynamics of the country provided a district level analysis contributing to a scientific framework in improving health outcomes in the country from a district point of view.

7.5 METHODOLOGY

In analysing the role socio-economic factors play in determining health, the study used the random effect district model. All the data were measured at district level and hence the results and entire analysis. The model was selected due to its applicability on the differences arising from the health outcomes and some socio-economic factors across the districts of the country. Apart from the classical regression modelling assumption, the specific assumptions under the model are the uncorrelation of the error components across the districts as well with the explanatory variables according to Gujarati and Porter (2009: 63). A number of diagnostic tests have been discussed which will be used before running the regression in ascertaining the pooling of data from different sources, the use of the random model and the presence of the random effects hence the applicability of the model.

The study has used information from the routine studies as conducted by the National Statistical Office in Malawi. These are primarily the Welfare Monitoring Surveys from 2005 to 2011 and IHS2 and IHS3, which mainly provided the socio-economic variables. The main socio-economic variables used in the study included employment levels, education, literacy, maize output, population growth and poverty levels. On the health outcomes, the study generally was informed by the Health Management Information System of the Ministry of Health and the Malawi Demographic and Health Surveys.

7.6 THE SOCIO-ECONOMIC ANTECEDENTS OF HEALTH OUTCOMES IN MALAWI: RESULTS SUMMARY

The study has demonstrated that the distribution of social economic factors of education, population, income levels has a random effect on the health outcomes across the country based on the district level analysis. The analysis and discussion in the study utilised the use of a district random effect model. The model was chosen for the country on the basis that district level data provides a more comprehensive base in analysing the role of social economic factors considering level of economic factors across the districts of the country and the health outcomes in the districts. As it has been demonstrated in the study, there are specific key socio-economic factors across the country, which have contributed to the shaping of specific health outcomes. Despite these factors being outside the realm of the health sector, these factors have had their tentacles over the past five to ten years outstretched into both individual and population health and are commonly called as the SDH. The key and significant factors and termed as socio-economic antecedents in the study are mainly being drawn from the SDH of education, poverty/employment, population and household characteristics as summarised in the subsequent sections.

7.7.1 Education and literacy

The study has shown that under education and literacy, primary school dropout, enrolment rate, secondary and above secondary attainment level of education, general literacy and female literacy rate are among the key antecedents as summarised in Table 7.1.

Table 7.1: Health outcomes antecedents: Education and literacy

SDH	Antecedents	Nature of relationship	Measure of effect	Implications
Education and Literacy	Dropout rate	Positively related to both MMRate and IMR	A unit change in dropout rate relates to 0.9 and 1.5 change in MMRate and IMR respectively	Reduced primary school dropouts (grade 5-8), will positively help reduce maternal, infant deaths as measured by MMRate and IMR
		Positively relating to malaria prevalence	Dropout ratio	
	Enrolment rate	Negatively related to malaria prevalence rate	With a base of 1000, a unit increase in primary school enrolment relates to a 0.8 decrease in malaria prevalence	Malaria vector control programme among school going children for example provision of mosquito nets should be promoted
	Secondary and beyond level of attainment	Negatively relates to malaria morbidity however positively related to the prevalence	A unit increase (percent) affects a 4 unit change in malaria prevalence rate	Despite education being a benefitting factor to health, malaria vector control programmes should consider even the highly educated as a target on effective malaria control
	General Literacy rate	Negatively related to malaria mortality rate	A unit change leads to a 0.4 unit change in malaria mortality rate	General Literacy plays an important role in the fight against malaria hence effort in increasing literacy levels for example through adult literacy programmes are critical at district level
	Female Literacy rate	Negatively related to IMR	A unit increase (percent) in female literacy affect a 0.5 drop in IMR	Policies deliberately targeting women literacies ought to be encouraged at district level as a way of reducing infant deaths as well as malaria mortality rate
		Negatively related to malaria mortality rate	A unit increase in female literacy rate (percent) affects 0.7 unit increase in malaria mortality rate	

7.7.2 Employment level and health outcomes

The role of employment on health outcomes has also been analysed in the study. The sectoral employment has shown to be systematically relating to the health outcome of IMR and TB prevalence rate as summarised in Table 7.2.

Table 7.2: Health outcomes antecedents: Employment level

SDH	Antecedents	Nature of relationship	Measure of effect	Implications
Employment	Employment in agriculture and fisheries	Negatively related to IMR	A unit increase (percent) in employment in Agriculture Industry affects a 0.36 unit decrease in IMR	Models of making agriculture as business in the country for example cooperatives, extensive irrigation can help in reducing infant mortality rates
	Employment in construction industry	Positively related to TB prevalence rate	As unit increase in the employment rate (percent) affect a unit increase in the TB prevalence rate	The activities under construction industry should be monitored and safety measure to be enforces. The growing of informal quarrying industry may also need to be closely monitored on safety matters

7.7.3 Population growth and health

An analysis on population has shown that population growth rate and dependency ratio are some of the key antecedents of health outcomes. The results summary and implications are presented in Table 7.3.

Table 7.3: Health outcomes antecedents: Population growth and Dependency Ratio

SDH	Antecedents	Nature of relationship	Measure of effect	Implications
Population	Population growth rate	Positively related to MMRate	Increase in population grow rate increases the MMRate	Policies in reducing fertility rate like family planning have a critical role in reducing MMRate
	Dependency Ratio	Positively related to malaria mortality rate	A unit increase in dependency ratio leads to a 32 unit increase in malaria mortality in U5	Activities aiming at improving the economic active among the economic active population for example community skills training programmes can reduce the malaria mortality rate at district level
			A unit increase in the dependency ratio affects 59 unit increase in malaria mortality in all ages	

7.7.4 Food security and health

The study also considered food security with the production of the staple food of the country, maize as a proxy. The results shows that an indirect effect can be drawn from its relationship with the health outcomes of MMRate and malaria prevalence as summarised in Table 7.4.

