ANALYSIS OF CHILD DEPRIVATIONS AND WELL-BEING INEQUALITIES IN KENYA

ISAIAH KIPRONO BYEGON

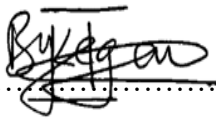
X80/97009/2014

THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS OF THE UNIVERSITY OF NAIROBI

NOVEMBER, 2022

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

Signature  ……Date……**09/11/2022**……

Isaiah Kiprono Byegon

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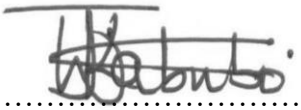
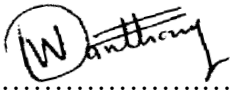
Signature  ... Date……**15/11/2022**…….

Prof. Jane Kabubo-Mariara

Faculty of Arts and Social Sciences

Department of Economics and Development Studies

University of Nairobi

Signature  .....Date……. **15/11/2022**……

Prof. Anthony N. Wambugu

Faculty of Arts and Social Sciences

Department of Economics and Development Studies

University of Nairobi

DEDICATION

To my loving father Mr Richard Kipyegon Arap Kirui and my late mama Zeddy Chebet Kirui.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all of the people and organizations who generously supported my work on this thesis. First and foremost, I want to express my gratitude to Professor Jane Kabubo-Mariara, who served as my primary supervisor, for her dedication to seeing that I finished the thesis. Her advice during the research and writing phases was quite helpful in honing my research abilities. I also like to thank Prof. Anthony Wambugu, who served as my second supervisor, for his unwavering encouragement and valuable contributions to this study. In fact, I had the honor of having two excellent individuals direct my PhD study. Beyond this thesis, I hope to collaborate with them once more.

This thesis also benefitted a lot from two biannual workshops by the African Economic Research Consortium (AERC) and several seminars at the Department of Economics, University of Nairobi where I received many useful insights. My utmost gratitude goes to friends and colleagues who enriched my life in many ways and with whom I share unforgettable experiences in the journey to obtaining my PhD degree. My appreciation goes to Bernard, Simon, Alex, Rogers, Winnie, Mary, Shauri, Bupe, Jackson, Gibson, and Petrose for their support and especially for providing me with the much-needed research journals. I am also grateful to the lecturers and professors who taught me at the University of Dar es Salaam and at the Joint Facility of Electives (JFE) at Kenya School of Monetary Studies.

At the time of writing this thesis, I lost a very important person in my life - my dear mum. She had always encouraged me to work hard and earn the ultimate degree in my education; may her soul rest in the comfort of the Lord. I want to express my sincere appreciation and respect to my father for his help, inspiration, and prayers. I want to express my gratitude to my sisters Flora and Juliana, as well as my brothers Leonard, Solomon, and John for providing moral support and caring for my family while I was abroad. Most importantly, I want to express my gratitude and love to my lovely wife Anyesi Chepngeno Byegon for all of her hard work and sacrifice in raising the kids.

This thesis would not have been possible without the funding provided by the African Economic Research Consortium (AERC) and Ministry of Finance (Government of Kenya). I sincerely appreciate the entire scholarships and other sorts of assistance that were given to me. I also want to express my gratitude to my employer for giving me a study leave.

Above all, I thank God for His faithfulness and blessings.

May God bless you all.

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ACRONYMS AND ABBREVIATIONS

ACRWC	African Charter on Rights and Welfare of the Child
CCF	Christian Children's Fund
CIPREE	Centre Interuniversitaire Sur Le Risqué Les Politiques Economiques Et'lemploi
COVID-19	Corona Virus 2019
CRC	Convention on the Rights of the Child
CWI	Composite Wealth Indicator
DFID	Department for International Development
ECHP	European Community Household Panel
EU	European Union
FGT	Foster-Greer-Thorbecke
HDI	Human Development Index
IDRC	International Development Research Centre
KDHS	Kenya Demographic and Health Survey
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
M0	Adjusted Headcount Ratio
MDGs	Millennium Development Goals
MDI	Multidimensional Inequality Index
MIMAP	Micro Impacts of Macroeconomic Adjustment Policies Network
MPI	Multidimensional Poverty Index
MTP	Medium Term Plan
NSAF	National Survey on American Families
NSCH	National Survey on Children's Health
OPHI	Oxford Poverty and Human Development Initiative

PEP	Partnership for Economic Policy
PMMA	Poverty Monitoring and Measurement Analysis
SDGs	Sustainable Development Goals
SID	Society for International Development
SSA	Sub-Sahara Africa
UN	United Nations
UNESCO	United Nations Education, Scientific and Cultural Organization
UNGA	United Nations General Assembly
UN Habitat	United Nations Human Settlements Programme
UNICEF	United Nation's Children Fund
USA	United States of America
WHO	World Health Organization

DEFINITION OF TERMS

Child Deprivation: This is used to describe a lack of access to or the absence of commodities or services that are essential for a child's growth and realization of their full potential.

Dimension: Collection of indicators that are used to convey a final measure of well-being which may be a service, right or good; for example, nutritional status or education attainment.

Indicator: A yardstick showing the level of availability or access to a particular good, service, or right.

Child poverty: Instances where a kid's entitlements are below a predetermined level i.e., when the child is denied in at least k% of the weighted indicators in the multidimensional deprivation, where k is the poverty cut-off.

Monetary poverty: A measure that assesses well-being in terms income or consumption and expenditure.

Composite index: A total assessment of household living conditions. The index is determined using data on a household's possession of specific assets, building supplies, accessibility to clean water, and sanitation.

Z-Score: The difference between a person's value and the median of a reference population divided by the reference population's standard deviation (or transformed to normal distribution).

Inequality: This refers to disparities or variances of individual deprivation scores of children. This thesis examines the dispersion of distribution in child well-being dimensions like nutrition, education, health among others.

Incidence of poverty: The percentage of people who have been classified as multidimensionally poor.

Intensity: The typical number of areas of deprivation faced by the impoverished.

ABSTRACT

Unidimensional approaches, especially those based on income or consumption and expenditure, previously dominated evaluation of the status of household or individual well-being. This thesis argues that the use of several non-metric indicators would be more suitable since well-being is a multidimensional phenomenon. Thus, measurement of well-being in terms of income or consumption and expenditure does not capture fully deprivations experienced by children because they are not economic agents. Furthermore, discussions based on income or consumption and expenditure indicators alone are often insufficient for the formulation of policies aimed at reducing deprivations in non-monetary dimensions of well-being. Finally, besides income, individuals and households also differ in health status, nutritional status, educational attainment, and housing conditions among others, which should be considered during evaluation of their well-being. There is little documentation on the study of child deprivations and well-being inequality from a multidimensional perspective in Kenya. This thesis reports the use of a multidimensional perspective in the measurement of deprivations and well-being inequalities among Kenyan children.

Using nationally representative and comparable data from the Kenya Demographic and Health Surveys (KDHS) for the years 1993 to 2014, the thesis examined child poverty and well-being disparities in Kenya. The investigation of multidimensional child well-being disparities followed an evaluation of the levels and patterns of different child deprivations. The study looked into the correlations between different child deprivations as well. The deprivations in seven child-specific dimensions of well-being—nutrition, health, education, water, shelter, sanitation, and information—are specifically reported in this thesis. The outcomes were produced using the Bristol Deprivation Approach and the Alkire and Foster (AF) Methodology, two frontier methodologies from the literature.

The study's methodological framework has three components. First, the prevalence, depth, and severity of multiple child deprivations were examined using the Bristol framework and the Alkire and Foster methodology. Second, composite well-being indices were calculated using multiple correspondence analysis (MCA) to measure multidimensional well-being inequalities among Kenyan children. This study further decomposed the overall well-being inequalities to account for

the contribution of various characteristics to inequality using regression-based decomposition approach. Third, we counted the dimensions in which each child experienced deprivation and ordered the children from those who had no deprivation to those who experienced deprivation in four or more categories. As a result, we examined the distribution of multiple child deprivations by various characteristics and examined parameters related to multiple child deprivations using an ordered logit regression model.

The results of the first essay show that the majority of Kenyan children are deprived in the areas of information, shelter, and water, in that order. The lowest rates of deprivation were observed in health dimension followed by education dimension. However, it was noted that the rates of deprivation in education dimension increased from 2008 to 2014. Multidimensional poverty index among Kenyan children declined from 0.37 to 0.26 between 1993 and 2014. This observation was attributed mainly to reduction in multidimensional headcount ratios from 72.77 percent in 1993 to 50.76 percent in 2014. The average deprivations among the children remained constant during the study period. The highest contributors to multi-dimensional child poverty (MPI) were information, water, and shelter dimensions while the lowest contributors were health, nutrition, and education dimensions. Children from North Eastern and Eastern regions suffered the highest deprivations in all dimensions compared to other regions.

Results from the second essay indicate the existence of modest and reducing well-being inequalities among the children. The Gini coefficient index was 0.29 in 1993, but declined to 0.23 in 2014. The Theil index was 0.15 in 1993 but declined to 0.09 in 2014 when the inequality aversion parameter is low, $\alpha=1$. The multidimensional inequality when the inequality aversion parameter is high, $\alpha=2$ showed slight dispersion as the entropy index declined from 0.16 in 1993 to 0.09 in 2014. Further, this essay found that inequality was relatively higher for girls, non-urban children, and children from female-headed households. The key contributors to multidimensional inequality were nutrition, housing, and information dimensions in that order. The most important determinants of inequality were identified as additional level of education of the mother, access to electricity, and non-urban residence of children.

From the third piece, numerous observations were made. First, rural children are more susceptible to numerous deprivations than their urban counterparts. Second, maternal education significantly reduced the incidence of multiple child malnutrition. Thirdly, children from female-headed homes experienced greater deprivation than their male-headed counterparts. Fourth, compared to other regions, children in the Nairobi region had the lowest deprivation rates, while those in the North Eastern region had the highest. Fifth, children from religious homes had higher outcomes than those from families with no religious affiliation. The empirical model revealed that children with higher birth orders, twins, and those living in rural areas were more likely to experience multiple deprivations, whereas children with mothers with higher levels of education and employed respondents were less likely to experience multiple deprivations. In addition, boys were more susceptible to multiple deprivations than girls, and the prevalence of multiple deprivations was higher among twins than among singletons.

The findings of this thesis suggest policies for tackling multiple forms of poverty. The thesis suggests streamlining of development in rural, arid, and semi-arid lands by encouraging investment in infrastructure and public services like hospitals, schools, electricity, water supply schemes in rural areas and ASALs. Households lacking access to sanitation facilities for proper disposal of human waste should be sensitized about the importance of constructing and using toilets to prevent disease outbreaks. At the same time, there is need for enforceable regulations on the proper disposal of human waste to conserve the environment. In terms of information, the government should introduce radio programmes in schools and community cinemas to expose children to events in the world outside their immediate environment as well as improve their cognitive development. The government could consider tax exemption for broadcast equipment and removal of the requirement for licencing to make this equipment affordable for most households so that children can access information through the broadcast media.

To spare children from growing up in conditions of severe hunger, the government should introduce sustainable targeted programmes for providing access to adequate food for vulnerable families with children, especially those under five years. These programmes could include relief food and expanded cash transfer programmes to vulnerable sub-groups. In the long term, this study suggests establishment of a universal childcare programme where families receive assistance in

cash or in kind to enable them access food and education. Finally, in addition to encouraging research and development to identify innovative ways of constructing cheap and affordable houses, the government should also reduce taxes and levies on building materials such as iron sheets, cement, sand, etc. to enable households to construct better houses.

This thesis makes a significant contribution to the study of child poverty. First it contributes to the conceptualization and reformulation of child well-being in a multidimensional perspective. Unlike past studies which examined child well-being based on income or consumption and expenditures, this thesis analysed child well-being using the whole gamut of child-specific dimensions. Secondly, the thesis contributes to the literature of multidimensional child well-being inequality. The innovative aspect of this thesis is that it developed a composite well-being index by using multiple correspondence analysis to investigate the distribution of children's well-being across seven child-specific variables. The index was then used to calculate multidimensional inequality. Thirdly, the thesis makes a contribution to measuring the severity of child deprivations by counting the number of domains in which a child is deprived and ranking them from a child who is not deprived to a child who is deprived in four or more domains with the assumption that a child deprived in one domain is better-off than a child deprived in two, three, four or more domains. Lastly, the thesis prescribes policy implications to reduce the child deprivations.

1.0 CHAPTER ONE

1.1 INTRODUCTION

1.1.1 Background

Kenya is experiencing severe and widespread poverty. Income or consumption and expenditure measures adjusted using the adult equivalence scale indicate that in 2009, the incidence of poverty was 45.2% having dropped from 46.6% in 2005/06 and 52.6% in 1997 (KNBS, 2014). Contrarily, the number of persons living in poverty has increased, from 3.7 million in 1972 to 11.5 million in 1994 and from 15.5 million in 2005 to 17.1 million in 2009. Based on recent household budget survey (KIHBS) the proportion of poor people declined further to 36.1% in 2015/16, translating to 16.4 million poor people (CBS, 1997; KNBS, 2018). The poverty rates have declined generally but many people have jumped into poverty 972 to 2016.

The above estimates of poverty in Kenya do not reflect disaggregation by age, thus masking the well-being of children. Children are disproportionately impacted by poverty, and this is strongly supported by the evidence. Additionally, as long as poverty assessments are still only based on income measurements, children's well-being and their needs will remain unnoticed, thus putting in jeopardy any prospects of ending the vicious cycle of poverty. This claim results from the reality that children and adults both experience poverty, but in different ways (Minujin et al., 2006; Minujin, 2011; Roelen, 2018). To date, there has been no comprehensive analysis of child well-being in Kenya, thus creating a knowledge gap in examination and design of policies for improving the well-being of children.

Poverty is a multi-dimensional concept, which means that other parameters, besides income or

consumption costs, should be included in the measurement of the well-being of an individual. Individual well-being does not only depend on insufficient income but also on deprivations related to housing, education, nutritional status, health status, or participation in social activities (Townsend, 1979; Sen, 1976; Sen, 1985 ; Alkire & Foster, 2011, Minujin et al., 2014; Roelen, 2018; Belete, 2021). Using income only as a measure of well-being has several drawbacks. First, the measure does not capture non-market goods, which are relevant to economic development and environmental sustainability; for example, public goods and services (Kabubo-Mariara et al., 2012). Second, there is no guarantee that well-off households would distribute income efficiently to every member of the household (Sen, 1985; Thorbecke, 2008). Sen (1985), Pinilla-Roncancio et al., 2020; Bersisa and Heshmati (2021) and Bourguignon and Chakravarty (2003) have argued that measures based on economic well-being should be complimented by other dimensions. Thus, the conceptualization and measurement of poverty should shift from using a one-dimensional approach to encompass a multi-dimensional approach.

The inadequacies of poverty measurements derived using income or consumption expenditure are even more serious in the estimation of child poverty (UNICEF, 2005; Minujin et al., 2014; Minujin, 2018). Children's well-being cannot be determined wholly using household income. In other words, the availability of products and services where children reside, such as schools and hospitals, as well as the support available to them on an emotional, spiritual, physical, and social level, all contribute to their overall well-being. A matter of grave concern is that poor children may remain poor in adulthood (Minujin et al., 2006). Thus, to break this vicious cycle of poverty, there ought to be accurate evaluation of child well-being so as to formulate effective poverty eradication

policies. Indeed, Corak (2005) has pointed out that tackling child poverty is fundamental to and instrumental in nurturing a poverty-free society.

Poverty has three features, namely incidence, intensity, and inequality (Seth and Alkire, 2014). Many studies address the three components of poverty but mostly based on measurements of income (Sen, 1976). However, inequality has some multidimensional connotation just like poverty (Sen, 1992) and, therefore, it is important to capture inequality among individuals by using many dimensions. In order to succeed in mitigating poverty, it is imperative to tackle inequality also (Sen, 1976).

Few econometric studies have assessed poverty and/or inequality of children in Kenya and therefore the policies that address child well-being lack firm evidence base since the complete picture of children is not known and hence the related consequences could be underestimated. The few empirical studies that have addressed the issue of child well-being focus on one dimension, for example, nutritional and health status of children (Mutunga, 2007; Kabubo-Mariara, Ndenge and Mwabu, 2009). However, the only studies that have measured child poverty using a multidimensional approach is by Kabubo-Mariara, Wambugu and Musau (2011) and KNBS (2017). The Kabubo-Mariara, Wambugu and Musau (2011) used a composite wealth indicator (CWI) and child health to assess multi-dimensional poverty while The Multidimensional Child Poverty Index was calculated by KNBS (2017) using the Multiple Overlapping Deprivation Analysis (MODA). Regarding inequality, Kabubo-Mariara, Karienyeh and Kabubo (2012) is the only available study that have analysed inequality of child survival in Kenya albeit using a bi-dimensional perspective.

This thesis argues that many dimensions of well-being, which are critical to child development, have not been studied comprehensively in Kenya thus leaving a considerable knowledge gap on measurement of child well-being. There is also lack of adequate evidence to support child well-being policies. This thesis uses empirical data to assess child well-being and inequalities from a multi-dimensional perspective in Kenya. Further, we investigate factors that are linked to numerous child deprivations.