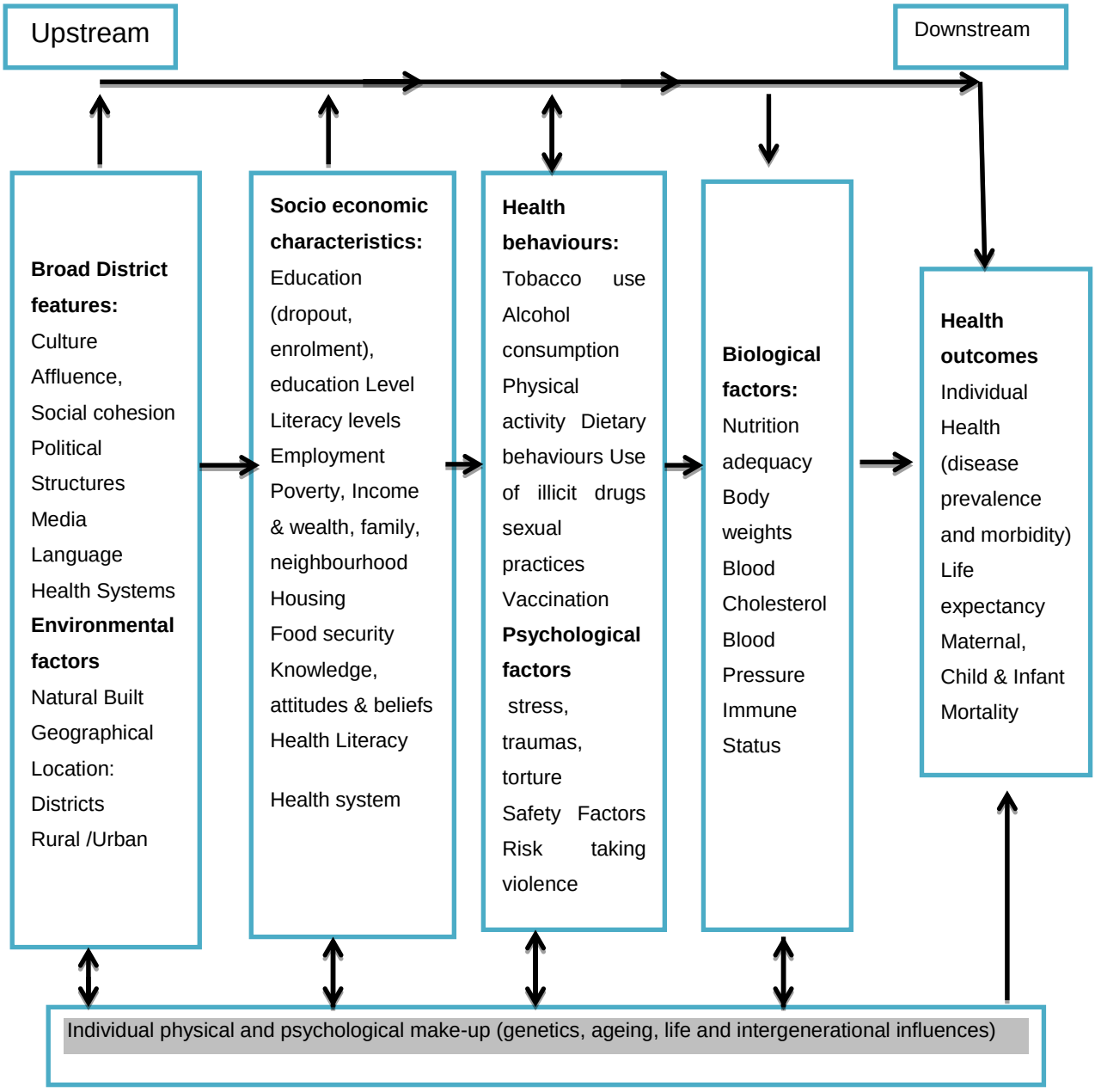
Table 7.4: Health outcomes antecedents: Food Security (maize output) and health outcomes

SDH	Antecedents	Nature of relationship	Measure of effect	Implications
Food security	Maize output	Positively related to MMR and Malaria prevalence	An increase per 10000 metric tonnes signifies a 0.5 increase in MMRate	This is a case of outweighed benefits where malaria incidences during good rainy seasons outweighs food security benefit
		Positively related to malaria prevalence rate	An increase per 10000 metric tonnes signifies a 4.5 unit increase in malaria prevalence rate	Efforts in increasing agriculture production for example extensive irrigation in Malawi should also incorporate malaria vector control programmes

7.8 CONCLUSION OF THE STUDY

In conclusion, the analysis of the socio-economic factors and the health outcomes in the country provides an understanding that the socio-economic antecedents of the health outcomes do not operate in isolation. This implies that interventions towards improving the health outcomes in light with the socio-economic factors at district level can be modelled from the understanding as depicted in Figure 7.1.

Figure 7.1: Malawi social economic antecedents of health outcomes model



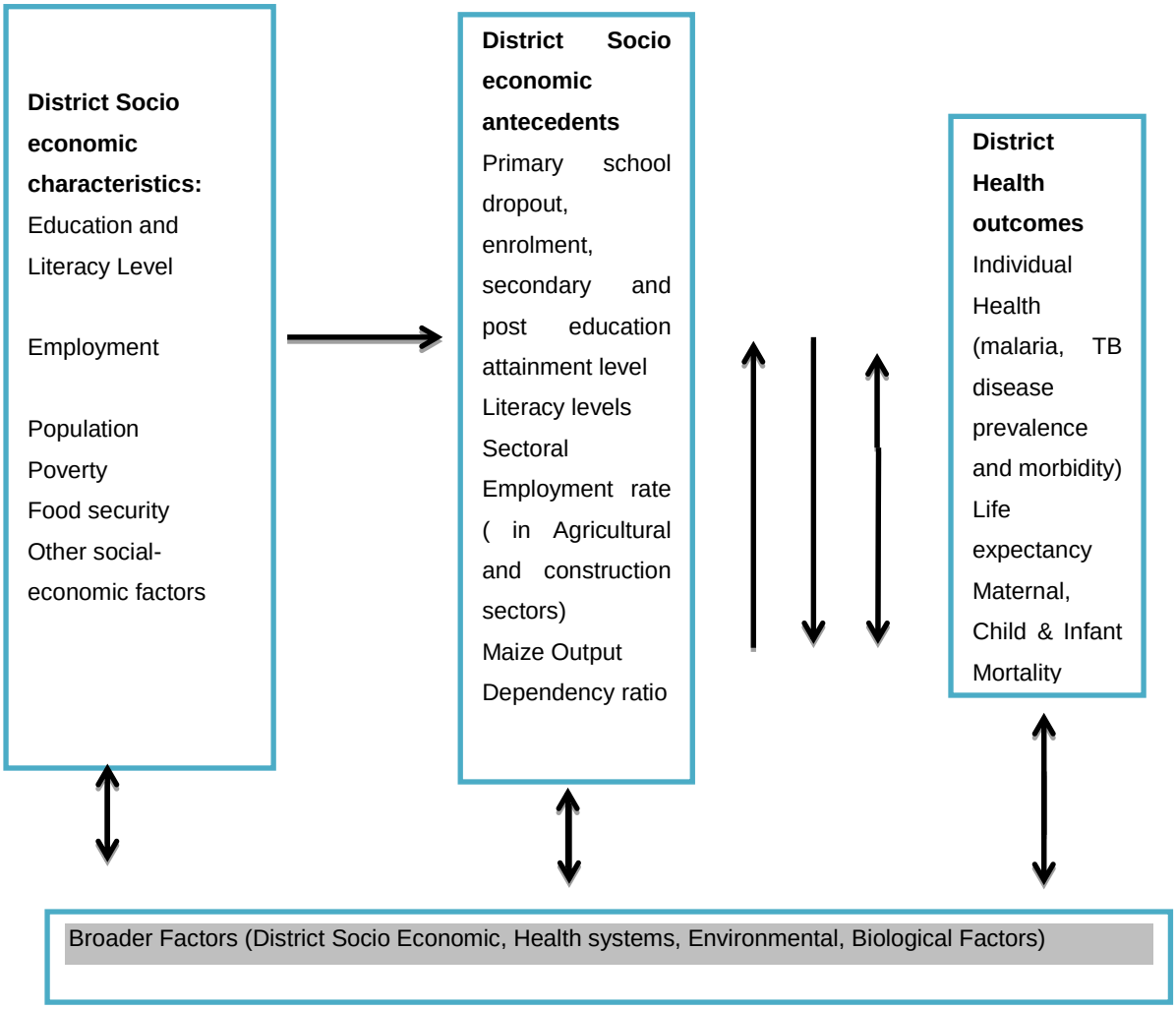
Source: Adapted from Australia Institute of Health and Wellness, (2014:5).