1.1.2 Research Questions

The main research questions addressed in this thesis are:

(i) What is the incidence, depth, and severity of multiple child deprivations in Kenya?

(ii) What is the extent of multidimensional child inequality in Kenya?

(iii) What are the main correlates of multiple child deprivations in Kenya?

(iv) What policies would be outlined to tackle multiple child deprivations in Kenya?

1.1.3 Objectives of the Thesis

The primary objective of this thesis is to analyse various child deprivations and well-being disparities in Kenya. In particular, the thesis aims to:

(i) Calculate the prevalence, depth, and severity of various child deprivations in Kenya and disaggregate by relevant population subgroups.

(ii) Analyse the magnitude and trends of multidimensional well-being inequalities among the children in Kenya.

(iii) Investigate the key factors that contribute to numerous child deprivations in Kenya?

(iv) Based on the findings, suggest policy changes to be undertaken.

1.1.4 Relevant literature

This thesis plunges into the debate of measurement of child well-being (Cho & Yu, 2020). There has been unending debate on the conceptualization and measurement of well-being since the dawn of the 20th century. This thesis' overarching goal to quantify and analyse multidimensional child deprivations and well-being inequalities as well as investigate the key socioeconomic determinants of numerous child deprivations. In the past, well-being has been conceptualized in a unidimensional phenomenon warranting the use of income or consumption and expenditure to measure it. This has a number of drawbacks. For example, using income or consumption and expenditure, ignores multidimensional nature of poverty, ignores different needs of people, i.e. Persons living with disabilities need more resources to perform similar tasks than non-disable people do, children have different needs i.e., dietary needs as compared to adults, among others (Sen, 1999). Similarly, the unit of analysis is a household, which subsume that income, is equally distributed within a household. This theory is child-centered because it takes the kid as its unit of study.

For many years, measurement of well-being based on income has been under constant scrutiny in the literature (Sen, 1979; Townsend, 1979). The conception and assessment of poverty have changed to a multidimensional viewpoint over the past thirty years or so (UNDP, 1990; Gordon et al., 2003; Alkire & Foster 2011; Mishra & Dutta, 2022). However, there is a huge debate when it comes to measurement of poverty (Cuesta, 2020). The multidimensional measurement approach has sparked fiercest critics from proponents of dashboard approach (Ravallion, 2011).

A small number of researches in Kenya have concentrated on children's well-being from a multifaceted angle. Using two measures of wellbeing, Kabubo-Mariara et al. (2011) assessed multidimensional poverty among mothers and children in Kenya: a composite wealth index and child health. Several other dimensions that are important to child well-being have not been studied. This has left a considerable gap in knowledge about the magnitude, trends and distribution of multiple child deprivations which this essay strives to fill. These factors are based on criteria of child well-being that have been adopted internationally, including those for nutrition, health, education, housing, water, sanitation, and information. This thesis evaluates the deprivations of these dimensions based on the Kenyan context. The Child Rights Convention serves as the foundation for these elements and violation of these rights constitute child poverty (UN, 1989; OAU, 2001; UNICEF 2005 and COK 2010).

A review of the literature reveals two innovative methodologies of measuring multiple child deprivations. These are Bristol framework (Gordon et al., 2003) and Alkire and Foster dual cut-off methodology (Alkire and Foster 2011). According to the Bristol approach, a kid is deemed to be living in absolute poverty if they are deprived in two or more aspects. The latter methodology, however, defines a child as multidimensionally poor if they are underprivileged across all domains by a factor of one-third. The difference between the two methodologies is that Bristol deprivation approach do not calculate the depth and severity of multiple child deprivation unlike the Alkire and Foster methodology. This essay employs the two methodologies and evaluate the situation of well-being among Kenyan children.

Another feature of child well-being considered in this thesis is inequality. Essay two tackles the issue of multidimensional inequality of well-being. Just like poverty, inequality is a multidimensional phenomenon (Maasoumi, 1986; Sen, 1992, Tsui, 1995; Araar, 2009). The difference between poverty and inequality is that while poverty evaluate well-being of children falling below a pre-determined deprivation threshold, inequality on the other hand examine the distributions of dimensions of well-being within the population.

Despite the rich theoretical and empirical literature available, studies on multidimensional inequality in Kenya are still in scarcity. Some past studies provide evidence on distribution of income in Kenya in the early 1980s (Crawford & Thorbecke, 1978; Vandemoortele, 1982; and Bigsten, 1981). Bigsten et al., 2014 investigates the development of inequality and poverty in Kenya during the past 100 years. Other studies have examined inequality among Kenyan children using two features well-being, namely assets and child survival (Kabubo-Mariara et al., 2012). These studies focus on unidimensional and/or bi-dimensional measures of well-being. Thus, the body of research on inequality measurement, and especially multidimensional inequality, in Kenya remains limited.

This essay uses the same dimensions of well-being used in essay one in the calculation of multidimensional inequality. Numerous statistical methods are used in the literature for analysing multivariate datasets. The key techniques are principal components analysis (PCA) and multiple correspondence analysis (MCA). Since all dimensions of child well-being are binary or categorical in nature, MCA is best suited for this analysis (Booysen et al., 2007; Asselin, 2009). Therefore, this essay applied MCA to examine the distribution in the deprivation scores of child well-being.

Since the distributions is made up of many indicators, the best approach is to aggregate them to a single index. The essay constructs composite child well-being indices which ranges from negative values to positives values. The negative values represent low standards of well-being while positive values represent high standards of well-being. Using these composite indices, several inequality measures are calculated and interpreted. The essay also applies the Araar (2009) methodology to examine the distributive indices within the dimensions. Araar (2009) developed an index of multidimensional inequality that possesses basic properties of an inequality index.

After calculating overall inequality in each survey, the essay sought to decompose inequality into its explanatory variables. The composite well-being indices of children in each survey is regressed on individual, household and community characteristics to analyse the contribution of each explanatory variable to the level of inequality. The quick literature survey makes it clear that there are limited studies dealing with the determinants of inequality in developing countries such as Kenya. Most of the available studies have focused on developed countries (Shorrocks, 1982, 1984; Cowell and Jenskins, 1995; Morduch & Sicular, 1998; Fields 2003). This essay addresses this gap by examining these issues in the Kenyan context using composite well-being indices for Kenyan children. We used Fields' (2003) regression-based decomposition methodology to determine how each explanatory factor affected overall inequality.

Finally, yet importantly, essay three investigates the correlates of multiple child deprivations. There is agreement in the literature that the features of the kid, the household, the region, and the community do have a substantial impact on the well-being of the child. Previous research in Kenya looked at the correlates of one factor affecting children's wellbeing. While Kabubo-Mariara et al.

(2009) look at the factors of nutrition status, Mutunga (2007) looks into the determinants of child mortality. This essay makes the case that focusing on a single facet of a child's wellbeing does not fully capture how poverty affects children.

In this essay, children facing deprivation in one dimension ranks differently with those facing deprivations in two or more dimensions. Therefore, this essay ranks children in terms of deprivations from those not deprived in any dimension to those deprived in at least four dimensions and investigates the elements that contribute to numerous deprivations. Except for Batana et al. (2014) which analysed the correlates of multiple child deprivation in Uganda, empirical studies in Kenya have measured child poverty using two dimensions (Kabubo-Mariara et al., 2011; 2012). However, this does not fully capture constraints to growth and development of a child. Other studies have investigated child welfare in terms of income or expenditure of the household, notwithstanding that poverty is a multifarious phenomenon (Makhalima et al., 2014).

This thesis is the first of its type to advance knowledge in this area and contribute to the body of research by attempting to identify the primary correlates of multiple child deprivation and examining how these explanatory factors interact with each category of child deprivation outcomes in Kenya.

1.1.5 Conceptual framework

The conceptual framework for analysing the multidimensional child poverty and inequality in Kenya is described in this section. The theoretical foundation of childhood poverty is founded on human rights. The universal declaration of human rights represented a major international step for

human development. However, these declarations were addressed to humankind as a whole rather than to a particular group of the population (UN, 1948).

In order to make progress in enforcing and addressing children's human rights and needs, it has become increasingly clear that children's needs and rights must be separated from those of adults. The Convention on the Rights of the Child (CRC) is the main international legal framework for children's rights (UN, 1989). The right to food, health care, and education are just a few of the essential rights that are upheld for kids by the CRC. As a result, childhood poverty might be seen as an infringement of fundamental rights (see for example, Sen, 1982; 1992, Townsend 1979; 1987 and UN, 2007).

The thesis utilizes the Bristol deprivation framework to evaluate multidimensional child deprivation in order to operationalize the child's rights-based approach to childhood poverty. The Bristol indicators of deprivation include food, health, education, housing, water, sanitation, and information. Figure 1 present the conceptual framework for analysing multidimensional child poverty. This framework borrows from Amartya Sen's Capability approach on how to analyse well-being (Sen, 1983). This approach adds capabilities (freedoms) and functioning's (opportunities) to the basic needs (Welfarist/Utilitarian approach) and the child rights (Alkire, 2002; Basu & Lopez-Calva, 2010; Biggeri & Cuesta, 2021).

According to the capability approach, people's level of freedom to advance or accomplish functions they value should be the primary criterion for measuring their level of well-being (Sen, 1985). The capability framework has been frequently referenced in the literature, and the UNDP

has utilized it as inspiration since the 1990s while developing the Human Development Index (HDI) (UNDP, 1990). The capability approach looks at how statutory freedoms—those protected by the UN convention on the rights of children—become actual freedoms (effective functionings).

In this thesis, the dimensions of capabilities include; being able to be well nourished, being able to avoid preventable sickness and premature mortality, ability to have a basic education, being able to be adequately and decently sheltered, being able to access drinkable water, being able to access sanitation facilities and being able to access information. In this transformational process, different mediating/moderating and confounding factors perpetuate this process. Mediating factors as variables that are affected by the independent variables but also affect dependent variables; moderating factors are variables not affected by the independent variables but it affects dependent variables while control variables are those that are kept constant to ensure that the findings are unaffected.

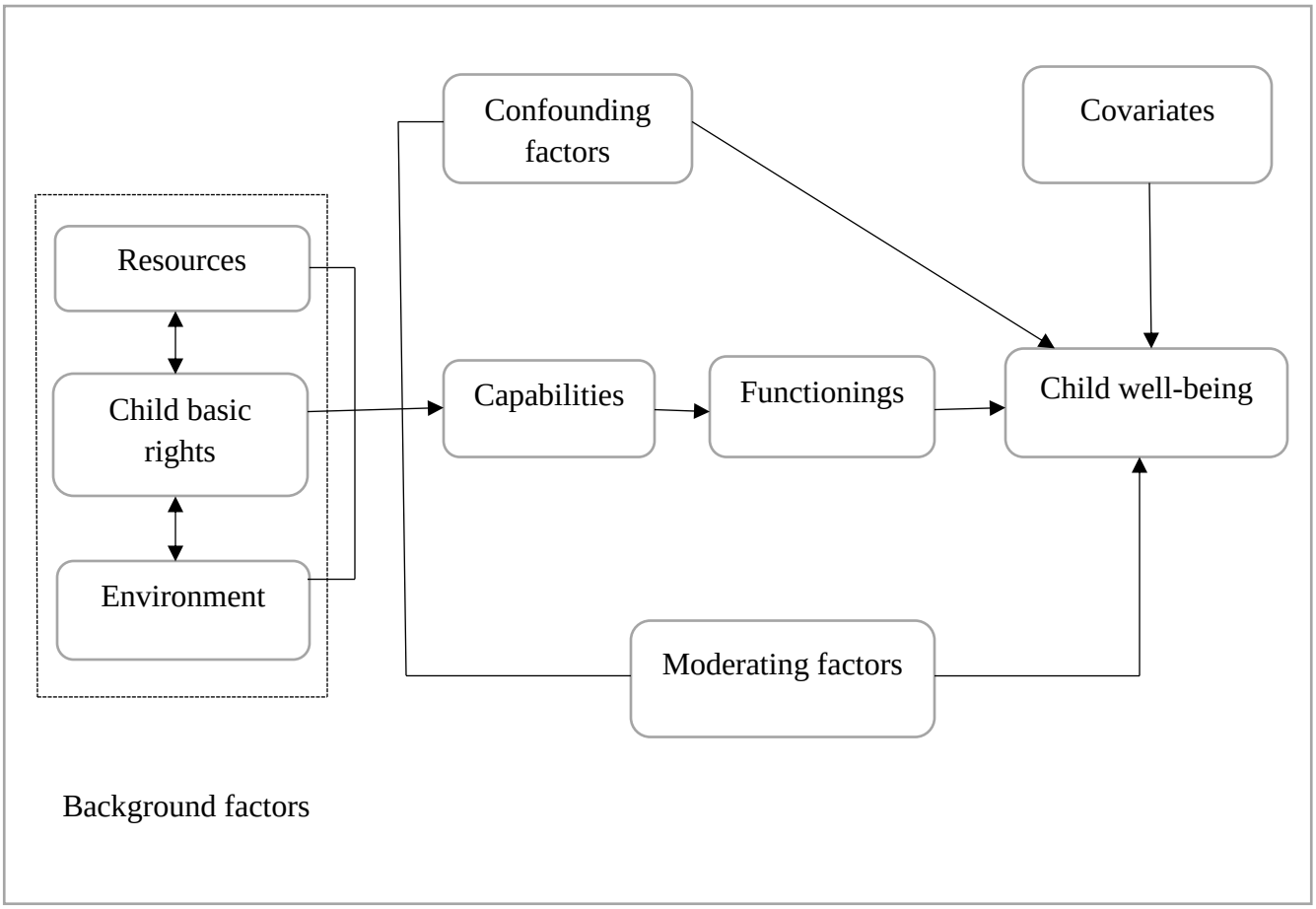
Among the confounding factors may include socio-cultural and political context, pandemics like the novel human Coronavirus which emerged in December 2019 in China, droughts, ethnic conflicts etc. The mediating factors may include the policies and interventions the government have brought forth to promote child development. These include universal primary education programme, free ante-and post-natal care, free vaccination of kids under 5 years of age, free day-secondary school education, cash transfer for orphans and vulnerable children, among others. We have also the control variable or the covariates. These include individual child, household and community characteristics, which also affect child well-being. Other covariates include the type

of religion the children profess, availability of infrastructural facilities like electricity within the community and the area of residence.

The background factors are underlying cause of child poverty. For example, household access to quality and quantity of resources for example land, employment, income, technology etc. that can influence child well-being. These resources are just a means, albeit an important one, to other ends like good health, schooling, housing and material standard of living.

Multidimensional inequality has also been studied using the capability approach. The capability-based analytical tool that evaluates social inequalities across seven domains of freedoms and functionings. The dimensions include inequality in the capability of being well nourished, inequality in the capability of being sheltered, inequality in the capability of being able to avoid preventable morbidity, and so on.

Figure 1: Conceptual framework for analysing multidimensional well-being



Source: Author's own compilation

1.1.6 Methodological approaches

This thesis uses a number of approaches to meet its three broad objectives in order to understand the complexity of children's well-being and outline several interventions to improve children's well-being and enable them attain their full potential.

The goal of the first essay was to assess the prevalence, breadth, and severity of different deprivations in Kenya. We estimated the levels and trends of multidimensional child deprivations using two multidimensional approaches. First, we applied the Bristol framework (Gordon et al.,

2003) to measure child deprivation in the Kenyan context. This method was created to gauge how severely lacking in fundamental needs children are in poor nations. According to this methodology, a child is considered to be living in severe deprivation if they are experiencing at least one deprivation and in extreme poverty if they are experiencing at least two deprivations. However, the depth and severity of child deprivations are not taken into consideration by the Bristol approach.

The Bristol framework was then augmented by Alkire and Foster methodology (Alkire & Foster, 2011), which analyses the depth and severity of multiple deprivations. The Alkire and Foster methodology identifies children as multidimensionally poor if they are deficient in at least one-third of all the weighted dimensions. The Alkire and Foster technique yields the following ratios: the intensity of deprivation counts the average number of deprivations a poor child has as a percentage of all measured deprivations; the multidimensional headcount ratio examines the prevalence of multiple deprivation in various dimensions; and the adjusted multidimensional headcount ratio, which is a combination of the multidimensional headcount ratio and average/intensity of deprivations to assess how acute multidimensional deprivations are.

The objective of the third chapter was to extend analysis of chapter two by moving into multidimensional inequality. In this chapter, we examined the distribution of child-specific domains. Since the most of the domains of child well-being are binary and/or categorical in nature, we employed multiple correspondence analysis (MCA) and examined the distribution of these indicators across the children. The essay then combined these indicators and merged them into a composite index of well-being. These aggregated indices are then used to calculate

multidimensional well-being inequalities. There are several summary measures of inequality. These include; Range, Coefficient of variation, Kuznets ratio, Gini coefficient, Atkinson's measures and the generalized entropy indices that includes Theil indices (Cowell, 2011). The Gini coefficient and the Theil indices are the most well-known and widely used measures in economic literature. This is because they possess desirable properties of an inequality index.