The model suggests that general factors physical and psychological makeup among the population still provides an essential overall background in affecting their health. However, there is always an upward and downward interaction between these underlying factors with the general broader features of the districts, the social economic characteristics, health behaviours, psychological factors and the health

outcomes. Despite this up and downward relation, there is also a subsequent relationship between these broader district features, their socio-economic characteristics, health behaviours, psychological factors and eventually being evidenced by the health outcomes

These relationships can further be simplified by drawing from it interactive pathways between the established socio-economic antecedents and the health outcomes as presented in Figure 7.2.

Figure 7.2: Malawi socio-economic factors/health outcomes Interactive pathways model



Source: Author's design

The model shows that from the existing relationship between the broader factors with the social economic characteristics and the socio-economic antecedents of health at

the district level, three types of relationship is drawn from the study, namely upward, downward and outweighed benefit relationships. The upwards relationship is where is where there is a positive relationship between the socio-economic antecedent and the health outcome. In other words, increase in the socio-economic antecedent at the district level subsequently increases the health outcomes for example increase in dropout rate affecting an increase in the MMRate. The downwards relationship is where a decrease in the socio-economic antecedent is leading a decrease in the health outcome for example the case of female literacy rate and IMR. The outweighed benefit relationship is where while the socio-economic antecedent provides benefits in improving the health outcome, the related factors may provide an opposite impact and the health outcome is shaped by the net benefit. An example of this relationship is between maize output and maternal mortality where maize output which signified food availability, its benefit is outweighed with increased malaria incidences. These forms of relationship hence provide policy guidance in formulating interventions at district level.

7.9 POLICY IMPLICATIONS FROM THE STUDY

The study is based on the district level analysis of the health outcomes and the associated socio-economic antecedents of health. From the analysis, five policy implications are being drawn from the study in a bid to improving the health outcomes of the country. These are enhancement of the district level leadership, strengthening the role of organisation and private companies, strengthening the role of the district health committees in the running of health services, the strengthening, deliberate broadening of economic activities within districts and strengthening malaria monitoring in light of expansion of irrigation activities.

7.9.1 Enhancement of district based interventions: adopt and adapt approach

One of the fundamental bases of the study was the district level analysis where despite having national based performance of health and its health outcomes, the disaggregation provides further insights for practical interventions. The study recommends that as government provides policy direction on health or policies governing the social and economic factors, consideration of district performance trends are critical in a bid to improve the health of people. In other words, policies ought to be adopted and adapted as local area or district specific for any meaningful

development. Malawi is already implementing the decentralisation policy and the legal framework for decentralisation derives from the Local Government Act of 1998 and the approval of the National Decentralisation Policy (MoH, 2014:6). This provides an opportunity for the implementation of district-based intervention based on the underlining district social and economic characteristics. This calls for the District Implementation Plans (DIPs) to be practically reflecting district based issued unlike just being a replica of generic activities. For example, districts that have shown some poor trends of health outcomes like Nsanje on MMR, Mangochi on IMR, and their modus operandi on health interventions should be analysed in respect of performance of the other sectors dealing with employment and education. This can also be incorporated into the resource formulas on sector budget allocations for example health performance would have a weight when considering resources towards education of agriculture. The health sector district budget allocation formula should also consider these socio-economic factors as currently it much considers population only which doesn't bring much significant differences in the allocated resource (Manthalu *et al.*, 2010:6). Furthermore, as organisations operate in the district, those interested in health need to be encouraged to collaborate with those in the areas where the social and economic characteristics have been established to be affecting health outcomes like primary school dropouts.

7.9.2 Enhancement of the district level leadership

As the district health sector structure is influenced by government administrative structure, the role of the community leadership like Traditional Authorities and village level leadership should be strengthened in light of the antecedents, which can be influenced by this structure. The study has shown that primary school dropout is one of key socio-economic antecedents towards health outcomes. It has been shown from reports within the country that culture is one of the key factors affecting the girl child in Malawi and education dropout outs especially on the perception of the girl child (Chimombo, 2000:19). Tradition leaders are the custodians of culture and its activities, and taking part in the health committees at district level should be empowered more. The study therefore recommends that traditional leaders should not only be oriented on the direct effects of culture on education but also on its impact on health outcomes in the country. In other words, any culture that affects

health direct on indirectly, traditional leaders should be guided by a proper legal framework. Traditional leaders can be promoted or provided monetary incentives or trophies for their fight against primary school dropouts.

One of these interventions by traditional leaders for example in fighting against high maternal and child deaths is the efforts by Senior Chief Inkosi Kachindamoto of Dedza, one of the districts in the central region of Malawi. In this district 330 teenage marriages were terminated, 175 teenage girls and 155 teenage boys and those involved were incorporated back to various primary and secondary schools (Nyasatimes, 2015, 23 June). A district such as Ntcheu district which is experiencing higher school dropouts (Mahwayo, 2015) should already send a signal towards subsequent higher maternal deaths. The reported efforts from Child Protection Committees, Youthnet and Counselling (YUNECO), Save the Children and Police as some of the stakeholders working in the district in fighting against teen-age marriages should be considered as key towards the reduction of maternal deaths in the district. Thus such effort in discouraging early marriages and promotion of girl child education which is one of the critical issues in the recently enacted Marriage, Divorce Relations Bill which restricts girls marriages before the age of eighteen (GoM, 2015), should not only be viewed as government's wider initiative. This should rather be considered as critically impacting the health outcomes and that involvement of the community leaders significantly contributes to such. In the case of Traditional Authority Kachindamoto, provides such an example where strengthening of such initiatives through recognition, would assist the country in improving health outcomes.

7.9.3 Strengthening the role of the private sector at district level

The role of the private sector within the district should be looked at beyond the provision of employment. Districts should be able to exploit the presence of organisations and companies working within the districts. As companies register, the corporate social responsibility should always be embodied within the business framework and districts should take advantage of such by incorporating the private companies as part of their strategic partners. Health sector at district level can exploit such through for example adoption of public health facilities by private companies. As the resource base of the country is still small, the touted public

private partnerships in the Health Sector Strategic plans can be strengthen by further providing and strengthening capacity of districts in handling the partnerships. This could be beyond the privatisation of services as numbers of districts have demonstrated (MoH, 2014) but also PPP coordination mechanism being put in place at district level. This includes full time PPP officers, maintaining database where organisations and their area of interest is managed, deliberate initiatives in approaching organisations and availability of both up to date priorities and associated costs for easy targeting of any interesting companies including infrastructure development. These companies would also be provided with incentives including placing their adverts within hospital setting and public acknowledgments. For example in Chikwawa where Illovo Sugar Company is situated, the Chikwawa District health office would engage the company and impress to adopt the Chikwawa District Hospital or services. The company would for example help maintain the hospitals fleet of vehicles and support their essential drug budget. In return, the company would advertise their sugar product within the hospital setting and their support being acknowledged within the hospital setting. These district-based initiatives would not only target these larger companies but with health facilities within the district, NGOs, smaller companies would be incorporated. For example, medicine donations to Zomba District by Airtel Malawi (Kadewere, 2015), translating these into established PPPs would bring a greater impact in improving health outcomes at district level. However, the strengthening of the coordinating office within the districts is essential in providing and maintaining up to date information on priority needs, monitoring, accountability and transparency.

These may not only be in the health sector, initiatives like for instance TNM in setting up a fund for under-privileged girls (Nyasatimes, 2015:29 July), does make more sense when are designed on district specific level as per the socio-economic effects on health outcomes across the districts of the country. In other words if these funds targets districts like Nsanje, Neno, Mzimba and Lilongwe where there were on average high primary school dropouts rates on various reason ranging from employment, marriages, pregnancies, an impact of reducing these dropout trends does not only decorates the education sector's success, but further translates into a greater impact on the fight against maternal deaths across districts. These district-based initiatives would actually easily be adopted by both private and non-

governmental organisations working in specific districts in considering that their efforts have a greater impact within the district and across. This can hence translate into practical, manageable and effective public-private collaborations unlike where they are deemed mere national initiatives.

7.9.4 Strengthening the role of the District Health Committees in monitoring the health services

As discussed in the operation of the health services in Malawi in section 4.8.4, the role of the District Health Management Team, under the Decentralisation Act, is to provide both operational and financial control oversight over the delivery of primary and secondary health services at the district level. The devolving of health service delivery started in 2005 with an aim of providing managerial autonomy to the district assemblies through decentralisation. This was in order to achieve improved health outcomes. However, one of the key challenges to decentralisation is weak coordination of decentralisation at the national level as District Local Assemblies lack the capacity to follow up closely on local activities, couple with financial constraint and high staff turnover (MoH, 2014:6).

The existing structures apart from the DHMT, at district level mainly the District Executive Committee (DEC) and health sub-committee which are responsible for the development of overall policy for the district, the Hospital Advisory Committee (HAC), the Area Development Committees (ADC), and the Village Development Committee (VDC), ought to be strengthened by establishing them as financial entities which can raise their own resources from private or NGOs for their monitoring capacity. By and large, they should be part and parcel of managing district health services including staff incentives such as promotion of disciplinary measures. The tendency of centralising decision making in Government has hampered quick decision making despite the decentralisation policy and this has resulted into demotivated staff and inefficiencies as also highlighted in the public reforms report (GoM, 2015:33). One way in strengthening the capacity at the local level is the de-politicisation of public services which would encourage professionalism coupled with performance related rewards and incentives to assist in reducing the staff turnover. Secondly, the support towards the committees under the decentralisation governance for example health

committees can help in enforcing quality health service delivery, which would help improve health outcomes at district level.

7.9.5 Deliberate broadening of economic activities within the districts

Despite Malawi economic base being limited, strengthening the district economic activities are an essential factor in improving the health outcomes of the country. The study has shown that the broadening of household income base and the employment in the agricultural sector are some of the antecedents towards improved health outcomes. This entails those initiatives towards making farming a business in the country through sustainable mechanisms such as irrigation would not only provide employment in the agricultural sector but also improve the health outcomes. The government has embarked on district bases technical colleges (Bnltimes, 16 September, 2014). The first phase of the community colleges has 12 districts, namely Chitipa, Karonga, Mzimba, Nkhatabay, Nkhotakota, Dowa, Mchinji, Dedza, Thyolo, Phalombe, Chiradzulu and Blantyre (Masuso, 2015). Such initiatives would go a longer way in improving the health of the people where such skills are supported in establishing business or cooperatives within the agricultural sector and beyond. Graduates from these colleges for example can be bankrolled as cooperatives under agro products processing in districts under the existing one village one product initiatives which aim at revitalising rural economies by promoting value addition on agriculture products (Kurokawa *et al.*, 2010:18)

It is worth noting that some of the policy recommendations being suggested are not purely new and have been broadly mentioned in some strategic plans for example the role of private sector in health, malaria control programmes and the role of district health committees. However, the strengthening of their roles in light of the socio-economic factors impact in line with the established antecedents provides an informed base and further understanding of specific district based strategy and subsequently avoiding the one size fits all kind of policy interventions. The study hence recommends the need to provide flexibility for adopt and adapt mode of operation where despite the overarching policy or strategy governing health interventions, these should be adapted according to district specific socio-economic structure and underlined general factors as depicted in the model in Figure 7.2. In Malawi, districts use District Implementation Plans in executing health programmes.