To measure the distributive indices of multidimensional inequality, the essay applied Araar (2009) hybrid multidimensional index of inequality. The hybrid Multidimensional Index of inequality (MDI) is additively decomposable by its components. This property is quite attractive as it allows for the decomposition of multidimensional inequality to its components (Araar, 2009). Finally, the chapter also decomposed the overall inequality using the regression-based decomposition pioneered by Shorrocks (1980; 1982 & 1984). In these studies, Shorrocks developed techniques for breaking inequality down into subgroups of the population, such as single people, married people and families with children, as well as into smaller groups of observations that have characteristics in common, such as age, household size, geography, occupation, or other characteristics.

In the 1980 article, he showed that a number of inequality measures were additively decomposable. According to his definition of an additive decomposable inequality, it can be written as a weighted total of inequality values computed for population subgroups plus the contribution arising from changes in subgroup means. Other pioneers in this realm are Bourguignon (1979) and Cowell (1980). Decomposition of inequality is important for establishing the influence of various components to total inequality and hence aids policy formulation and targeting.

Chapter four carries essay three in which we investigated the main factors associated with numerous child deprivations. The first objective of this essay was achieved by the patterns of multiple child deprivations by various characteristics, such as gender, area of residence, household headship among others. The second objective shifted the focus of distribution analysis and examined the socio-economic determinants linked to various forms of child deprivations. The study ordered the children from those who are not deprived to those who are experiencing at least 4 deprivations and chose to use an ordered regression model. The essay subsumed that a kid deprived in 4 or more dimensions is worse-off compared to a kid deprived in one dimension. The commonly used models to calculate estimates for regressors in the context of ordered responses are ordered probit model or ordered logit model (Long and Freece, 2001). However, the essay settled for an ordered logit regression model by assuming that the error term does not follow a normal distribution.

1.1.7 Contribution of the thesis

This thesis contributes to the knowledge of child well-being. There is a dearth of studies concerning child well-being in Kenya and therefore the country has not been able to adequately track the well-being of children. Past researches have measured child well-being using income or consumption and expenditure. To promote child well-being policies and programs, it is imperative to consider many dimensions of child well-being as much as possible. Besides contribution to knowledge by measuring child well-being using a multidimensional approach, this thesis also draws implications for policy, programs, and resource targeting. For poverty reduction policies and programs to succeed, there is need to conceptualize and measure poverty using more than one

dimension. This will in turn influence and re-orient both public and private spending to sectors that have relatively greater impact on children's well-being.

The concepts of poverty and inequality are intrinsically linked and are critical aspects of human development. This thesis introduced a paradigm shift of measuring and analyzing inequality using a multidimensional perspective. A knowledge gap also exists in the literature regarding the inequality of well-being outcomes especially among Kenyan children including access to public services. The existing evidence in Kenya does not take into account the multidimensionality of inequality and not aligned to SDG clarion call of leaving no one behind.

The thesis has important implications for policy. First, a unidimensional approach to the assessment of well-being is likely to give incomplete information, which in turn affects policy design, monitoring, and evaluation. Second, the thesis examines spatial and gender disparities in well-being among Kenyan children for a period of two decades for which no empirical evidence is available to date. A regression model was used in inequality decomposition to examine the factors driving well-being inequalities among Kenyan children. This has helped to identify variables that contribute to inequality in child well-being so that policy makers can design suitable policy intervention to target these variables and reverse the trends.

Third, a study of the correlates of multiple child deprivations is crucial for child well-being because it facilitates the determination of factors that influence multiple child deprivations. The elements affecting multiple child deprivations in Kenya are examined for the first time in a thesis of this kind. Fourth, the thesis takes stock of the well-being of Kenyan children from early 1990s, which

coincides with the ratification of the Convention of the Rights of the Child (CRC) by the Government of Kenya. Furthermore, it assesses the success of the Millennium Development Goals (MDGs) whose implementation period ended in 2015 and can be regarded as the benchmark for the Sustainable Development Goals (SDGs) related to child well-being whose implementation in Kenya began in January 2016.

Fifth, Kenya's long-term development plan, the Vision 2030, envisages a highly competitive economy driven by science, technology, and innovation (Government of Kenya, 2007). This requires a highly trained labor force with requisite skills and capacities to contribute to economic, social, and political development. To enhance the realization of the vision and the availability of quality human capital, there is need to understand how the children of today are growing so as to prescribe interventions early. Children could offer enormous gains later in life if their basic needs are met while they are still young.

1.1.8 Data source

The Kenya Demographic and Health Surveys (KDHS) data sets from 1993 to 2014 were used in this research. The surveys are comparable and nationally representative. The 2014 KDHS used the 5th National Sample Survey and Evaluation Programme (NASSEP V) that is based on 2009 Kenya Population and Housing Census (KPHC). The 2008-09 and 2003 KDHS used the NASSEP IV based on 1999 KPHC while 1993 and 1998 KDHS used the NASSEP III frame based on 1989 KPHC. The 2014 KDHS is the sixth survey to be undertaken in Kenya since 1989 (CBS, 1993; 1998; 2003; KNBS 2008-09; 2014). These surveys were carried out by the Kenya National Bureau of Statistics (KNBS) in partnership with in the Ministry of Health, the National AIDS Control

Council (NACC), the National Council for Population and Development (NCPD), and the Kenya Medical Research Institute (KEMRI). The KDHS collects information from the population relating to health, childhood, child and maternal mortality, nutrition, water supply, and sanitation facilities, among others from the sampled respondents.

The 2014 KDHS collected information from a sample of 31,079 women whose ages ranged from 15-49 years and 12,819 men aged 15-54 years from a sample of 36,430 households. The survey was done from May to October 2014. In total, 153,840 individuals were surveyed consisting of 79,114 children below 18 years (KNBS, 2015). Similarly, the 2008-09 KDHS collected information from a sample of 8,444 women between 15 and 49 years and 3,465 men aged 15-54 years from the 9,057 households that were sampled. The sample consisted of 37,873 individuals with 19,192 being below 18 years of age. The data were collected in November 2008 to February 2009.

The 2003 KDHS interviewed 8,195 women aged 15-49 years and 3,578 men aged 15-54 years from 8,561 households (CBS, 2003). There were 5,949 children under 60 months. In the 1998 KDHS, information was captured from 7,881 women aged 15-49 years and 3,407 men aged 15-54 years. There were 5,672 children below 5 years. The survey was carried out during the months of February and July 1998 (CBS, 1999). The 1993 KDHS corresponds to a survey of 7,540 women aged 15-49 years and 2,336 men aged 15-54 years from a sample of 8,805 households (CBS, 1994).

The choice of these data sets was necessitated by the desire to take stock of the implementation of the Convention of the Rights of the Child (UN 1989) which were ratified in Kenya in 1991 and

also act as an evaluation of the implementation of MDGs which came to an end in 2015. Subsequently, the study will act as a benchmark or baseline for the implementation of the SDGs which came into effect in January 2016. The findings are still a concern as they fall short of MDG targets and a lot of work need to be done to meet the SDG targets by 2030.

1.1.9 Organization of the thesis

The remainder of this thesis consists of four chapters. Chapter two evaluates the incidence, depth and severity of multiple child deprivations. The dimensions of child well-being are anchored on the convention of the rights of the children and customized to the Kenyan context. Chapter three focuses on measurement of multidimensional child well-being inequality and examines the influence of various characteristics on overall inequality. The multiple correspondences analysis (MCA) was used to calculate composite welfare indices and thereafter calculate various measures of inequality. A hybrid index of multidimensional inequality was then used to analyse the different distributive indices.

Using an ordered logit model, chapter four explores the causes of multiple child deprivation. The fact that these deprivations can be ranked or ordered from a kid who is not deprived in any dimension up to the extremes when a child suffers deprivations in four or more dimensions guided the selection of the econometric model. The thesis is summarized and concluded in chapter five

2.0 CHAPTER TWO

2.1: INCIDENCE, DEPTH AND SEVERITY OF CHILD DEPRIVATIONS

2.1.1 Introduction

Poverty estimates based on just income or consumption expenditure portray a narrow perspective of well-being (Alkire and Foster, 2011; Bourgignon and Chakravarty, 2003; Laderchi, Saith, and Stewart, 2003; Sen, 1983). This is because well-being is not only determined by income or consumption expenditure but also non-monetary indicators such as nutrition status, health status, housing conditions, literacy levels (Kim, 2019). Sen (1999) emphasizes that poverty estimates should be evaluated with all the components of well-being that comprise material resources and capabilities and functioning of an individual. Thus, poverty is a multi-dimensional concept.

Traditionally, poverty primarily refers to lack of income. An individual or a household with incomes falling below the predetermined poverty cut-off is regarded as poor. Deprivation, on the other hand, reflects the multidimensional notion of poverty (Townsend, 1979). This includes, other than low income, disadvantages faced by individuals such as improper waste disposal facilities, lack of clean drinking water, poor health, lack of food (malnutrition), poor educational outcomes, and precarious housing conditions (UN, 2007). These deprivations hinder children from growing to their full potential.

Therefore, a deprived child lacks vital material conditions and services for development and is therefore unable to reach full potential (Minujin et al., 2006). Poor children are deprived of food, water, sanitation, health, information, shelter and education (UNICEF, 2005).

Globally, it has been realized that children are over-represented among the poor. This was deliberated on during a United Nations meeting where 117 nations ratified the CRC (UN, 1989). A total of 194 countries have ratified the rights by 2014 (UN, 2014). In the spirit of the Agenda 2030 and Sustainable Development Goals of leaving no one behind, policy dialogue should focus on children as an independent group in the society, and whose well-being needs to be identified separately from adults to combat child poverty.

Given the grave implication of child poverty and the shortcoming of standard welfare measures, it is imperative to examine the complexities of poverty based on child specific multiple indicators. This study departs from traditional poverty analysis and adopts a multidimensional deprivation analysis.

2.1.2 Statement of the Problem

The formative years of childhood are crucial for development and shape how people will live in the future. The foundation for life and development is laid during this time, so it is important to prioritize a child's best interests. The effects of deprivations on a child are widely acknowledged to have detrimental outcomes. Children may become handicapped or succumb to diseases like polio, TB, or measles if they are not immunized against them. Other forms of deprivations may result in death and/or impairment. Additionally, crucial to their future adult lives is this time period for the development of their mental and emotional well-being, educational and cognitive skills, and mental health (Minujin & Delamonica, 2005; Ortiz, 2012).

Furthermore, research has demonstrated that childhood deprivations can have long-term repercussions since they make disadvantaged kids into poor adults who then pass on poverty to their offspring. This worsens poverty in a society, endangering government efforts to eradicate poverty (Corak, 2005; 2006). While Vandemoortele (2012) emphasized that fairness starts with children, UNICEF has argued that addressing child poverty is the most effective way to end poverty in a society (UNICEF, 2004).

Kenya is a young nation that is still developing. In both the 2009 Kenya Housing and Population Census (KPHS) and the 2019 KPHS, 54% and 50% of the population, respectively, were under the age of 19 (KNBS, 2019). This demonstrates unequivocally that Kenya's children are the country's future. By 2030, children of today will be in charge of the economy when the Vision 2030 anticipates an upper middle-income economy. Given that the majority of Kenya's population is young, there is therefore a significant chance that the demographic dividend will be realized.

Numerous empirical researches have examined the multifaceted nature of child deprivation (Bradshaw et al., 2007; Land, Lamb & Mustillo, 2001; Minujin, 2011; Moore et al., 2008). However, there is little empirical data to support Kenya's claims of child poverty (Kabubo-Mariara et al., 2011). The well-being of children was studied by Kabubo-Mariara et al. (2011) based on assets and nutritional status. By incorporating additional child-specific characteristics of well-being that were not covered by earlier studies, this study expands on this line of inquiry. To the best of our knowledge, this is a first-of-its-kind investigation on the state of children's well-being in Kenya from a range of perspectives to help with the development of effective intervention strategies.

In Kenya in 2014, the infant mortality rate was 39 per 1000 live births, while the mortality rate for children under the age of five was 52 per 1000 (KNBS 2015). According to predictions provided by the World Bank, the infant mortality rate was forecast to fall to 31.9 deaths per 1000 live births in 2019, while the under-five mortality rate was forecast to fall to 43.2 deaths per 1000 live births (World Bank, 2020). These rates are significant and very troubling when compared to the Sustainable Development Goals (SDG) targets of 25 deaths per 1000 live births for the under-five mortality rate by the year 2030 (UNGA, 2015).

Children who received all recommended vaccinations climbed slightly from 71% in 2008 to 72% in 2014. However, the vaccinations coverage fell from 77% in 2008 to 71% in 2014, posing major threats to their well-being (KNBS, 2015). Vaccination coverage differences among 1-2-year-olds in Kenya were examined by Donfouet, et al. (2019). The findings show that inequities have continued over time and are favored in Kenyan homes headed by women with at least a secondary education. Children delivered in clinical settings have a better likelihood of having full vaccination coverage, according to findings by Allan, Adetifa, and Abbas (2021).

Children who are malnourished have a higher death rate and have been shown to have slower mental growth. According to data from the 2014 KDHS, there was an improvement in children's nutritional status between 2008 and 2014, with stunting rates dropping from 35% to 26%, wasting rates from 7% to 4%, and the percentage of underweight children falling from 16% to 11%. Children's nutritional status is still falling or stagnant, particularly in locations where there is food insecurity, which exacerbates other aspects like health and education.

Infant mortality and malnutrition rates have decreased, but there is a chance that the continuing global Corona virus (COVID-19) pandemic will cause these numbers to deteriorate. Despite the fact that each of these issues existed before to COVID-19, the pandemic has negatively impacted the availability of food, nutrition, and healthcare services (Alkire et al., 2020). A higher risk of COVID-19 is predicted by lack of access to clean water, inadequate diet, and subpar housing, as well as poor hygiene, compromised immune systems, and respiratory disorders (WHO 2017; 2018; 2019; Alkire et al., 2020). Policymakers must confront poverty in all of its forms as a result of this horrible pandemic, especially for the most vulnerable people of our society. The children's already challenging circumstances are regrettably made worse by the COVID-19 outbreak.

To tackle and reduce child poverty, accurate conceptualization and measurement of child well-being is required to inform the design of interventions targeting poor children. Without accurate conceptualization and assessment of child poverty, directing resources to children with the greatest need will not be prioritized, thus hindering formulation and child sensitive budgeting of child welfare programmes. This study emphasizes the need of investigating child poverty from various angles.

2.1.3 Research Questions

This essay's research questions are as follows.

(i) What are the levels and trends of multiple child deprivations in Kenya?

(ii) What are the levels and trends of multiple child poverty indices in Kenya?

(iii) How has the magnitude of multiple child deprivations in Kenya evolved between 1993 and 2014?

(iv) Which population subgroups of children in Kenya are multiply deprived?

2.1.4 Objectives of the Study

This essay aims to evaluate the incidence, depth and severity of child deprivations in Kenya. Specifically, the essay seeks to:

(i) Analyse the levels and trends of multiple child deprivations in Kenya;

(ii) analyse the levels and trends of multiple child poverty indices in Kenya;

(iii) Decompose the multidimensional child deprivation indices by dimension, region and county governments.

(iv) Draw policy interventions for reducing child deprivations.

2.1.5 Contribution of the Study

There are several ways in which this essay contributes to the corpus of literature in a number of different ways. First, based on the Bristol framework (Gordon et al, 2003), it employs a comprehensive collection of seven child-specific well-being dimensions. Second, it uses Alkire and Foster's (2011) methodology to calculate the prevalence, severity, and depth of child deprivation in Kenya. Third, the essay makes use of cross-sectional survey datasets that cover the years 1993 through 2014. Thus, the study serves as a baseline for the implementation of the Sustainable Development Goals and assesses the wellbeing of children in Kenyan since Kenya adopted the Convention on the Rights of the Child (UN, 1989) in 1991. The report also makes policy conclusions for reducing child deprivations. In its conclusion, it offers more and in-depth empirical data on Kenya's position regarding children's well-being.

2.1.6 Source of Data

The KDHS provided the data for this study, which covered the years 1993 through 2014. In chapter one of this thesis, the data are provided in great detail.

2.1.7 Outline of the Study

Literature review is included in the following section. The study's methodology is provided in Section 2.3, and Section 2.4 discusses the study's conclusions. Section 2.5 presents the summary, conclusions, and policy implications.

2.2 Literature Review

2.2.1 Introduction

In this part, a review of the literature is provided. Beginning with the idea of child deprivation. The second sub-section examines the literature on child deprivations is examined, and the final subsection provides a summary of the literature.

2.2.2 Concept of Deprivation

In the literature, the notion of deprivation is closely related to poverty. Traditionally, poverty has been conceptualized to refer to low income and/or inadequate consumption expenditure (Gordon et al., 2003). Deprivation goes beyond this philosophy to include other conditions, other than income, which contribute to well-being. Townsend (1979) pioneered the concept of deprivation in a comprehensive way. He conceptualized poverty to include wider perspectives of social relationships and relativist terms (Townsend, 1987).