This already provides an opportunity for further empowering such to both in raising resources for health, its accountability to the district authorities as well as ability to bring to accountability within the decentralisation framework, impeding was to be supportive sectors and disciplining and correcting of any failing structures. This can be monitored through districts stakeholder meetings or conferences, which ought to incorporate key players within the districts including NGOs and the private sector.

7.10 LIMITATIONS OF THE STUDY

The study had a number of limitations, more especially on the availability of data on some health outcomes and social economic factors at district level. As such, the study failed to further analyse the employment as disaggregated further by sectors. The study's analysis also was greatly based on the hospital-based data as the most survey data on health outcomes, such as demographic and health surveys, were available at national level and where available could not provide for consistent years for the purpose of the study.

7.11 AREAS FOR FURTHER STUDY

The study proposes that more research should be conducted on the impact of these socio-economic antecedents from the inequality point of view as well as the incorporation of more socio-economic factors. Further investigation and analysing on the district level antecedents' inequalities and health outcomes would further contribute to the policy orientation on improving the health outcomes in the country.

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APPENDICES

Appendix A1: Results for the Hausman Test for the random Effects for U5 malaria death rate model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.649973	3	0.3018

Appendix A2: Results for the Hausman test for the random effects for Malaria death rate (all ages) model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.247449	3	0.3550

Appendix A3: Results for the Hausman test for the random effects for IMR model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.847801	4	0.4270

Appendix A4: Results for the Hausman test for the random effects for maternal mortality model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	1.218853	3	0.7485

Appendix A5: Results for the Hausman test for the random effects for malaria incidence rate model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.102249	7	0.4183

Appendix A5: Results for the Hausman test for the random effects for TB incidence rate model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.561261	3	0.9052

Appendix B1: Results for the Breusch-Pegan test for the U5 malaria mortality rate model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        u5malariadeathrate[districtcode,t]     =     Xb     +     u[districtcode]     +
e[districtcode,t]

        Estimated results:
                          |       Var     sd = sqrt(Var)
                 ---------+-----------------------------
                u5malar~e |   492.3247       22.18839
                        e |   132.5074       11.51119
                        u |   266.1897       16.31532

        Test:   Var(u) = 0
                                 chi2(1) =   102.78
                              Prob > chi2 =     0.0000
```

Appendix B2: Results for the Breusch-Pegan test for the malaria mortality rate (all ages) model

```
Breusch and Pagan Lagrangian multiplier test for random effects

      Malariamortalityrate[districtcode,t]    =    Xb    +    u[districtcode]    +
e[districtcode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                over5ma~e |   1630.303       40.37701
                        e |   393.3143       19.83215
                        u |   1112.602        33.3557

        Test:   Var(u) = 0
                                chi2(1) =   125.25
                             Prob > chi2 =     0.0000
```

Appendix B 3: Results for the Breusch-Pegan test for the maternal mortality model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        maternaldeaths[districtcode,t] = Xb + u[districtcode] + e[districtcode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                materna~s |   468.9148       21.65444
                        e |   235.8943       15.35885
                        u |   83.68426        9.14791

        Test:   Var(u) = 0
                                chi2(1) =     8.24
                             Prob > chi2 =     0.0021
```

Appendix B 4: Results for the Breusch-Pegan test for the IMR model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        infantmortalityrate[districtcode,t]    =    Xb    +    u[districtcode]    +
e[districtcode,t]

        Estimated results:
                          |       Var     sd = sqrt(Var)
                 ---------+------------------------------
                infantm~e |   619.4557       24.88887
                        e |   192.7228       13.88246
                        u |   60.03372       7.748143

        Test:   Var(u) = 0
                                chi2(1) =     85.24
                             Prob > chi2 =     0.0032
```

Appendix B5: Results for the Breusch-Pegan test for the malaria prevalence rate model

```
        malariaincidencerate[districtcode,t]    =    Xb    +    u[districtcode]    +
e[districtcode,t]

        Estimated results:
                          |       Var     sd = sqrt(Var)
                 ---------+------------------------------
                malaria~e |   17642.56       132.8253
                        e |   6842.927       82.72199
                        u |   8813.996       93.88288

        Test:   Var(u) = 0
                                chi2(1) =    58.47
                             Prob > chi2 =     0.0000
```

Appendix B5: Results for the Breusch-Pegan test for the TB prevalence rate model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        incidencerate[districtcode,t] = Xb + u[districtcode] + e[districtcode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 ---------+-----------------------------
                incidence |    18793.8       137.0905
                        e |   2439.903       49.39538
                        u |    16254.1       127.4916

        Test:   Var(u) = 0
                                 chi2(1) =   176.22
                               Prob > chi2 =     0.0000
```

Appendix C1: Regression results for U5 mortality rate model

```
Random-effects GLS regression                   Number of obs      =       130
Group variable: districtcode                    Number of groups   =        26

R-sq:  within  = 0.0928                         Obs per group: min =         5
       between = 0.2436                                        avg =       5.0
       overall = 0.2077                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(3)       =     18.22
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0004

------------------------------------------------------------------------------
u5malariad~e |        Coef.    Std. Err.        z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
dependency~o |   32.61554   11.32206     2.88   0.004     10.42471    54.80636
 eduliteracy |  -.4576594   .2265189    -2.02   0.043    -.9016282   -.0136906
edusecandp~t |  -.2086022   .2570859    -0.81   0.417    -.7124812    .2952769
       _cons |   37.16254   17.74303     2.09   0.036     2.386848    71.93824
-------------+----------------------------------------------------------------
     sigma_u |  16.315321
     sigma_e |  11.511185
         rho |  .66764898   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix C2: Regression results for general malaria mortality rate (all ages) model

```
Random-effects GLS regression                   Number of obs      =       130
Group variable: districtcode                    Number of groups   =        26