Following the summit in Copenhagen, Denmark, in 1995, the UN designated severe deprivation of basic needs as "absolute poverty" (UN, 1995). Food, water, sanitation, health, information, and education are among these essential requirements (UN, 1995). Therefore, child deprivations mean not having enough food to consume, not having schools or hospitals to go to, not accessing safe drinking water, lack of sanitation facilities, not having shelter to protect themselves at night or not accessing information by any means (UN, 2007).

This definition warranted that child well-being does not consider children in poor or affluent households, but accessibility to basic needs and services including food, water, sanitation, health,

information and education. This conceptualization calls for assessment of well-being in a multidimensional perspective.

2.2.3 Assessment of child deprivation and poverty

Assessment of child deprivation is based on three main approaches. These include holistic child poverty metrics, child deprivation indices, and child deprivation headcount ratios (Roelen & Gassmann, 2008). Deprivation headcount ratios are determined by each person's level of information. This approach yields the proportion of children falling below a predetermined threshold and provides headcount/incidence ratios (Roelen and Gassmann, 2008). An example is the income poverty approach, which is calculated using income or consumption and expenditure.

The number of children residing in households with incomes that are below the predefined poverty threshold is how the income approach measures child poverty. The underlying presumption is that income strongly correlates with children's wellbeing. The requirements of children and their consequent well-being, however, are underestimated by income metrics. Since poverty is multidimensional, a measure of child well-being should be child-specific and consider more than one dimension when assessing well-being. Furthermore, each child should be the study's unit of analysis. However, monetary approach is still widely used in the whole world (Laderchi et al., 2003).

The Bristol Deprivation Framework is another strategy that falls under the category of count-based methods (Gordon et al., 2003). This multifaceted framework looks at disadvantages in seven areas that specifically affect children, including food, shelter, water, sanitation, health, information, and

education. According to this method, children are judged to be living in extreme poverty if they are subjected to two or more of the aforementioned deprivations. The problem with this methodology is that it does not determine the breadth (the gap between rich and poor) and depth of deprivations (Alkire & Foster, 2011; Delamonica & Minujin, 2007). UNICEF has adopted this approach to analyze child deprivations for policy making purposes (UNICEF, 2005). The levels and trends of different child deprivations in Kenya are estimated using the Bristol deprivation framework in this essay. Additionally, it expands upon this concept by applying the Alkire and Foster (2011) methodology to analyze the breadth and severity of child deprivations.

Alkire and Foster (2011) is also another count measure approach to child poverty. This method aggregates dimensions of deprivation into an index. In addition to this, it determines whether or not a child is multidimensionally poor based on the number of areas in which they are lacking simultaneously. For example, if a child is deprived in one-third of all the dimensions, then a child is considered multidimensionally poor. This approach also permits other poverty measures such as intensity and depth of poverty to be calculated. The MPI index can be disaggregated into subgroups of the population and broken down by dimensions, which is key for targeting public policy. These figures are very essential, especially because they make it easier to compare different subgroups and create profiles of different types of multidimensional child deprivation. In this essay, the methodology was utilized to obtain the adjusted headcount ratios, which reflect both the incidence and intensity of multiple child deprivations.

The second method is the use of composite well-being indices in assessing the welfare of individuals or households (Filmer & Pritchett, 1999; 2001; Filmer & Scott, 2008). These indices

are often more effective than income or consumption and expenditure estimates in assessing the welfare of households (Filmer and Pritchett, 1999). In absence of income data, asset indices derived from ownership of assets are used to infer household wealth (Filmer and Pritchett, 1999; 2001; Filmer and Scott, 2008; Kabubo-Mariara et al., 2011) in measuring household poverty and child poverty. A critical issue in this approach is the choice of weights, normalization and aggregation technique. Several empirical studies have used this approach to evaluate child poverty. These include Moore et al. (2007; 2008), Fernandez et al. (2011; 2012), Bradshaw et al., (2007), Bradshaw and Richardson (2009) and Land et al. (2001; 2007).

The third strategy is the application of comprehensive child poverty measures. Examples of these approaches are the Development, Exclusion and Vulnerability Framework, created by Children Christian Fund (Wordsworth et al., 2007) and the Young Lives Approach, a project started by DFID and Save the Children UK in 2001 (Young Lives, 2001). These methods analyze changes in child poverty in particular countries over a long period of time using both qualitative and quantitative methods. However, these methods have not been improved for use in measurement analysis and child poverty analysis (Feeny & Boyden, 2003).

2.2.4 Empirical Literature

The empirical study of child well-being has four main strands. We start with the child and youth well-being index for the USA (Land et al., 2001; 2007). For the years 1975–2001, the authors used 28 time series indicators that were combined into 7 domains. The index is a measure of the variable change expressed in percentage from the year 1975. All subsequent observations were calculated from the base year of 1975 up to 1985 when they changed the base year. The findings indicate that

American children's well-being declined progressively throughout the 1980s and peaked in the 1990s. From 1993, an improvement of child well-being was observed through to 1998 but lower than 1975 levels. The results were consistent with their earlier study of 2001. Because some of the variables utilized are not available in developing countries, the index's applicability to these nations is restricted. Comparatively to the USA, Kenya collects far fewer data sets on an annual basis.

Another body of research focuses on the American child well-being index, which was constructed using micro-level data (Moore et al., 2007; 2008) rather than macro-level data by Land et al., (2001; 2007). In both studies, the authors used exploratory analysis, examining the mean scores and distribution of children against various characteristics. In the 2007 study, the authors chose 29 indicators distributed over five (5) domains. The study made use of the American Household Survey (NSAF) data sets from 1997, 1999, and 2002. Results from the 2007 study show that girls are better off than their male counterparts. They also found that children aged between 6 and 11 years do better than those between 12 and 17 years in terms of well-being. Children who were white and not Hispanic fared better than those who were black and not Hispanic. Further, the authors found that characteristics related to family, community, and socio-demographic background contributed positively to overall well-being index. In the 2008 study, the authors constructed a different index using new micro-level data sets of 2003-2004. This index comprised 69 indicators grouped into seven (7) clusters. The authors of this study discovered that characteristics related to family, community, and socio-demographic environment have a favorable impact on the overall well-being index.

Last but not least, a key indicator of children's well-being was pushed in Europe by Bradshaw et al. (2007) and Bradshaw and Richardson (2009). Using 51 indicators condensed into 23 domains and 8 clusters for 25 European Union (EU) member states, Bradshaw et al. (2007) examined the child well-being index. They further ranked EU member states, and children from Slovenia had the lowest rates of child poverty while Greece had the highest rates. Overall, child well-being was best in Denmark, while it was worst in Lithuania.

Bradshaw and Richardson (2009) revised the data and enlarged their index to include all 27 EU member states in their 2009 study. Iceland and Norway were the two new nations. However, the new data set did not have information on citizenship and, therefore, they expunged this domain with its indicators. The indicators decreased to 43 and were grouped into seven categories as a result. The outcomes of the study on children's wellbeing were consistent with their earlier study. The Netherlands had the best child well-being, while Lithuania had the worst. They discovered that child's well-being correlated negatively with inequality and positively with a country's GDP per capita.

Moving away from indices, other studies have examined child well-being in a multidimensional perspective (Bastos et al., 2004; Bastos & Machado, 2009). These studies combined household income and non-financial aspects of living standards. In Portugal, Bastos et al. (2004) examined poverty derived from income and child deprivation and found that they do not overlap. This suggests that income poor children may not be deprived or otherwise. Contrary to research conducted in the same country by Bastos and Nunes (2009), who found that household income per adult equivalent supported non-financial dimensions of deprivation in homes with children. In

terms of deprivations, families with four or more children and single parents were also disproportionately represented. However, Jenkins (2000) and Thorbecke (2008) criticised the use of per adult equivalent income because there is an unequal distribution of income within a household. Further, the unit of analysis in these studies was household unlike this study which is a child. This essay uses child-specific indicators of well-being. Such indicators make the well-being of children more visible (Roelen, Gassmann & Neurbourg, 2008).

The first study to evaluate children's well-being in developing countries from a multidimensional perspective was Gordon et al., 2003. The authors used seven child-specific dimensions. These are: sanitation facilities, access to information, safe drinking water, vaccinations against diseases, adequate and balanced diet food (nutrition), education attainment, and type of shelter. The authors children who were impoverished in one or more aspects were defined as being in severe deprivation, while those who were deprived in two or more dimensions were defined as being in absolute poverty. The study used a very high level of cut-off for severe deprivation because the intention was not to allow any deprivations at all for children as they negatively affect their future (Minujin & Delamonica, 2005).

According to the findings of Gordon et al. (2003), over fifty percent and thirty percent of children were deficient in at least one and two domains in developing countries, respectively. In general, 80% of children in Sub-Saharan Africa and Southern Asia endure severe deprivation. When compared to their counterparts in urban areas, over 90% of children in rural areas of these two regions experience severe deprivation. More over 30 percent of children in SSA are deficient in two or more domains. Gordon et al. (2003) determined headcount ratios for deprived children only.

To effectively reduce and eradicate acute poverty, it is essential to comprehend its depth and severity. Although simple to construct, the headcount ratio lacks the desirable characteristics of a poverty index, such as monotonicity and transfer principle (Sen, 1976).

The headcount ratio of child deprivation is just one of the characteristics of child poverty. Although easy to compute and interpret, the incidence or headcount ratio does not give sufficient information for policy formulation and prioritization of programmes targeting poor children (Alkire and Roche, 2012). To enable formulation of policies targeting poor children, the depth and severity of child deprivations should be carried out (Delamonica & Minujin, 2007). This essay extends the literature by examining the depth and severity of deprivations for the Kenya children using Alkire and Foster (2011) methodology.

The same methodology was employed by Alkire and Roche (2012) to assess child poverty in Bangladesh. This was an improvement on the Bristol framework (Gordon et al., 2003) which uses only headcount ratios. The authors used Bangladesh data from 1997-2007 to compute multidimensional poverty indices. These indices go beyond headcount ratios and calculate the depth and severity of multi-dimensional poverty indices. The results show a decline of MPI indices. For example, the adjusted headcount ratio has decreased from 55% in 1997 to 40% in 2007 while multidimensional headcount ratio decreased from 83% to 66% in the same period. The intensity of poverty has also decreased from 67% in 197 to 61% in 2007. This Alkire and Foster approach is appropriate to policy makers as it has a range of practical applications. However, this has been criticised by Gordon and Nandy (2012) for lacking fundamental theoretical underpinnings. However, its originators vehemently dispute this critique (Alkire & Roche, 2012).

Despite this continuous debate, Gordon and Nandy (2012) agree with the elegant mathematics in AF methodology but observed that the results for Bangladesh children based on the AF methodology were almost similar with those of Gordon et al. (2003).

The Bristol deprivation framework has been used to examine the welfare of children in Uganda, Mozambique, Tanzania and DR Congo (see for instance, Batana et al., 2014; UNICEF, 2006; Minujin & Delamonica 2012; Nanivazo, 2014). It was found in Uganda that 55% of children were lacking at least two dimensions and 24% dwell in abject poverty. In DR Congo, Kinshasa Province was ranked the best in child well-being followed by Kasai-Oriental and the lowest being Equateur province. Results from Tanzania indicated that multidimensional poverty evaluation was significantly higher than traditional poverty estimates, particularly in rural areas. Compared to only 10% of children in urban areas, about 50% of children in rural areas experience deprivations across three or more dimensions. Approximately 41% of the population in mainland Tanzania had severe deprivations, compared to 19% in Zanzibar.

Kabubo-Mariara et al. (2011) computed a composite wealth indicator (CWI) using multiple correspondence analyses to obtain the values of each deprivation dimension and then utilized the principal components analysis (PCA) to obtain the continuous dimensional values. They then employed Alkire and Foster (2011) methodology to assess child well-being using two domains i.e. CWI and child health-related indicators (anthropometric measures). The findings indicate that the proportion of poor children vary across population subgroups and regions. However, the study examined child poverty based on two dimensions, only; that is nutritional status and CWI. We argue that there are more dimensions of well-being that were left out that affect child well-being.

This essay addresses this issue by focusing on seven aspects of wellbeing that are unique to children.

The recent study on child poverty in Kenya is by KNBS (2017). KNBS (2017) used the multiple overlapping deprivation analysis (MODA) methodology to evaluate child poverty in Kenya. The study used KDHS data from 2014. According to the study, children between 12-59 months experienced considerably more deprivations than infants between the ages of 0 and 11 months (12% vs. 12%). Between 12 and 59 months, the nutrient deprivation rate was 37%, and between 0 and 11 months, it was 17%. Sanitation, at 54 percent, and housing, at 53 percent, were the two areas of greatest deprivation for children ages 0 to 11 months. Children between the ages of 5 and 14 showed the greatest levels of deprivation in housing (52%), followed by sanitation (58%). The performance of health, education, and information came in at 38%, 37%, and 27% respectively.

2.2.5 Overview of Literature

In Kenya, there have only been a handful of studies that take a multifaceted perspective at how our children are doing. Using a composite welfare indicator and child-health, Kabubo-Mariara et al. (2011) analysed multidimensional poverty among children in Kenya. Several other dimensions that are important to child well-being have not been studied. This has left a considerable gap in knowledge about the magnitude, trends and distribution of multidimensional child poverty which this essay strives to fill. Another study which has attempted to estimate child deprivations is by KNBS (2017). However, this study solely evaluated child deprivation as per KDHS 2014. This essay investigates child deprivations utilizing the internationally recognized child well-being domains-Bristol deprivation indicators-throughout five waves of the KDHS from 1993 to 2014.

The essay also decomposes multidimensional poverty by region and county and also breakdown overall multidimensional indices into its components.

This essay therefore adopts the Bristol deprivation indicators in the context of Kenya to analyze the welfare of Kenyan children. The Bristol framework is augmented with the Alkire and Foster (2011) methodology. Based on the findings, we prescribe policy recommendation to reduce child deprivations in Kenya.

2.3 Methodology

2.3.1 Introduction

To answer the research questions, we employ a variety of approaches. In section 2.3.2, we first present the indicators that were utilized to measure the child-specific dimensions then followed by analytical frameworks in section 2.3.3.

2.3.2 Choice of Dimensions and Thresholds

In this essay, the Bristol deprivation indicators developed by Gordon et al. (2003) are utilized to conduct a multidimensional assessment of child poverty in Kenya. Children are deemed to be in dire need when they do not have access to adequate levels of food, water, housing, sanitation, or information. These dimensions are all asymmetrical and indivisible because they are all taken from the Convention on the Rights of the Child. However, we have examined simultaneous deprivations and relative importance of each of these attributes of child poverty. Children's wellbeing is likely to suffer significantly from deprivations in these areas. A child who experiences deprivation in one or more aspects is considered severely deprived, whereas a kid who experiences deprivation in two or more dimensions is considered to be extremely poor, according to the Bristol Deprivation Framework (Gordon et al., 2003; Minujin et al., 2006; Batana et al., 2014).

In this essay, the deprivation indicators from Bristol approach were operationalized for the Kenyan setting as shown in Table 2.1, based mostly on conventional measures as advocated by WHO, UN Habitat, UNESCO and the Constitution of Kenya.

Table 2.1: Dimensions and indicators of child deprivations

Dimension	Indicator	Reference population	Deprivation cut-off	Source
Nutrition/ Food	Stunted underweight wasted	< 5 years < 5 years < 5 years	z-scores below -2 standard deviation below reference median population	CRC Art. 24; CoK Art. 43, 53; SDG 2; WHO, 2006
Health	Immunization against BCG, DPT, Polio and Measles	< 5 years	Have not been immunized against any disease	CRC Art. 24; CoK Art. 43, 53 SDG 3; WHO 2006
Water	Water sources and distance to water source	All Children	Surface water, i.e. ponds, streams, rivers, dams, lakes OR time to fetch water takes more than 30 minutes	CRC Art. 24; CoK Art. 43; SDG 6; WHO 2006
Sanitation	Type of toilet facility	All Children	Lack of toilet facilities in or around households	CRC Art. 24; CoK Art. 43; SDG 6 WHO 2006
Shelter	Main material of floor and roof	All Children	Floor: earth, sand, dung Roof: thatch, palm leaf	CRC Art. 27; CoK Art. 43, 53; SDG 11 UN Habitat
Education	School attendance/ Attainment	6 to 17 years	School-aged children never been to school or not attending school or drop outs (UNESCO standards)	CRC Art. 28; CoK Art. 35, 43; SDG 4 UNESCO WHO 2006
Information	Household possession of radio and television	3 to 17 years	No radio and television (MDG 8)	CRC art. 13; 17 CoK Art 35

Source: Adopted and modified from Gordon et al. (2003)

2.3.3 Analytical Framework

The analytical framework for measuring child deprivation follows two methodologies. These methodologies enhance the traditional income-based approach. The research conducted by Gordon et al. (2003) was the first of its kind to measure child deprivations in developing countries from a multidimensional point of view. However, the Bristol method only takes into account (through headcount ratios) the total number of disadvantages that the children are subjected to. The flaws of headcount ratio are that it cannot be decomposed by dimension and population subgroups. Thus, in this study, Bristol approach is augmented by AF methodology (Alkire & Foster, 2011) which analyses the headcount ratios, depth, severity and subgroup decomposition of multidimensional child deprivations. We start with the formulation of Bristol multidimensional approach and subsequently AF methodology.