R-sq:  within  = 0.1059                         Obs per group: min =         5
       between = 0.1141                                        avg =       5.0
       overall = 0.1122                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(3)       =     15.16
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0017

------------------------------------------------------------------------------
     Malar~e |        Coef.     Std. Err.         z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
maizeprodu~n |   .0000183    .0000398     0.46    0.646    -.0000598    .0000964
dependency~o |   59.62558   19.17306     3.11    0.002     22.04707     97.2041
   literacyf |  -.7437994    .3200883    -2.32    0.020    -1.371161   -.1164379
       _cons |    44.0427   28.87273     1.53    0.127    -12.54681    100.6322
-------------+----------------------------------------------------------------
     sigma_u |  33.355696
     sigma_e |  19.832154
         rho |  .73882067   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix C3: Regression results for maternal mortality model

```
Random-effects GLS regression                   Number of obs      =       107
Group variable: districtcode                    Number of groups   =        27

R-sq:  within  = 0.0225                         Obs per group: min =         3
       between = 0.5591                                        avg =       4.0
       overall = 0.3566                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(3)       =     32.39
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
maternalde~s |        Coef.    Std. Err.        z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
maizeprodu~n |   7.94e-06   .0000261     0.30   0.761    -.0000433    .0000592
  population |   .0000354     .00001     3.53   0.000     .0000158    .0000551
dropoutrat~y |    .934893   .4553738     2.05   0.040     .0423766    1.827409
       _cons |  -10.30199   6.227789    -1.65   0.098    -22.50823    1.904257
-------------+----------------------------------------------------------------
     sigma_u |  9.1479103
     sigma_e |  15.358852
         rho |  .26185816   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix C4: Regression results for IMR model

```
Random-effects GLS regression                   Number of obs      =        53
Group variable: districtcode                    Number of groups   =        27

R-sq:  within  = 0.7559                         Obs per group: min =         1
       between = 0.5039                                        avg =       2.0
       overall = 0.6381                                        max =         2

Random effects u_i ~ Gaussian                   Wald chi2(4)       =     97.58
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
infantmort~e |        Coef.    Std. Err.        z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
maizeprodu~n |   .0000513   .0000233     2.20   0.028     5.57e-06     .000097
emplymenta~s |  -.3615401   .0682984    -5.29   0.000    -.4954024   -.2276778
   literacyf |  -.5170696   .2132849    -2.42   0.015    -.9351003   -.0990388
dropoutrat~y |   1.537415   .7278325     2.11   0.035     .1108894     2.96394
       _cons |   93.70645   21.51351     4.36   0.000     51.54074    135.8722
-------------+----------------------------------------------------------------
     sigma_u |  7.7481428
     sigma_e |  13.882462
         rho |  .23751604   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix C5: Regression Results for the malaria incidence rate

```
Random-effects GLS regression                   Number of obs      =       130
Group variable: districtcode                    Number of groups   =        26

R-sq:  within  = 0.2332                         Obs per group: min =         5
       between = 0.0377                                        avg =       5.0
       overall = 0.0962                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(7)       =     28.44
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0002

------------------------------------------------------------------------------
malariainc~e |        Coef.    Std. Err.        z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
povertyofp~r |  -.2801441   .7904345    -0.35   0.723    -1.829367    1.269079
maizeprodu~n |   .0004504   .0001913     2.35   0.019     .0000755    .0008253
dependency~o |   315.1672   94.41834     3.34   0.001     130.1106    500.2237
dropoutrat~y |   .7230706   1.978701     0.37   0.715    -3.155111    4.601252
schoolenro~t |   -.000809   .0002862    -2.83   0.005    -.0013698   -.0002482
 eduliteracy |  -2.232125   1.652456    -1.35   0.177    -5.470879    1.006629
edusecandp~t |   4.354164   1.898763     2.29   0.022     .6326574     8.07567
       _cons |   219.3019   180.8039     1.21   0.225    -135.0672    573.6711
-------------+----------------------------------------------------------------
     sigma_u |  93.882883
     sigma_e |  82.721987
         rho |   .5629456   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix C6: Regression Results for the TB incidence rate

```
Random-effects GLS regression                   Number of obs      =       130
Group variable: districtcode                    Number of groups   =        26

R-sq:  within  = 0.1149                         Obs per group: min =         5
       between = 0.0023                                        avg =       5.0
       overall = 0.0147                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(3)       =     13.10
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0044