2.3.3.1 Bristol Deprivation Approach

In this methodology, there are three steps of analysis. The first step is to use indicators to analyze deprivation. Examining deprivation at each dimension's level is the second stage. The final step is to add the number of dimensions in which each child is poor and use the child poverty cut-off to determine whether or not a child is poor (Gordon et al., 2003).

At the indicator level, the notation is as follows:

$$IV = \frac{\sum_{i=1}^{n} I}{n} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .. (1)$$

Where *IV* represents "*vulnerable indicator*," "*I*" is a "*dummy variable*" with a value of "1" if a child is poor and "0" if not, and "*n*" is the sample of children for which the *I* indicator can be seen. The following gives the equation for dimension deprivation:

$$DV = \frac{\sum_{i=1}^{n} D_i}{n} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (2)$$

Where *D* is a dummy variable whose value is 1 if the child is lacking in that dimension and 0 otherwise, *DV* stands for dimension vulnerability. If a child experiences deficiency in at least one indicator within a given dimension, the child is considered to be deprived in that dimension. The notation can be expressed using equation 3 as follows:

$$D_i = 1, \quad if \sum_{i=1}^{d} I_i \geq 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where *d* refers to the total number of indicators that are contained within a certain dimension.

The third and final aggregation is at the dimension level. This gives us the child poverty rates based on the cut-off points. The literature has presented three approaches for measuring poverty rates. These three strategies are intersection, intermediate, and union (Gordon et al., 2003; Atkinson, 2003; Alkire and Foster, 2011). The union approach identifies poor children as those deprived in at least one dimension. In contrast, the intersection approach identifies poor children as those deprived in all dimensions. The intermediate approach, on the other hand, lies between the union and intersection approaches (Alkire and Foster, 2011). The disadvantage of union approach is that it gives a huge number of deprived children while the intersection approach gives a very low number of deprivations. Therefore, intermediate approach seems to be a better approach

than the two approaches (Alkire and Foster, 2011). The Bristol deprivation framework (Gordon et al., 2003) utilized the three approaches.

A child is considered severely deprived if they are lacking in at least one domain while absolutely poor if they are lacking in two or more domains. Equations 4 and 5 provide the notations.

$$SevDep = \frac{\sum_{i=1}^{N} Sev_i}{N} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

$$AbsPov = \frac{\sum_{i=1}^{N} Abs_i}{N} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

N denotes the total number of children aged 0 to 17 years. Sev_i and Abs_i stands for binary variables with values 1 if a child suffers at least one dimension or two or more dimensions, respectively.

$$Sev_i = 1 \ \ if \ \sum_{i=1}^{D} D_i \geq 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

$$Abs_i = 1 \ \ if \ \sum_{i=1}^{D} D_i \geq 2 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots . (7)$$

Where D denotes the overall number of dimensions that are being considered.

This essay uses this approach to evaluate the levels and trends of child deprivation. In addition to this, it calculates the rates of absolute child poverty as well as severe deprivation utilizing the

criteria established by the Bristol deprivation framework (Gordon et al., 2003). The methodology described below by Alkire and Foster (2011) supplements this approach. This is because the previous approach does not give the extent and severity of child deprivations.

2.3.3.2 Alkire and Foster Methodology

This methodology is one of the latest for measuring multidimensional poverty indices pioneered by Alkire and Foster (2011). It is used to measure global multidimensional indices published by United Nation Development Programme's (UNDP) Human Development Reports. The methodology follows two criteria, i.e., identification (who is poor?) and aggregation (construction of poverty indices) as propounded by Sen (1976). The notation for multidimensional headcount ratio, H, is given as:

$$H = \frac{q_k}{n}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where $q_k = \sum_{i=1}^{n} \rho_k(x_i; z)$ gives the proportion of people considered as poor given the poverty line *z* and cut-off *k*, in set Z_k. This index's simplicity in computation and comprehension makes it advantageous. However, one of the shortcomings of this measure is that it is a crude or shallow index of poverty. To circumvent this, additional information is included on the average of deprivations faced by the poor.

Let *c(k)* be the censored vector of deprivation counts defined as follows: If $c_i \geq k$, then $c_i(k)=c_i$, or person i's deprivation count; if $c_i<k$, then $c_i(k) =0$. Notice that *ci(k)/d* represents the share of possible deprivations experienced by a poor person i, and therefore average deprivation share across the poor is given by:

$$\text{Depth (A)} = \frac{\sum_{i=1}^{n} c_i\,(k)}{q} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where c_i stands for censored deprivation score of individual i and the proportion of children who are multidimensionally poor is q. This index portrays essential information that is the percentage of the possible dimensions d in which the average poor child experience deprivation.

When we adjust the multidimensional headcount ratio with the average number of deprivations experience by the poor children, we get the adjusted headcount ratio (M_0) as shown in equation 10.

$$M_0 = H \times A = \frac{1}{nd}\sum_{i=1}^{n} c_i \rho_k(x_i; z) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

In contrast to the multidimensional headcount ratio (H), the adjusted multidimensional headcount ratio (M0) satisfies desirable characteristics of a poverty index, which are crucial for formulating policy for targeting the poorest of the poor. This is because if one component of adjusted multidimensional headcount ratio increases or decreases, the index increases or decreases, respectively. The measure M_0 ranges between 0 and 1. This reflects the depth and severity of deprivations among those who are affected by multidimensional poverty. This essay employs equation 10 to measure multidimensional poverty indices of child deprivations.

2.3.4 Decomposition by Population Subgroups

This essay also aimed to highlight the impact of each subgroups on multidimensional poverty by breaking down the multidimensional poverty index by subgroups of the population. Because of

the desirable properties of the adjusted multidimensional poverty index, this is made practicable (Alkire and Foster, 2011).

Relevant subgroups of the population include gender of household head, urban *vs* rural, caste, ethnicity, regions (provinces, counties) and religion (Alkire et al., 2015). In this essay, we decompose the MPI by area of residence, i.e., rural and urban and region (provinces) and county governments. It is noted that the 2014 survey collected information based on county governments. The decomposition of the MPI to rural and urban is as shown in equation 11:

$$MPI_{country} = \frac{n_u}{n} MPI_u + \frac{n_r}{n} MPI_r \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (11)$$

Where u stands for urban children and r stands for rural children. Therefore, n_u/n is the population of urban areas divided by the total population, and n_r/n is the population of rural population divided by total population (assuming $n_u+n_r=n$). This relationship is applicable to numerous groups as long as they all constitute the total population.

The formula that follows the above notation is used to determine the contribution of each subgroup to overall poverty:

$$Contribution\ of\ u\ to\ MPI = \frac{\frac{n_u}{n} MPI_U}{MPI_{country}} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (12)$$

Notice that the contribution of all groups needs to be 100 percent.

2.3.4 Decomposition by dimensions

Once we have calculated the MPI, we can decompose the MPI by its components censored indicators. The formula for decomposition by dimension is as follows;

$$MPI = w_1 CH_1 + w_2 CH_2 + \cdots + w_7 CH_7 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (13)$$

Where w_1, is the weight of indicator 1 to overall MPI and CH is the censored headcount ratio of each indicator. The weights of all indicators should add up to 1. In a similar manner with the previous decomposition, we can also look at the contribution of each indicator to overall MPI simply by;

$$Contribution\ of\ indicator\ i\ to\ MPI = \frac{w_i CH_i}{MPIcountry} \times 100, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (14)$$

The total contribution from all indicators needs to be 100 percent.

2.4 Empirical Results

2.4.1 Introduction

This part presents the levels, trends and distribution of child deprivations in Kenya. We first present a brief on data used, followed by descriptive statistics of each indicator in the analysis. This is followed by headcount ratios, severe deprivation and absolute poverty ratios based on Gordon et al. (2003) deprivation approach. We then calculate the multidimensional poverty indices using the Alkire and Foster methodology (2011) and decompose the indices by dimensions, area of residence, regions and county.

2.4.2 Sample size of children

This essay used data drawn from the KDHS for the period 1993-2014. These surveys contain child specific information on their living standards. Table 2.2 presents the number of children that were analysed. We have categorized children into two groups, i.e., children under 5 years and the total number of children under 18 years. This is because health and nutrition dimensions apply only to this group of children. In 1993, the total number of children under 18 years were 21,242 of which 10,472 were males and 10,770 were females. In the same year, children under five years were 6,115 of which 3,054 were males and 3,061 were females. In 1998, the sample size for children was 19,591 of which 9,948 were male and 9,643 were female. There were 5,471 children under 5 years in the same period of which 2,799 were male and 2,672 were female. The same proportion were seen for children in 2003 and 2008 surveys. But in 2014, the sample size of children was 79,099 comprising of 40,208 males and 38,891 females. The sample size for 2014 is four times the sample size of the previous surveys. The KDHS 2014 data set surveyed 40,300 households as

opposed to 10,000 in previous surveys. In the same period, 21,970 children were under 5 years of which 11,116 were male and 10,854 were female.

Table 2. 2: Sample size for children

Year of Survey	Sex	Children < 5 years	Children < 18 years
	Male	3,054	10,472
1993	Female	3,061	10,770
	Total	**6,115**	**21,242**
	Male	2,799	9,948
1998	Female	2,672	9,643
	Total	**5,471**	**19,591**
	Male	3,015	9,543
2003	Female	2,934	9,192
	Total	**5,949**	**18,736**
	Male	3,180	9,886
2008	Female	3,011	9,593
	Total	**6,191**	**19,479**
	Male	11,116	40,208
2014	Female	10,854	38,891
	Total	**21,970**	**79,099**

Source: Author's Compilation using KDHS 1993-2014

2.4.3 Descriptive Statistics

Food (Nutrition) Deprivation

This dimension has three indicators for children aged 0 to 59 months. The indicators show whether a child is stunted, underweight or wasted. The international child growth standard is used to identify children who are deprived in these indicators (WHO, 2006). We calculated the standard deviation scores (Z-scores) of these indicators that express anthropometric measures of children. Any child below a Z-score of -2 is considered deprived in each indicator. These indicators are used to monitor nutritional balance of food intake or malnutrition. Lawson and Appleton (2007) pointed

out that it is important to examine all the indicators of this dimension as each indicates a different aspect of child well-being. For example, height-for-age represents accumulated nutrition in the past while weight-for-age and weight-for-height represent current nutritional status of a child.

Table 2.3 presents descriptive statistics. The results show that the mean z-core for stunting indicator was -1.58 in 1993, -1.37 in 1998, -1.31 in 2003, -1.30 in 2008 and -1.16 in 2014. On average, the results show the welfare of children improved over the period. In terms of children who are underweight, the mean Z-score was -0.97 in 1993 and decreased to -0.77 in 1998. It increased to 0.79 in 2008 and worsened to -0.81 in 2008 and dropped to -0.74 in 2014.The mean Z-score of wasting indicator in 1993 was -0.084, which increased to -0.13 in 2014 suggesting worsening of child well-being over the period.

Table 2. 3: Descriptive statistics

	1993		1998		2003		2008		2014	
	Obs	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**
Nutrition										
Stunted	5000	-1.58(1.61)	3011	-1.37(1.86)	4801	-1.31(1.69)	5212	-1.30(1.75)	18801	-1.16(1.46)
Underweight	5159	-0.97(1.370	3125	-0.77(1.44)	4945	-0.79(1.32)	5359	-0.81(1.32)	18987	-0.74(1.20)
Wasted	4968	-0.084(1.35)	2994	-0.041(1.50)	4780	-0.05(1.39)	5177	-0.14(1.40)	18760	-0.13(1.21)
Health										
No vaccination	5985	6.5(2.51)	3243	6.2(2.45)	5384	5.92(2.7)	5657	6.2(2.45)	19951	6.86(2.02)
Education										
No education	13877	0.16(0.37)	13003	0.088(0.23)	11960	0.238(0.41)	12248	0.209(0.41)	52774	0.19(0.40)
Incomplete pri.	13877	0.72(0.44)	13003	0.85(0.35)	11960	0.694(0.46)	12248	0.695(0.46)	52774	0.70(0.45)
Complete pri.	13877	0.08(0.28)	13003	0.03(0.17)	11960	0.029(0.16)	12248	0.048(0.214)	52774	0.019(0.13)
Incomplete sec.	13877	0.02(0.15)	13003	0.02(0.167)	11960	0.034(0.03)	12248	0.043(0.204)	52774	0.081(0.27)
Complete sec.	-	-	13003	0.001(0.04)	11960	0.001(0.03)	12248	0.002(0.04)	52744	0.001(0.04)
Higher	-	-	-	-	-	0.0002(0.01)	12248	0.000(0.009)	52774	0.000(0.019)
Shelter										
Floor										
Earth	21189	0.771(0.42)	19510	0.733(0.44)	18713	0.694(0.46)	19469	0.684(0.46)	79087	0.677(0.47)
Parguet	21189	0.002(0.04)	19510	0.008(0.09)	18713	0.007(0.08)	19469	0.006(0.08)	79087	0.003(0.06)
Cement	21189	0.228(0.42)	19510	0.258(0.44)	18713	0.296(0.46)	19469	0.369(0.46)	79087	0.319(0.47)
Others	21189	0.000(0.01)	19510	0.0003(0.09)	18713	0003(0.05)	19469	0.001(0.02)	79087	0.000(0.02)
Roof										
Grass	21121	0.388(0.49)	19491	0.329(0.47)	18714	0.299(0.46)	19473	0.307(0.46)	79070	0.229(0.42)
Iron sheets	21121	0.593(0.49)	19491	0.649(0.48)	18714	0.633(0.48)	19473	0.656(0.47)	79070	0.743(0.44)
Tiles	21121	0.015(0.12)	19491	0.015(0.12)	18714	0.044(0.21)	19473	0.035(0.18)	79070	0.012(0.11)
Others	21121	0.003(006)	19491	0.007(0.09)	18714	0.023(0.15)	19473	0.002(0.04)	79070	0.017(0.13)
water										
Time to water	17671	28.53(40.07)	14275	32.70(42.65)	11352	40.93(56.81)	19385	30.23(60.35)	78633	31.64(49.58)
Piped water	21142	0.262(0.44)	19528	0.250(0.43)	18718	0.268(0.44)	19479	0.256(0.44)	79077	0.284(0.45)

Well/borehole	21142	0.230(0.42)	19528	0.241(0.43)	18718	0.341(0.47)	19479	0.288(0.45)	79077	0.272(0.45)
Surface water	21142	0.465(0.50)	19528	0.480(0.50)	18718	0.325(0.47)	19479	0.434(0.50)	79077	0.402(0.49)
Rain water	21142	0.018(0.13)	19528	0.011(0.11)	18718	0.021(0.14)	19479	0.017(0.13)	79077	0.029(0.17)
Others	21142	0.237(0.15)	19528	0.017(0.13)	18718	0.045(0.21)	19479	0.005(0.07)	79077	0.012(0.11)
Sanitation										
Flush toilet	21183	0.057(0.23)	19495	0.059(0.24)	15183	0.080(0.27)	19479	0.082(0.28)	66218	0.057(0.23)
Pit latrine	21183	0.774(0.41)	19495	0.779(0.41)	15183	0.679(0.47)	19479	0.668(0.47)	66218	0.714(0.452)
No facility	21183	0.167(0.37)	19495	0.161(0.37)	15183	0.232(0.42)	19479	0.249(0.43)	66218	0.227(0.419)
Others	21183	0.002(0.45)	19495	0.001(0.29)	15183	0.007(0.082)	19479	0.000(0.01)	66218	0.002(0.042)
Information										
No Radio	17634	0.44(0.49)	16128	0.34(0.48)	15165	0.29(0.45)	15161	0.319(0.466)	66215	0.406(0.491)
No Television	17633	0.95(0.22)	16134	0.88(0.31)	15161	0.81(0.39)	15764	0.774(0.418)	66156	0.773(0.418)

Source: Author's calculation using KDHS 1993-2008
Standard deviations are in parentheses

Health Deprivation

In this thesis, child health status was measured by number of vaccinations given to a child against deadly diseases. The traditional vaccines are against Polio, Tetanus, Diphtheria, Tuberculosis, Pertusis and Measles. This dimension considers only children below 5 years. A child who has not been immunized against any disease is considered deprived in health dimension (Gordon et al., 2003). On average, the results indicate that children have received at least six out of eight doses of vaccinations.

Education Deprivation

The domain targets children between 6 and 17 years who are not schooling. In 1993, approximately 16% of school-aged children had never attended school. This number reduced to 8.8% in 1998. Surprisingly, the figure rose to 23.8% in 2003 and dropped slightly to 20.9% in 2008 and 19% in 2014. This trend is worrying because the free and compulsory primary education that was introduced as a goal under MDGs had not yielded the desired effects. This shows that there are other underlying issues which needs to be investigated.

Shelter Deprivation

Children and teenagers who get enough sleep have less emotional issues and are happier and more optimistic (Lau, Lam, & Lee, 2021). This dimension has two indicators, i.e., type of materials used for making floors and roofs. Housing safeguards children from unfavorable weather conditions and is thus an important dimension of child's development. Children are identified as deprived in shelter dimension if they dwell in household whose floors or roofs are made of poor materials; for

example, natural earth (mud floors) or cow dung floors and roofs covered by grass or tins or leaves. In all the surveys, most children lived in households with poor floors and this has hardly changed over the period. For example, 77.1% of children lived in houses made of earth or mud in 1993 and in 2014 this declined slightly to 67.7%. There has been an increase of children living in houses with cemented floors. On average, 22.8% of children lived in houses with cemented floors in 1993 and this increased to 31.9% in 2014. Children living in homes with grass-thatched roofs made up of 38.8% in 1993, 32.9% in 1998, 29.9% in 2003, 30.7% in 2008 and 22.9% in 2014. There has been improvement of building materials as 59.3% of children in 1993 lived in houses with iron sheets roofs while in 2014 this had increased to 74.3%.

Water Deprivation

This dimension applies to all children residing in households with no or limited access to safe drinking water. This dimension is assessed using two indicators; water source and distance to water source. A child is considered deprived if the distance to the water source and back is beyond 30. Further, water sources such as unprotected wells or springs, water in open surfaces, tanker tracks, and bottle water are unsafe drinking water for children, hence deprived. The results indicate that children deprived in water dimension steadily declined from 74.1% in 1993 to 54.2% in 2014 while time to get to water was 28 minutes in 1993, and increased to 32 minutes in 1998, which was just above the cut-off point. The time to get to water source and back was 40.93 minutes in 2003, 30.23 minutes in 2008 and 31.64 minutes in 2014, which was above the cut-off point. This suggests worsening access to water over the period.

Sanitation Deprivation

The deprivation of this dimension is measured by unavailability of toilet facility of any kind or use of improper toilet facilities such as bucket toilets and hanging/open pit latrines. Children deprived in sanitation dimension shot up from 16.7% in 1993 to 22.7% in 2014. The results show that about 70% of Kenyan children access pit latrines.

Information Deprivation

This dimension is measured in terms of access to information through radio or television in their households. This dimension is very critical to child wellbeing. Case in point during the shutdown necessitated by the Covid-19 pandemic, these gadgets came in handy for the continuation of syllabus in some schools and even relaying of information on how to prevent the spread of the virus. These gadgets can also expose children to learn different cultures across societies.

Children from households without radio or television are considered deprived in information dimension. The results indicate that in 1993, 95% and 44% of children had no access to television and radio, respectively. By 2008, access to television had improved to 77.4% while access to radio had improved to 31.9%. In 2014, the proportion of children with no access to television reduced marginally to 77.3% while no access to radio increased to 40.6%. Television requires electricity to power it up and this could explain the high number of children without access to television in most households. This suggests that deprivation in information dimension is severe to most children.

2.4.4 Magnitude and Trends of Child Deprivations

The primary goal of this essay was to assess the magnitude and evolution of multiple child deprivations. To do so, this essay used two approaches—the Bristol deprivation framework and AF methodology (Gordon et al., 2003; Alkire and Foster, 2011). We begin with the Bristol approach (Table 2.4) where we calculate the magnitude/levels of child deprivations for the years 1993 to 2014. We calculate deprivation headcount ratios for each dimension. Where a dimension is assessed with at least one indicator, then we aggregate these indicators using the union approach. The union approach defines that a child is regarded deprived in a domain if s/he is deprived in one indicator of that domain (Atkinson, 2003; Alkire and Foster, 2011).

Table 2. 4: Levels and trends of child deprivations, (%)

	Year of survey				
Dimensions	**1993**	**1998**	**2003**	**2008**	**2014**
Nutrition	32.22	43.77	36.38	41.31	29.41
Health	5.38	9.58	11.07	5.82	2.66
Education	15.56	8.61	23.82	21.16	19.01
Shelter	77.84	72.88	70.40	70.54	41.28
Water	69.70	80.17	67.22	54.24	49.71
Sanitation	16.68	15.13	23.28	25.48	23.15
Information	94.34	87.57	81.58	79.09	80.29

Source: Author's calculation from KDHS 1993-2014

The findings show that although certain aspects have improved, others have gotten worse. For instance, the information dimension showed the highest rates of deprivation, peaking at 94.34% in 1993 and falling to 79.09% in 2008 before rising once more to 80.29% in 2014. Because of the

increased expense of purchasing decoders, the current government policy of 100% digital migration may make it even harder for people to get information through television. The shelter component had the second-highest deprivation rates, with 77.84% of kids living in poverty in 1993 and 41.28% in 2014. According to research by Batana et al. (2014) in Uganda, the shelter component had the highest incidence of deprivation among Ugandan children, accounting for 49% of children in 2000, 28.9% in 2006, and the same percentage in 2011.

The second highest deprivation was in information dimension with 43.1% of Ugandan children deprived in 2000; this dropped to 32.1% in 2011. Compared to children from Haiti (Gordon and Nandy, 2012), shelter dimension recorded the highest deprivation at 49% followed by sanitation at 41%. In addition, 39% of children were deprived in health and the lowest deprivation was in food/nutrition dimension with 10% of children deprived. In contrast, Gordon et al. (2003) demonstrated that the highest and the second highest deprivation rates in developing countries were in shelter and sanitation dimensions respectively. These differences in the level of deprivations justify country-specific analysis of child deprivations. These could be attributed to different levels of development and purpose of the measure in each country.

Regarding educational deprivation, 8.61% of children were deprived in education in 1998, down from 15.92% in 1993. When free primary education was introduced in 2003, 23.82% of children were deprived, but by 2014, that number had hardly decreased to 19.32%. This aspect is particularly troubling given that the government has fully implemented universal primary education since 2003. This essay envisioned that there could be other factors which prevent these

children from attending school. This thesis recommends mixed methods approach to explore the underlying issues hindering children from going to school and staying until completion.

The health dimension showed the lowest levels of deprivation, with deprivation rates typically less than 10% during the periods under consideration. The highest rates of health deprivation were in 2014 when 2.66% of children were not immunized. This suggests that the policies to have all children immunized against deadly diseases has been fruitful. But given the vulnerabilities of a child not immunized, this rate should be brought down to zero. Incidence of deprivation in sanitation dimension increased from 16.68% in 1993 to 25.48% in 2008 but reduced to 23.15% in 2014. This lack of sanitation facilities combined with lack of safe drinking water jeopardizes the health of children as they may contract waterborne diseases such as diarrhea, cholera and fluorosis, among others. From 32.22% in 1993 to 29.41% in 2014, nutritional deprivation has decreased while water deprivation stood at 69.70% in 1993 and declined to 49.71% in 2014.

We also applied the Alkire and Foster (2011) approach to examine if the results differ between the two methodologies. The results from Alkire and Foster (2011) approach in Table 2.5 are similar to those obtained using Gordon et al. (2003) approach in Table 2.4. The minor differences are due to censoring[1] and application of weights in Alkire and Foster (2011) approach. We used equal weights for all the dimensions because all the dimensions are indivisible as they are based on fundamental human rights. Thus, all the seven aspects of child well-being are equally important and therefore, we cannot assign some dimensions more weight than others (Atkinson, 2003).

[1] Censoring is the exclusion of non-poor children from analysis.

Based on the two approaches, the highest levels of deprivation occurred in information dimension. The second highest incidence of the deprivations was from shelter dimension while water dimension was the third. The lowest prevalence of deprivations was seen in health dimension followed by sanitation and nutrition dimensions in that order. It is evident that the most serious deprivation affecting Kenyan children are physical capital dimensions; that is shelter, water and information. Fewer children face deprivations of human capital dimensions; that is health, nutrition and education. This essay recommends policies targeting the physical capital dimensions to reduce child deprivations.

Table 2. 5: Uncensored headcount ratios (%)

Variable	1993	1998	2003	2008	2014
Nutrition	32.22	43.77	36.38	41.7	30.72
Health	5.38	9.58	11.07	5.82	2.64
Education	15.56	8.61	23.02	21.16	19.02
Shelter	77.84	72.88	70.4	70.54	41.36
Water	69.7	80.17	67.22	54.24	49.27
Sanitation	16.65	15.13	23.28	25.48	21.31
Information	94.34	87.57	81.58	79.09	79.78
Sample	13880	13065	11960	12248	52827

Source: Author's calculation using KDHS 1993-2014

2.4.5 Depth and severity of child deprivations

The second goal of the essay was to analyse the depth and severity of child deprivations. Severely deprived children are children experiencing deprivation in one dimension while the concept of

absolute poverty measures the number of children facing deprivation in at least two dimensions (Gordon et al., 2003; Minujin & Delamonica, 2005 and Alkire & Roche, 2012).

Table 2.6 reveals the rates of severe deprivations and absolute poverty using the Bristol deprivation framework (Gordon et al., 2003). According to the findings, the number of children who are not in poverty climbed from 5.03% in 1993 to 12.32% in 2014. This demonstrates that throughout time, children's wellbeing has improved. In 1993, 94.98% of children were severely deprived, declining to 93.69% in 1998, 90.85% in 2003, 82.67% in 2008 and 87.68% in 2014. We used union and intersection approaches to assess the deprivations (Atkinson, 2003; Alkire & Foster, 2011). The union strategy has the drawback of highlighting high deprivations. Conversely, intersection approach-suffering deprivation in all aspects, indicate that less than 1% of youngsters in all surveys were deprive in all dimensions (Atkinson, 2003; Alkire & Foster, 2011).

Table 2. 6: Severe deprivations and absolute poverty comparisons (%)

Number of deprivations	Year of survey					Absolute rate of change				
	1993	1998	2003	2008	2014	1998-1993	2003-1998	2008-2003	2014-2008	2014-1993
0	5.03	6.31	9.16	17.33	12.32	1.28	2.85	8.17	-5.01	7.29
1	16.95	14.50	15.44	26.56	28.18	-2.45	0.94	11.12	1.62	11.23
2	35.44	35.05	28.58	25.15	28.97	-0.39	-6.47	-3.43	3.82	-6.47
3	27.94	29.60	24.83	17.56	18.21	1.66	-4.77	-7.27	0.65	-9.73
4	11.42	12.17	14.97	9.70	9.14	0.75	2.8	-5.27	-0.56	-2.28
5	2.82	2.18	5.91	3.18	2.93	-0.64	3.73	-2.73	-0.25	0.11
6	0.39	0.19	1.05	0.47	0.24	-0.20	0.86	-0.58	-0.23	-0.15
7	0.02	0	0.07	0.05	0.01	-0.02	0.07	-0.02	-0.04	-0.01
Severe deprivation	94.98	93.69	90.85	82.67	87.68	-1.29	-2.84	-8.18	5.01	-7.3
Absolute poverty	78.03	79.19	75.41	56.11	59.50	1.16	-3.78	-19.3	3.39	-18.53

Source: Author's calculation from KDHS 1993-2014

Children who experienced deprivation in at least two aspects made up 78.03% of the population in 1993, 79.19% in 1998, 75.41% in 2003, 56.11% in 2008, and 59.50% in 2014. The absolute rate of change for the proportion of children not deprived were positive from 1993-1998, 1998-2003 and 2003-2008. The proportion of children who are non-deprived increased by 7.29 percentage points from 1993 to 2014. During the research period, there was an increase by 11.23 per cent in the proportion of children deprived in one dimension. The percentage of children in absolute poverty, or those who are deprived in at least two dimensions, decreased by 18.53 per cent during the research period, while kids deprived in one or more dimensions decreased by 7.3 per cent.

During the 2008-2014 period, the proportion of children not deprived declined by 5.01 per cent. At the same time, the proportion of children deprived in one or more and two or more increased by 5.01 per cent and 3.39 per cent respectively. This is attributed to violence which erupted after the disputed general elections of December 2007 and the difficult economic times experienced by the whole world after economic meltdown of 2008.

According to Alkire and Foster (2011) methodology, a child is regarded as poor if he or she is deprived in one-third of all dimensions. Table 2.7 shows the proportion of children considered as multidimensionally poor using several cut-off points (k). A poverty cut-off, or the minimum level of deprivation at which a kid is considered poor, must be established in multidimensional poverty. The aggregate poverty lines identify children who are multidimensionally poor depending on the poverty threshold. For instance, at a poverty cut-off equal to 10% of all deprivation, (k=10%), multidimensional headcount ratio was 99.61% in 1993, 99.36% in 1998, 98.66% in 2003, 84.28% in 2008 and 92.66% in 2014. Thus, overall, the proportion of multidimensionally poor children declined over the years. This type of aggregation is known as the union approach (Alkire and

Foster, 2011). As earlier stated, the disadvantage with union approach is that it gives a huge proportion of children considered as poor and therefore overestimation of the index (Tsui, 2002; Bourguignon and Chakravarty, 2003; Atkinson, 2003; Alkire and Foster, 2011). On the other extreme, using poverty cut-off of k=90% or 100%, we observe that the proportion of children facing deprivations in 90% or 100% of total dimensions are less than 0.5% in all the surveys. Conversely, the drawback of intersection approach is that it underestimates the multidimensional poverty index for children.

Alkire and Seth (2009) pointed out that the deprivations between the two extremes also gives important insights into the depth of child deprivations. This approach is known as intermediate approach. As the cut-off point (k) increases from 20% to 80%, the headcount ratio of child deprivation decreases in all the years. As we see from the results, there is no difference between children who are deprived in 30% and 40% of dimensions. Therefore, this point provides the cut-off for examining the multidimensional headcount ratios (H0) and other subsequent ratios; that is, intensity of deprivations (A) and adjusted headcount ratios (M0). Therefore, a child is considered multidimensionally poor if the number of his/her deprivations is equal to or greater than the cut-off point.

Table 2. 7: Multidimensional poverty using different deprivation cut-off points, K= (10-100)

Cut-offs of deprivation	1993	1998	2003	2008	2014
K=10%	99.61	99.36	98.66	94.28	92.66
K=20%	93.95	93.02	88.41	82.95	75.98
K=30%	72.77	74.87	66.38	64.57	50.76
K=40%	72.77	74.87	66.38	64.57	50.76
K=50%	35.48	40.17	39.06	37.96	22.98
K=60%	9.23	9.25	16.76	15.28	6.44
K=70%	9.23	9.25	16.76	15.28	6.44
K=80%	1.21	1.18	4.68	3.55	0.90
K=90%	0.00	0.00	0.36	0.15	0.00
K=100%	0.00	0.00	0.36	0.15	0.00

Source: Author's calculation using KDHS 1993-2014

2.4.6 Censored Headcount Ratios

This concept measures the percentage of the population that are multidimensionally poor with respect to a chosen poverty cut-off, *k*, and are deprived in a specific dimension at the same time. The censored headcount ratios[2] differ with the concept of uncensored[3] headcount ratios (compare Table 2.5 and Table 2.8) in that the latter considers the deprivations of the multidimensionally poor children, ignoring or censoring the deprivations of the non-poor to be equal to zero (Alkire and Seth, 2009).

[2] Censored headcount ratio can be defined as the proportion of people who are multidimensional poor and deprived in each dimension (Alkire and Foster, 2011)

[3] Uncensored headcount ratio is defined as the proportion of the population that are deprived in each dimension. It aggregates deprivation of the poor alongside the non-poor (Alkire and Foster, 2011)

Table 2.8 presents the results of censored headcount ratios. The results show that among multidimensionally poor children, 29.16% were also deprived in terms of nutrition in 1993, dropping to 23.23% in 2014. In 1993, 15.08% of multidimensionally poor children were also concurrently deficient in terms of education and this rose to 16.51 % in 2014. The majority of the children who were multidimensionally poor were deficient in the areas of information, housing, and water, in that order. This is attributable to physical capital problems (infrastructure) where most of these services are out of reach in some areas. On the other hand, less than 10% were deprived in terms of health dimensions over the period.

Table 2. 8: Trends of censored headcount ratios (unit: %)

Variables	1993	1998	2003	2008	2014
Nutrition	29.16	37.74	30.89	31.38	23.23
Health	4.88	8.19	9.51	4.74	2.01
Education	15.08	8.23	22.49	19.13	16.51
Shelter	67.16	66.95	59.29	59.47	37.68
Water	59.08	65.29	50.73	48.19	41.72
Sanitation	16.67	15.14	23.20	25.08	49.31
Information	72.20	73.67	63.89	62.64	57.36

Source: Author's calculation using KDHS 1993-2014

2.4.7 Multidimensional poverty indices

The assessment of the multidimensional child poverty indices for Kenyan children and how they have changed between 1993 and 2014 was the second goal of this essay. Table 2.9 presents the

adjusted multidimensional poverty index (M_0), multidimensional headcount ratio (H) and intensity or average of deprivations (A) based on the chosen poverty cut-off point of 40% of all deprivations. The adjusted headcount ratio (M_0), which is the product of the multidimensional headcount ratio and average of deprivations, was 37.75% in 1993, 39.31% in 1998, 37.14% in 2003, 35.81% in 2008 and 26.09% in 2014. This reveals that the proportion of multidimensionally poor children declined from 72.77% in 1993 to 50.76% in 2014, with a notable increase of multidimensional poverty to 74.87 percent in 2003. The intensity of child deprivations, that is, the average number of deprivations children suffered were 51.87% in 1993 dropping modestly to 51.39% in 2014. Therefore, we draw the conclusion that a main factor in the decline in adjusted headcount ratios was a decrease in multidimensional headcount ratios.