------------------------------------------------------------------------------
incidencer~e |        Coef.    Std. Err.        z      P>|z|       [95percent Conf.
Interval]
-------------+----------------------------------------------------------------
   femalehhh |   .8691471   1.247996     0.70   0.486    -1.576881    3.315175
dropoutrat~y |   2.417464   1.112497     2.17   0.030     .2370104    4.597917
emplymentc~n |   1.013577   .5753569     1.76   0.078    -.1141019    2.141256
       _cons |   127.8467   42.35688     3.02   0.003     44.82876    210.8647
-------------+----------------------------------------------------------------
     sigma_u |  127.49156
     sigma_e |  49.395379
         rho |  .86948202   (fraction of variance due to u_i)
```

Appendix D1: Maternal Mortality Rate and Infant Mortality Ratio District Distribution 2011-2014

	Maternal Mortality Rate (Maternal deaths per 10,000 Reproductive age population)					Infant Mortality Ratio (Infant deaths per 100000 libe births)	
Interval	2011	2012	2013	2014	Interval	2005	2011
0≤1	Blantyre, Chikwawa, Chiradzulu, Chitipa, Dedza, Dowa, Karonga, Kasungu, Mchinji, Mulanje, Mwanza, Neno, Nkhata Bay, Ntchisi, Phalombe, Salima, Rumphi, Thyolo, Zomba	Blantyre, Chikwawa, Chiradzulu, Chitipa, Balaka, Dedza, Dowa, Karonga, Kasungu, Mchinji, Mulanje, Neno, Nkhata Bay, Ntchisi,Phalombe, Salima, Rumphi, Thyolo, Zomba, Lilongwe	Chiradzulu, Chitipa, Balaka, Dedza, Dowa, Karonga, Machinga, Mchinji, Mulanje, Mwanza, Ntcheu, Nsanje,Phalombe, Salima, Rumphi, Thyolo, Zomba, Blantyre	Blantyre, Chikwawa, Chiradzulu, Chitipa, Balaka, Dedza, Dowa, Karonga, Machinga, Mchinji, Mulanje, Neno, Nkhata Bay, Nkhotakota, Ntcheu, Ntchisi, Lilongwe,Phalombe, Salima, Rumphi, Thyolo, Zomba, Mangochi, Mzimba	0-20	–	–
>1≤2	Mangochi, Mwanza, Mzimba, Machinga, Ntcheu, Balaka	Mangochi, Mwanza, Mzimba, Nsanje, Machinga, Ntcheu	Chikwawa, Kasungu, Lilongwe Mangochi, Neno, Nkhata Bay	Kasungu, Nsanje, Mwanza	21-40	Chitipa	Karonga, Nkhata Bay, Rumphi
>2≤3	Lilongwe, Nkhotakota	–	Mzimba, Nkhotakota	–	41-60	Nkhata Bay, Ntchisi, Rumphi	Blantyre, Chiradzulu, Kasungu, Machinga, Mangochi, Mzimba, Mwanza, Mangochi, Mchinji, Nkhotakota, Ntcheu, Ntchisi, Nsanje, Thyolo, Zomba
>3≤4	Nkhotakota	Nkhotakota	Ntchisi	–	61-80	Chiradzulu, Kasungu, Lilongwe, Machinga, Mchinji	Chikwawa, Balaka, Dedza, Dowa, Lilongwe, Mchinji, Mulanje, Phalombe, Salima
>4≤5	–	–	–	–	81-100	Blantyre, Chikwawa, Balaka, Dowa, Mzimba, Mwanza, Nkhotakota, Ntcheu, Salima, Zomba	–
>5≤6	–	–	–	–	101-120	Dedza, Karonga, Mangochi, Nsanje, Phalombe, Thyolo	–
More than 6	Nsanje	–	–	–	141-160	Mulanje	–

Appendix D2: Malaria Mortality rate (per 100, 000 population) District Distribution 2005-2011

	Year				
Category	2005	2007	2008	2009	2011
0-20	Blantyre	Blantyre, Mzimba	Blantyre, Mzimba	Blantyre, Karonga, Mzimba, Zomba	Blantyre, Zomba
21-40	Chitipa, Balaka, Dowa, Karonga, Lilongwe, Machinga, Mzimba	Chitipa, Lilongwe	Lilongwe, Machinga, Thyolo, Zomba	Lilongwe, Machinga	Chitipa, Lilongwe, Machinga, Mzimba, Phalombe, Salima, Thyolo
41-60	Chiradzulu, Dedza, Nkhotakota, Ntchisi, Phalombe, Salima, Zomba	Chiradzulu, Balaka, Dowa, Karonga, Kasungu, Machinga, Mulanje, Thyolo, Zomba	Chiradzulu, Chitipa, Dedza, Dowa, Kasungu, Rumphi	Chiradzulu, Balaka, Dowa, Kasungu, Rumphi, Thyolo	Chikwawa, Chiradzulu, Balaka, Dowa, Mulanje, Nkhotakota, Ntcheu, Ntchisi, Nsanje
61-80	Chikwawa, Kasungu, Mangochi, Nkhata Bay, Rumphi, Thyolo	Dedza, Ntchisi, Phalombe, Rumphi	Chikwawa, Balaka, Karonga, Nkhata Bay	Chikwawa, Chitipa, Dedza, Nkhata Bay, Ntchisi, Phalombe	Dedza, Karonga, Kasungu, Mangochi
81-100	Mulanje	Chikwawa, Mchinji, Nkhata Bay, Nkhotakota, Salima	Nkhotakota, Phalombe	Nkhotakota, Salima, Mangochi	Mchinji, Rumphi
101-120	–	Mangochi	Mangochi, Salima	Ntcheu, Nsanje, Mulanje	–
121-140	Mchinji	–	Ntcheu, Ntchisi, Nsanje	Mchinji	–
141-160	Ntcheu, Nsanje	Ntcheu, Nsanje	Mchinji, Mulanje	–	Mwanza, Nkhata Bay
161-180	Mwanza	–		–	–
181-200	–	–	Mwanza	–	–
over 200	–	Mwanza		Mwanza	–

Appendix D3: U5 Malaria Mortality rate (per 100, 000 population) District Distribution 2005-2011

	Year				
Category	2005	2007	2008	2009	2011
0-20	Blantyre, Chitipa, Karonga, Lilongwe, Zomba	Blantyre, Chitipa, Karonga, Lilongwe, Mzimba	Blantyre, Karonga, Mzimba, Thyolo, Zomba	Blantyre, Chitipa, Karonga, Machinga, Mzimba, Zomba	Blantyre, Chitipa, Dowa, Karonga, Mzimba, Salima, Zomba
21-40	Chikwawa, Chiradzulu, Balaka, Dedza, Dowa, Machinga, Mulanje, Mzimba, NkhataBay, Nkhotakota, Ntcheu, Ntchisi, Phalombe, Salima	Chiradzulu, Balaka, Dedza, Dowa, Kasungu, Machinga, Mulanje, NkhataBay, Thyolo, Zomba	Chiradzulu, Chitipa, Balaka, Dowa, Kasungu, Lilongwe, Machinga, NkhataBay, Ntchisi	Chiradzulu, Chikwawa, Balaka, Dowa, Kasungu, Lilongwe, Mulanje, NkhataBay, Salima, Rumphi, Thyolo	Chikwawa, Chiradzulu, Balaka, Kasungu, Lilongwe, Machinga, Mangochi, Mulanje, NkhataBay, Nkhotakota, Ntcheu, Ntchisi, Nsanje, Phalombe, Thyolo
41-60	Kasungu, Mangochi, Rumphi, Thyolo	Chikwawa, Nkhotakota, Ntcheu, Ntchisi, Phalombe, Salima, Rumphi	Chikwawa, Dedza, Nkhotakota, Phalombe, Salima, Rumphi	Dedza, Nkhotakota, Ntchisi, Phalombe	Dedza, Rumphi
61-80	Mchinji	Mchinji	Mchinji, Mulanje, Ntcheu, Nsanje	Mangochi, Ntcheu	Mchinji, Mwanza
81-100	Nsanje	Mangochi, Mwanza	Mangochi, Mwanza	Mchinji, Mwanza, Nsanje	–
101-120	Mwanza	Nsanje	–	–	–

Appendix D4: Malaria Prevalence rate (per 1000 population) District Distribution 2005-2011

	District Malaria Prevalence Rate				
Category	2005	2007	2008	2009	2011
0-200	–	Mulanje	Mzimba	–	–