Table 2. 9: Trends of multidimensional poverty indices from 1993 to 2014, K=40%

Year	Multidimensional poverty (M0)	Headcount ratio (H)	Intensity of Poverty (A)
1993	0.3775	0.7277	0.5187
1998	0.3931	0.7487	0.5251
2003	0.3714	0.6638	0.5596
2008	0.3581	0.6457	0.5546
2014	0.2609	0.5076	0.5139

Source: Author's calculation using KDHS 1993-2014

2.4.8 Decomposition of multidimensional poverty indices

Decomposing multidimensional child poverty indices by dimension, region, and county was the third goal of this essay. The ability of MPI to be divided into demographic sub-groups based on factors like urban vs. rural areas, regions, religion, and ethnicity is a key characteristic. Any trait

that suggests a significant difference between households/individuals, for example, gender and head of the household, can be considered a relevant variable. This is vital for policy design and targeting. Similarly, MPI can also be decomposed to its components or indicators. This gives us the ability to assess how each element contributes to the overall multidimensional poverty index and express overall poverty as a percentage of the weighted total of sub-groups poverty levels. We start with decomposition of MPI into its components in the sub-section below.

2.4.8.1 Decomposition of MPI by dimensions

Table 2.10 presents the decomposition of adjusted headcount ratio (M0) to its dimensions. Regarding absolute contribution, the results show that nutrition dimension contributed the highest to M0 followed by education and information dimensions. Nutrition contributed 41.7% to overall multidimensional poverty in 1993 but in 1998, information contributed the highest at 11%. Information remained the highest contributor to adjusted headcount ratio in the entire period of study. Regarding the proportional contribution of each category to multidimensional poverty, similar tendencies were also observed. The least amount of multidimensional poverty came from the health and education domains.

Table 2. 10: Decomposition of multidimensional poverty by dimensions

	1993	1998	2003	2008	2014
Adjusted headcount ratio (M0)	0.38	0.39	0.37	0.36	0.26
Absolute contribution to M0					
Nutrition	0.417	0.054	0.044	0.045	0.033
Health	0.007	0.012	0.014	0.001	0.003
Education	0.215	0.012	0.032	0.027	0.024
Shelter	0.096	0.096	0.085	0.084	0.054
Water	0.084	0.093	0.072	0.069	0.060
Sanitation	0.024	0.022	0.033	0.035	0.070
Information	0.103	0.11	0.091	0.089	0.082
Percentage contribution to M0					
Nutrition	11.04	13.71	11.88	12.52	10.19
Health	1.85	2.98	3.66	1.89	0.88
Education	5.71	2.99	8.65	7.63	7.25
Shelter	25.42	24.33	22.80	23.72	16.54
Water	22.36	23.72	19.51	19.23	18.31
Sanitation	6.31	5.50	8.92	10.00	21.64
Information	27.32	26.77	24.57	24.99	25.18

Source: Author's calculation using KDHS 1993-2014

2.4.8.2 Decomposition of MPI by region

The multidimensional child poverty index was decomposed by region to identify where the poor children live for policy design and targeting. The levels and trends of Kenya's multidimensional poverty indices are shown in Table 2.11 by region. According to the findings, the Eastern region had the largest percentage of children living in multidimensional poverty at 41% which it reported in 1993 and 45% in1998, and that Nairobi region had the lowest rate at 36% which it recorded in 1993, 30% in 1998, and 27% in 2014. It should be noted that the 1993 and 1998 KDHS surveys did not collect data in the North Eastern region. The children from North-Eastern region contributed 44% of the total adjusted headcount ratio in 2003, which was the highest percentage.

Table 2. 11: Decomposition of MPI by region

	1993			1998			2003			2008			2014		
	H	**A**	**M0**	**H**	**A**	**M0**	**H**	**A**	**M0**	**H**	**A**	**M0**	**H**	**A**	**M0**
Nairobi	0.70	0.51	0.36	0.60	0.50	0.30	0.63	0.54	0.34	0.63	0.57	0.36	0.52	0.52	0.27
Central	0.71	0.52	0.37	0.78	0.52	0.41	0.61	0.55	0.34	0.65	0.56	0.36	0.53	0.54	0.29
Coast	0.72	0.52	0.38	0.68	0.50	0.34	0.67	0.57	0.38	0.67	0.56	0.37	0.64	0.56	0.36
Eastern	0.79	0.52	0.41	0.83	0.55	0.45	0.69	0.56	0.39	0.68	0.57	0.39	0.65	0.56	0.36
Nyanza	0.71	0.51	0.36	0.80	0.54	0.43	0.67	0.57	0.38	0.62	0.55	0.34	0.58	0.54	0.31
Rift Valley	0.71	0.51	0.36	0.70	0.50	0.35	0.67	0.56	0.38	0.64	0.55	0.35	0.64	0.55	0.36
Western	0.73	0.52	0.38	0.64	0.49	0.32	0.65	0.55	0.36	0.65	0.55	0.36	0.56	0.53	0.30
North Eastern-	-	-	-	-	-	-	0.76	0.58	0.44	0.66	0.56	0.37	0.56	0.53	0.29
Total	0.73	0.52	0.38	0.75	0.53	0.39	0.66	0.56	0.37	0.65	0.55	0.36	0.60	0.55	0.33

Source: Author's calculation using KDHS 1993-2014

Note: H is the multidimensional headcount ratio

A is the intensity or breadth of multidimensional poverty

M_0 is the adjusted headcount ratio of multidimensional poverty

In both 1993 and 1998, Eastern region recorded the highest levels of multidimensional headcount ratios at 79% and 83%, respectively. The biggest contributions to the multidimensional poverty indices came from the Eastern and North Eastern regions. Multidimensional headcount ratios decreased over time in each of the eight regions, while the average level of deprivation remained relatively constant across all of the provinces. For instance, in Nairobi region, the adjusted headcount ratios declined from 36% in 1993 to 27% in 2014 while in North Eastern region it declined from 44% in 2003 to 29% in 2014. Regarding multidimensional headcount ratios, in Nairobi region the rates declined from 70% in 1993 to 52% in 2014 but the average deprivations increased from 51% in 1993 to 52% in 2014.

In 2014 survey, the regions with the highest rates of adjusted headcount ratios were Coast, Eastern and Rift Valley at 36% while Nairobi region had the lowest rates of adjusted headcount ratios at 27%.

2.4.8.3 Decomposition of uncensored head count ratios by region

Table 2.12 presents the decomposition of uncensored/raw headcount ratios by region. The uncensored headcount ratios are always higher than the censored headcount ratios. In 2014 survey, children from North-Eastern region recorded the highest deprivations in terms of nutrition and health dimensions. Children from Eastern region recorded the highest deprivations in education and sanitation dimensions, while children from Central region recorded the highest deprivation in shelter dimension, and children from Western region performed poorly in water dimension while children from Western and Nyanza regions recorded the highest deprivations in terms of information.

Table 2. 12: The uncensored headcount ratios by region

Region	Nutrition	Health	Education	Shelter	Water	Sanitation	Information
2014 Survey							
Nairobi	0.180	0.001	0.195	0.406	0.496	0.215	0.801
Central	0.237	0.001	0.191	**0.434**	0.522	0.211	0.802
Coast	0.243	0.005	0.179	0.398	0.477	0.219	0.797
Eastern	0.193	0.003	**0.204**	0.433	0.504	**0.233**	0.798
Nyanza	0.093	0.008	0.179	0.391	0.479	0.188	**0.809**
Rift Valley	0.289	0.036	0.185	0.403	0.476	0.201	0.791
Western	0.218	0.003	0.200	0.433	**0.523**	0.232	**0.809**
North Eastern	**0.304**	**0.072**	0.179	0.394	0.489	0.208	0.786
Total	0.222	0.013	0.191	0.413	0.496	0.214	0.800
2008 Survey							
Nairobi	0.128	0.018	**0.248**	0.684	0.548	0.244	0.790
Central	0.288	0.017	0.214	0.700	0.511	0.259	0.765
Coast	0.483	0.063	0.209	0.708	0.527	0.245	0.804
Eastern	**0.497**	0.008	0.209	0.683	0.520	0.257	0.787
Nyanza	0.263	0.123	0.206	0.696	**0.563**	0.243	0.791
Rift Valley	0.337	0.029	0.201	0.690	0.534	**0.264**	0.777
Western	0.306	0.037	0.169	0.699	0.535	0.215	0.779
North Eastern	0.460	**0.234**	0.226	**0.731**	0.503	0.230	**0.812**
Total	0.350	0.052	0.204	0.694	0.535	0.249	0.784
2003 Survey							
Nairobi	0.243	0.069	0.232	0.656	**0.736**	0.236	0.804
Central	0.319	0.011	0.224	0.708	0.675	0.229	0.823
Coast	0.429	0.078	0.250	0.700	0.673	0.237	0.816
Eastern	0.431	0.081	0.243	**0.729**	0.672	**0.244**	**0.839**
Nyanza	0.355	0.216	0.250	0.683	0.661	0.240	0.793
Rift Valley	0.398	0.104	0.238	0.726	0.650	0.232	0.822
Western	0.275	0.123	0.239	0.696	0.686	0.223	0.819
North Eastern	**0.459**	**0.405**	**0.258**	0.688	0.615	0.236	0.831
Total	0.364	0.111	0.240	0.706	0.670	0.234	0.818
1998 Survey							
Nairobi	0.083	0.001	0.079	0.698	0.777	**0.159**	0.849
Central	0.100	0.003	**0.118**	0.739	**0.824**	0.155	0.882
Coast	0.738	0.012	0.095	0.737	0.768	0.144	0.888
Eastern	0.446	0.012	0.071	0.701	0.811	0.138	0.849
Nyanza	0.467	0.018	0.089	0.749	0.804	0.155	0.890
Rift Valley	0.149	**0.020**	0.090	**0.758**	0.802	0.155	0.887
Western	**0.781**	0.007	0.082	0.746	0.809	0.158	**0.891**
Total	**0.477**	**0.011**	**0.086**	**0.737**	**0.803**	**0.154**	**0.880**
1993 Survey							

Region	Nutrition	Health	Education	Shelter	Water	Sanitation	Information
Nairobi	0.205	0.072	0.133	0.699	0.620	**0.199**	0.934
Central	0.254	0.100	**0.172**	0.781	0.707	0.165	**0.957**
Coast	0.476	0.124	0.153	0.732	0.708	0.149	0.950
Eastern	**0.524**	0.095	0.165	0.776	0.687	0.153	0.941
Nyanza	0.368	0.157	0.164	0.782	0.683	0.160	0.944
Rift Valley	0.422	0.031	0.153	**0.796**	**0.725**	0.183	0.942
Western	0.191	**0.195**	0.156	0.780	0.682	0.164	0.943
Total	0.369	0.118	0.160	0.777	0.695	0.164	0.945

Source: Author's calculation using KDHS 1993-2014

In the 2008 survey, children from North Eastern region suffered high deprivations in terms of health, shelter and information dimensions. Children from Eastern region registered the highest deprivations in nutrition dimension while children from Nyanza region registered highest deprivations in water dimension. Surprisingly, children from Nairobi region registered the highest deprivation in education dimension while Rift Valley region registered highest deprivations in sanitation dimensions.

In the 2003 survey, children from North Eastern region recorded the highest deprivations in nutrition, health and education dimensions while children from Eastern region registered the highest deprivations in shelter, sanitation and information dimensions. The main activity from this part of the region is nomadism and this could explain why children do not attend school or receive medical services. This is because they move about with their livestock, running away from drought in search for pasture and water. Children from Nairobi region performed poorly in terms of water dimension. This could be attributed to the informal settlements in the city where most families get water from carts, that they do not know the source or safety.

There is no information about the children from North Eastern region because that region was not included in data collection for the 1993 and 1998 surveys. In 1998, children from Western region mostly deprived in terms of nutrition and information dimensions while children from Rift Valley region mostly deprived in terms of health and shelter dimensions. Children form Central region mostly deprived in education and water dimensions and children from Nairobi region performed poorly in terms of sanitation dimension.

In the 1993 survey, children form Western region registered the highest deprivations in terms of health dimension while children from Central region registered the highest deprivation in terms of education and information dimensions. Children from Rift Valley region registered the highest deprivations in terms of shelter dimension while Nairobi region registered highest deprivations in sanitation dimension. As expected, this is attributed to huge informal settlements in Nairobi without proper sanitation facilities.

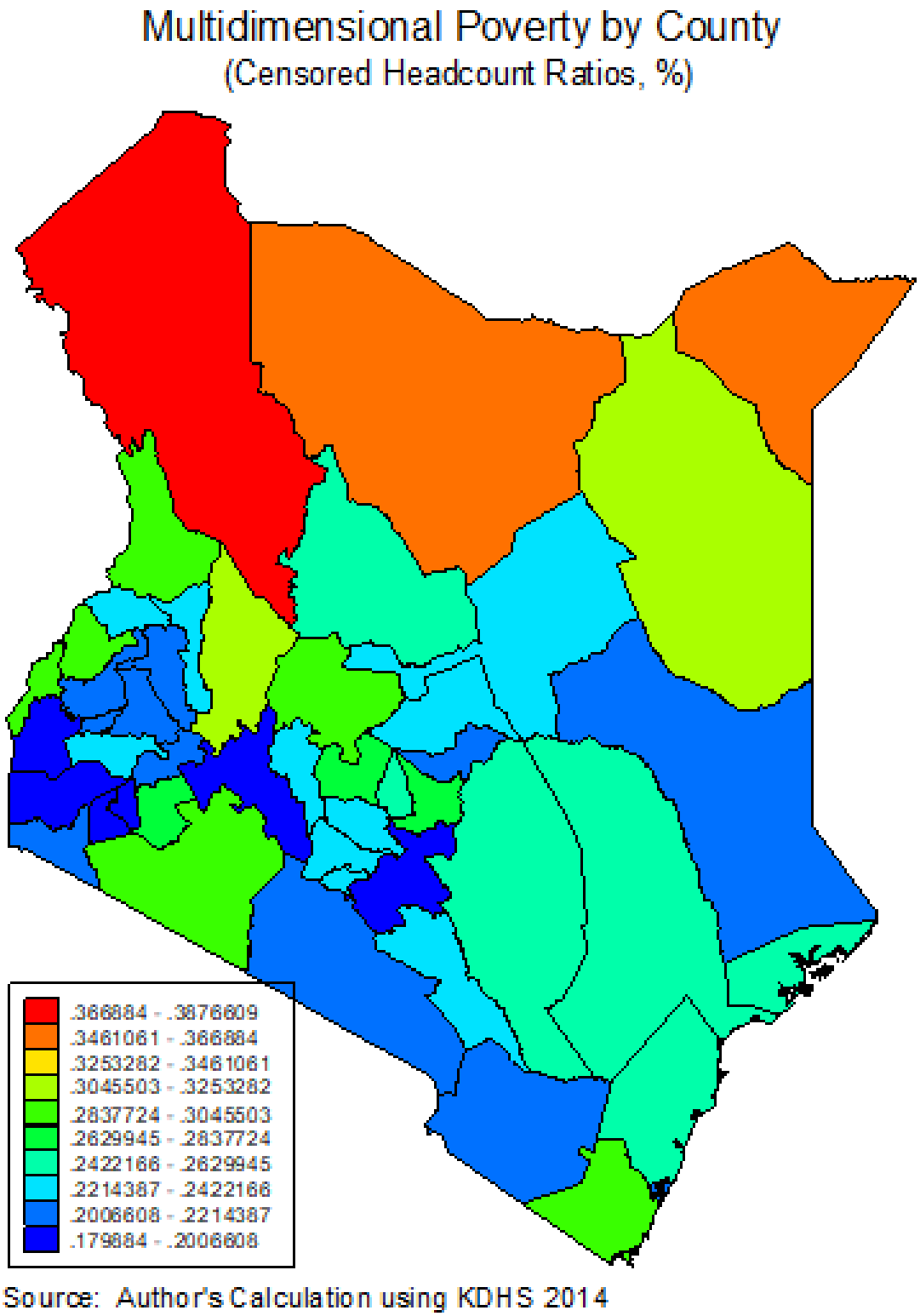
Overall, the results indicate that children from Nairobi region recorded the lowest deprivations in nutrition and health dimensions in all the surveys.