201-400	Blantyre, Chiradzulu, Chitipa, Balaka, Dedza, Dowa, Karonga, Kasungu, Mangochi, Mchinji, Mulanje, Mzimba, Mwanza, Ntcheu, Phalombe, Thyolo, Zomba	Blantyre, Chiradzulu, Chitipa, Dedza, Karonga, Kasungu, Lilongwe, Mangochi, Mchinji, Mzimba, Phalombe, Thyolo, Zomba	Chitipa, Dedza, Dowa, Kasungu, Lilongwe, Mchinji, Mulanje, Phalombe, Thyolo, Zomba	Chitipa, Kasungu, , Mzimba, Thyolo	Blantyre, Chikwawa, Chiradzulu, Chitipa, Balaka, Dedza, Kasungu, Machinga, Mangochi, Mulanje, Mzimba, Nkhotakota, Phalombe, Thyolo, Zomba
401-600	Chikwawa, Lilongwe, Machinga, Nkhotakota, Salima, Rumphi	Chikwawa, Balaka, Dowa, Machinga, Nkhotakota, Ntcheu, Ntchisi, Salima	Blantyre, Chikwawa, Chiradzulu, Balaka, Karonga, Machinga, Mangochi, NkhataBay, Nkhotakota, Ntcheu, Ntchisi, Salima	Blantyre, Chikwawa, Chiradzulu, Balaka, Dedza, Dowa, Karonga, Lilongwe, Machinga, Mangochi, Mulanje, Nkhotakota, Ntchisi, Phalombe, Salima, Rumphi, Zomba	Dowa, Karonga, Lilongwe, Mchinji, Mwanza, Ntcheu, Ntchisi, Nsanje, Salima, Rumphi
601-800	NkhataBay, Ntchisi, Nsanje	Mwanza, NkhataBay, Nsanje, Rumphi	Nsanje, Rumphi	Mchinji, Ntcheu, Nsanje	NkhataBay
801-1000	–	–	Mwanza	Mwanza, NkhataBay	–

Appendix E1: Independent T-test for the primary school dropout rate between 2005 and 2011.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DropoutRate	Equal variances assumed	2.218	.143	5.255	51	.000	5.078	.966	3.138	7.017
	Equal variances not assumed			5.233	47.884	.000	5.078	.970	3.127	7.029

Appendix E2: Independent T-test for the MMRate between southern and central Regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MMRate	Equal variances assumed	.410	.524	-.331	86	.742	-.065847	.199205	-.461853	.330159
	Equal variances not assumed			-.339	81.301	.736	-.065847	.194397	-.452613	.320919

Appendix E3: Independent T-test for the MMRate between southern and northern regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MMRate	Equal variances assumed	.229	.633	.600	70	.551	.137656	.229479	-.320025	.595337
	Equal variances not assumed			.760	59.987	.450	.137656	.181153	-.224706	.500018

Appendix E4: Independent T-test for the MMRate between Central and Northern Regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MMRate	Equal variances assumed	1.861	.178	.969	54	.337	.203503	.210119	-.217761	.624767
	Equal variances not assumed			1.092	52.649	.280	.203503	.186313	-.170253	.577259

Appendix E5: Independent T-test for the IMR between South and Central Regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IMR	Equal variances assumed	5.374	.026	.497	41	.622	3.369	6.784	-10.332	17.070
	Equal variances not assumed			.539	39.615	.593	3.369	6.252	-9.271	16.009

Appendix E6: Independent T-test for the IMR between South and Northern Regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IMR	Equal variances assumed	.105	.748	2.302	33	.028	23.380	10.157	2.715	44.045
	Equal variances not assumed			2.133	14.379	.051	23.380	10.961	-.071	46.831

Appendix E7: Independent T-test for the IMR between Central and Northern Regions

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IMR	Equal variances assumed	4.305	.048	2.334	26	.028	20.011	8.574	2.387	37.635
	Equal variances not assumed			1.941	11.476	.077	20.011	10.308	-2.563	42.585

Appendix E8: Independent T-test for the female literacy rates between 2005 and 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Literacy F	Equal variances assumed	.984	.326	-2.100	50	.041	-8.1808	3.8963	-16.0067	-.3548
	Equal variances not assumed			-2.100	49.073	.041	-8.1808	3.8963	-16.0104	-.3512

Appendix E8a: Independent T-test for the U5 Malaria Mortality Rate between Southern and Central Regions 2005 - 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Under 5 malaria mortality rate	Equal variances assumed	9.944	.002	-.142	103	.887	-.644	4.538	-9.645	8.357
	Equal variances not assumed			-.152	97.668	.879	-.644	4.226	-9.031	7.743

Appendix E8b: Independent T-test for the U5 Malaria Mortality Rate between Southern and Northern Regions 2005 – 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Under 5 malaria mortality rate	Equal variances assumed	9.874	.002	2.772	83	.007	15.749	5.682	4.447	27.051
	Equal variances not assumed			3.655	82.052	.000	15.749	4.309	7.176	24.322

Appendix E8c: Independent T-test for the U5 Malaria Mortality Rate between Central and Northern Regions 2005 - 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Under 5 malaria mortality rate	Equal variances assumed	.932	.338	4.457	68	.000	16.393	3.678	9.053	23.733
	Equal variances not assumed			4.764	59.797	.000	16.393	3.441	9.509	23.276

Appendix E9a: Independent T-test for the General Malaria Mortality Rates between Southern and Central Regions 2005 – 2011

ndependent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Malaria Mortality Rate	Equal variances assumed	2.702	.103	-.202	103	.841	-1.694	8.405	-18.363	14.974
	Equal variances not assumed			-.212	102.685	.833	-1.694	8.010	-17.580	14.192

Appendix E9b: Independent T-test for the General Malaria Mortality Rates between Southern and Northern Regions 2005 - 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Malaria Mortality Rate	Equal variances assumed	5.255	.024	2.114	83	.038	21.361	10.106	1.260	41.462
	Equal variances not assumed			2.742	80.723	.008	21.361	7.789	5.863	36.859

Appendix E9c: Independent T-test for the General Malaria Mortality Rates between Central and Northern Regions 2005 - 2011

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95percent Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Malaria Mortality Rate	Equal variances assumed	1.945	.168	3.011	68	.004	23.055	7.657	7.775	38.335
	Equal variances not assumed			3.334	64.544	.001	23.055	6.914	9.244	36.866