2.4.8.4 Decomposition of MPI by county

Following the adoption of the Kenyan Constitution of 2010 and the new administrative structure that resulted, data for the KDHS 2014 were gathered in all 47 county governments. Therefore, we decomposed MPI into Kenya's 47 counties. We discovered that the highest percentage of children that are multidimensionally poor are found in Turkana, Marsabit, and Mandera counties. Following these were the counties of Wajir, Narok, Busia, Bungoma, West Pokot, Baringo,

Laikipia, and Kwale, which had MPI scores of between 24%–30%. Nairobi, Taita Taveta, Kajiado, and Embu Counties had the lowest percentage of children that are multidimensionally poor.

Figure 2: Multidimensional child poverty by county



2.5 Summary, Conclusions and Policy Implications

2.5.1 Introduction

The essay's summary, findings, and implications for policy are presented in this part. We also make suggestions for future study areas.

2.5.2 Summary

The conventional approach of using income or consumption expenditure to measure child well-being does not capture all the aspects and components of children's basic needs and rights as enshrined in Kenya's constitution and the Conventions of Rights of the Child (UN, 1989). The income approach for measuring child well-being is also challenged on the basis that it assumes that income is equally distributed in households, which is not always the case and children do not earn income of their own and that they depend on their environment for accessibility or availability of public goods and services. In light of this, the goal of this essay was to assess the prevalence, severity, and extent of multidimensional child deprivations utilizing seven child-cantered aspects, including sanitation, water, information, education, housing, health, and nutrition. Specifically, this essay measured the levels and trends of multiple child deprivations, multidimensional poverty indices decomposed them into their population sub-groups i.e., area of residence, region and county governments.

We used two latest methods of measuring multidimensional child well-being. These are, the Bristol framework (Gordon et al., 2003) to measure child deprivation in the Kenyan context and Alkire and Foster (2011) methodology to assess the extent and severity of multiple child deprivations. The Bristol deprivation framework considers a child to be living in absolute poverty if s/he is

deprived in two or more dimensions while the Alkire and Foster methodology identify a child as multidimensionally poor if s/he is deprived in one-third of all dimensions under considerations.

The data was drawn from five rounds of KDHS for the period 1993 to 2014. These data sets are nationally representative and more importantly field similar questions, thus making them comparable. The KDHS has been conducted in Kenya since 1989 after an interval of five years, with the latest survey conducted in 2014. The KDHS 2020 was put on hold due to COVID-19 pandemic. These surveys have similar sample design, thus ensuring that they collect information from both rural-urban areas across the country. The 2014 KDHS collected information from 40,000 households in all the counties unlike the previous surveys which collected information from close to 10,000 households in all the districts except the 1993 and 1998 surveys which did not collect information in North-Eastern region. All the former districts are can be traced to a county under the new structure of Government according to the Constitution of Kenya 2010.

The findings indicate that highest incidence of deprivation among the Kenyan children was from information dimension with about 94.34% of children deprived in this dimension in 1993, dropping to 80.29% in 2014. The second highest prevalence of deprivation was from shelter dimension followed by water dimension. Though these incidences are on a downward trend, they are still very high given the importance they have on the development of a child. The lowest incidences of deprivations were in health dimension which was below 10% over the period of the study. This reflects the efforts by Government of Kenya and other policy actors to vaccinate children against deadly diseases. In Uganda, 17.2% of children were not immunized, but this dropped to 11.6% in 2006 and 9.2% in 2011 (Batana et al., 2014).

The second lowest incidence of deprivation was from education dimension. However, deprivation in education dimension was on an upward trend; that is, more children are not attending school or those attending school are not completing their education (dropouts). This is surprising given the policy on universal primary education which has been on implementation in Kenya since 2003. More in-depth analysis is required to examine the success or otherwise of the policy and provide reasons why it is not ensuring that all children are attending and completing their level of education. However, it is noted that the school enrolment rates for Kenyan children have been on an upward trend.

Over 90% of children between 1993 and 2003 experienced deprivation in at least one dimension, while less than 1% of children experienced deprivation across all dimensions. From 5.03% in 1993 to 12.32% in 2014, the proportion of children not deprived in any way have increased.

The Alkire and Foster (2011) methodology enabled us to identify children who are acutely multidimensionally poor. The findings indicate that the proportion of multidimensionally poor children was 72.77% in 1993 which declined to 50.76% in 2014. The level of acute multidimensional child poverty was 37.75% in 1993 which declined to 26.09% in 2014. Rather than the average intensity of poverty, which barely changed from 51.87% in 1993 to 51.39% in 2014, the key factor in lowering the adjusted headcount ratios was a decrease in multidimensional headcount ratios.

Regarding the decomposition of adjusted multidimensional poverty index, we found that information dimension contributed the highest to adjusted headcount ratio (M_0) followed by shelter

dimension for all the survey years. The two dimensions were also the ones in which we observe severe deprivations among the Kenyan children.

2.5.3 Conclusion

Despite the fact that poverty is a multifaceted problem, many researches in Kenya still concentrate on income or consumption and expenditure indicators of wellbeing. Apart from being unidimensional, monetary measures of poverty ignore the needs of the children. This essay conceptualized child well-being beyond conventional income or consumption and expenditure measures. We argue that the measurement of child well-being should be assessed based on child-specific dimensions so as to manipulate policies for reduction of child deprivations. One of the compelling reasons for outrage is the long-term damage these deprivation does to children. We should value the quality of childhood as experienced by children now, not just their future chances on social progression.

The highest incidence of deprivation among the Kenyan children were observed in information dimension. The second highest score was observed in shelter dimension and water dimension came third. Deprivation in information presents untapped opportunities of education and exposure among children. Similarly, children's caretakers miss out on information which is being broadcasted, be it public health, prices of food prices or political events which may be helpful in nurturing children. There are other means of getting information through mobile phones, internet or newspapers, but these are even more costly.

Shelter deprivation was measured using materials for constructing floors and roofs. Mud or earth floors and no roof or palm/leaves roofs indicate deprivation in this dimension. Children takes up the majority of the time on the floor walking, sitting or playing and they most likely pick up harmful germs on the floor and become ill. Moreover, access to clean water and sanitation is still a big problem. This could explain the high rates of mortality amongst the children in Kenya because they contract diseases and die young.

The multidimensional headcount ratios of poor children in Kenya children are very high. Children who are multidimensionally poor are more than half of the population. With respect to multidimensional poverty, the information dimension had the greatest influence across all surveys. According to region, the multidimensional poverty rates were lowest in Nairobi region but highest in North Eastern region.

This essay contributes to knowledge by measuring child well-being using seven child-specific dimensions. Child deprivation must be addressed since it leads to children's low self-esteem and increased risky behaviour, diverts them from a focus on school, and encourages their involvement in crime and other social vices. Accurate measures of child deprivations enable the policy makers to re-direct and re-orient resources to sectors with the most severe deprivations. These sectors are in physical capital dimensions such as information, shelter and water dimensions.

2.5.4 Policy Implications

Kenya subscribes to the international agenda for development, the Sustainable Development Goals (SDGs), which kicked in as of January 1, 2016 (UNGA, 2015). The SDGs build on the lessons

learnt and policy recommendation arising from the implementation of the Millennium Development Goals (MDGs). The SDGs seeks to complete the unfinished agenda of the MDGs and respond to new and emerging development challenges in the world, such as climate change. In line with the Kenya Vision 2030, the SDGs focus on economic, social and environmental aspects and recognize their inter-linkages in achieving sustainable development in all its dimensions.

This essay and the first goal of SDGs recognizes that poverty is multidimensional. The first SDG endeavours to eradicate poverty in all its forms everywhere. The multidimensional nature of poverty is acknowledged in target 1.2, which requires countries to *reduce at least by half the proportion of men, women and children living in poverty in all its dimensions according to national definitions* (UNGA, 2015). Other Goals which this essay measures and addresses directly include SDG 2 which seeks to end hunger, achieve food and nutrition security; SDG 3 which ensures healthy lives at all ages and well-being; SDG 4 which seeks to provide quality education; SDG 6 which seeks to ensure clean water and sanitation; and SDG 11 which seeks to make cities and human settlement safe and resilient, among many others. The conclusions from this essay serve as a evaluation of MDGs and baseline to policy makers to target areas which need urgent attention for action during implementation of SDGs so that Kenyan children cannot be left behind.

Child deprivations were categorized into two main categories: human capital dimensions and physical and infrastructural dimensions. Dimensions which emanate from human capital problems include nutrition, health and education while dimensions which spring from physical capital problems include information, sanitation, water and shelter. The results suggest that urgent

interventions should be targeted towards physical and infrastructural problems. Key among them is accessibility of information through broadcast media equipment such as television and radio. In order to expose youngsters to current events and broaden their cognitive horizons, we advocate for the distribution of radio programs in schools, community cinemas (media centers) in villages, and social halls. By eliminating licenses and exempting such equipment from taxes, the government, along with other stakeholders, should also make televisions and radios inexpensive for households to acquire.. Access to electricity complements information dimension. The government should provide basic infrastructures such as electricity in remote areas so that it encourages more households to buy broadcast media equipment. However, most of the rural households are off-grid and the government should encourage the private sector to invest in clean energy like solar or wind power by creating a conducive environment.

Similarly, water and shelter dimensions are crucial areas where interventions should be targeted. To enable many households to build better homes to live in, we urge the government to zero rate or subsidize contemporary building materials like iron sheets and cement. This will improve the well-being of children by protecting them from diseases, cold and boosting their self-worth. Better still, the government should economically empower communities by formulating programmes that enable communities at the lower level earn income and uplift themselves.

The county governments should develop water deliver infrastructure in rural areas and informal settlements to increase access to safe drinking water. The government could also build water kiosks to enable children fetch clean water in areas where there is no water supply system. During rainy seasons, households should be provided with water tanks or underground water storage tanks to

enable them harvest water and store it to be used during dry seasons. This can be done by donating water tanks to households facing chronic water deprivation and exempting them from taxation.

Lack of adequate and proper sanitation facilities could lead to diseases such as cholera, dysentery and diarrhoea which affect schooling and health of the child. Households that lack sanitation facilities need to be assisted to construct pit latrines and sensitized on the importance of using toilet facilities. In the slum areas, the government should construct public toilets and improve lighting for security during the night.

The lowest levels of deprivations were emanating from human capital dimensions, mainly education, health and nutrition. In health, the rates of children who were not immunized against diseases have been reduced to a single digit in all the years. Since a child who is not immunized may die or become disabled forever, it is important that all children be immunized. The government should upscale efforts to reach out to all children under 5 years and have them immunized. The government should also investigate why some children are not immunized and determine the underlying causes and tackle them.

In education, the government should actualize the right of free and compulsory primary education by providing education infrastructure in throughout the country. In marginalized areas such as the North-Eastern region, the government should offer affordable boarding schools to encourage kids to go to school and feed them while in school. This will ensure school attendance and nutritional status of children are met. The government could also introduce conditional cash transfer for

schooling to vulnerable parents/households with children so that they can release their children to attend school.

2.5.5 Suggestion for future research and limitations

The essay contributes to literature on child deprivation. It would be interesting to extend this study to examine other forms of child deprivation such as child labour, child violence, teenage pregnancies and drug abuse. This was beyond the scope of this study. This essay did not also include income in examining the well-being of children despite the close association of income and other direct measures of well-being. It would be relevant to see how the monetary measures and non-monetary measures can be combined to examine possibility of overlaps between income poverty and other forms of deprivations. Future studies should compare metric and non-metric dimensions and investigate if there is overlap between the two; that is, if children living in household considered income poor are simultaneously deprived in other non-income domains.

3.0 CHAPTER THREE

3.1: MULTIDIMENSIONAL ANALYSIS OF CHILD INEQUALITY IN KENYA

3.1.1 Introduction

The concept of inequality and its linkage to poverty and growth has been an important policy and scholarly issue since the 1970s (Kolm, 1977; Atkinson & Bourguignon, 1982; Maasoumi, 1986; Araar, 2009; Kabubo-Mariara et al., 2012; Jung et al., 2014; Josa & Aguado, 2020; Belete, 2021). Poverty and inequality are intrinsically linked and are often studied together, but the two are distinct concepts describing different aspects of well-being. Inequality, in contrast to poverty, is a broader concept and is measured as the spread of an indicator rather than the individuals or households below a predetermined threshold (Litchfield, 1999). To achieve genuine socio-economic development, proponents of development have suggested taking policy measures that concentrate on both reducing inequality and poverty.

The standard objective concerning measurement of inequality has been to examine the distribution of a single dimension of a welfare indicator, most commonly income or consumption expenditure. However, a complete picture of an individual's and/or household's welfare is not fully captured by income inequality. This is because inequality has many dimensions that matter for human well-being just like poverty (Sen 1983; 1992 and Stewart, 2013). To evaluate a complete state of well-being of an individual and/or household, it needs to take into account different circumstances and characteristics of people (Sen, 1979; Maasoumi, 1986 and Tsui, 1995; 1999).

When evaluating well-being, there are several issues with utilizing income or consumption and expenditure statistics. First, focusing on income overlooks the aspect of how and by whom the

income was earned as well as the time involved (Piachaud, 1987). Second, because they are collected based on memory recall, income or consumer spending statistics probably are sporadic, imprecise, and of poor quality (Sahn & Stifel, 2003). Third, the construction of consumption aggregates or smoothening consumption in developing countries can be difficult because of very high inflation rates, depreciation rates, nominal rates, and prices of semi-durable and durable goods (Sahn & Stifel, 2003). Fourth, Araar (2009) has indicated that it is difficult to put a price on all goods and services. Fifth, non-monetized (non-traded) goods provided by the government are common in developing countries (Roelen & Gassmann, 2008; Maasoumi, 1986). Finally, Sen (1992) identified different physical and social characteristics that affect inequality derived from income to include; personal heterogeneities, environmental differences, variation in social climate and distribution within a family.

One argument of both poverty and inequality estimates derived from income (or consumption) is that income is closely associated to all other attributes of well-being (Sen, 1983). However, the notion that all other aspects of well-being can be proxied by income would be misplaced. For instance, some aspects of well-being, like health and education, rely on public provisions of schools and hospitals and, therefore, cannot be captured by income from an individual or household. Therefore, studies on welfare inequality based only on one dimension have garnered much discussion in the literature about the validity of using income-based measures to reflect the status of well-being. Use of income can lead to over-estimating or under-estimating the extent of welfare inequality (Sen & Foster, 1982; Atkinson & Bourguignon, 1982; and Maasoumi, 1999). Thus, using a single dimension of welfare can lead to wrong interpretation of the extent of well-being inequality of individuals.

Major organizations like the World Bank and United Nations Development Programme (UNDP) have acknowledged and utilised the multifaceted nature of well-being inequality. The Inequality-Adjusted Human Development Index (IHDI), for instance, is an index created by the UNDP by adjusting the Human Development Index (HDI) to include disparities within the human development components. The HDI measures a nation's progress along three axes: health, education, and living standards (UNDP, 2010). The Gender Inequality Index (GII) by the same institution followed the IHDI as the second multidimensional inequality index to be monitored globally. The IHDI measures inequalities in the achievement of HDI dimensions. The variance between the HDI and IHDI is a measure of how much progress has been lost because of inequality (UNDP, 2010). The GII index evaluates gender-based disparities in three areas: economic activity, empowerment, and reproductive health (UNDP, 2019). The GII evaluates the drop-in achievement within a county as a result of gender inequality. According to Logar and Nizami (2022), inequality has a detrimental impact on both health and education.

This chapter adopts the capability approach, as proposed in the literature by Sen (1992; World Bank 2006), of examining well-being inequality among Kenyan children from a multidimensional perspective. We calculate a composite well-being index from the fundamental child well-being domains. We analyse the disparities in the achievements of these dimensions and subsequently calculate the inequalities among the Kenyan children.

3.1.2 Statement of the Problem

In 2019, Kenya scored 0.601 on the HDI. This achievement positioned the country at position 143 out of the 189 countries ranked. However, when this index was discounted for inequality, the HDI

dropped to 0.443, placing Kenya among the most unequal countries in the world (UNDP, 2021). The adjustment represented a loss of 26.3% on human development due to inequality. Previous literature (Crawford & Thorbecke, 1978; Vandemoortele, 1982 and Bigsten, 1981) also show that Kenya's income distribution is very unequal.

Despite the multidimensionality of inequality, previous studies are largely concerned with inequality in monetary dimension commonly income (Conceicao & Bandura, 2008). However, proponents' unidimensional approaches often argue that income measures presuppose the provision of all other essential services like education, health facilities, and sanitation facilities, which is not always the case. The well-being of an individual depends on many other factors, such as a long, healthy and quality life; nutritional status; educational attainment; and environmental and housing conditions (Tsui, 1999; Sen, 1993; 2003).

Policy makers are concerned with inequality because the reduction of poverty requires lowering inequality at a much faster pace. Inequality is negatively related to economic growth, which detracts the sustainable socio-economic development of a country. Additionally, inequality has negative social outcomes such as social unrest or violent conflict and/or higher incidence of crimes (Sen, 1980). Further, inequality is likely to reduce progress toward achievements of SDGs, and, therefore, reducing inequality within and between societies is a global challenge in the agenda 2030 (UNGA, 2015). The COVID-19 Pandemic worsened the vulnerable groups in the society and children were the hardest hit by the pandemic. Thus, addressing inequality should be a priority development issue.

In spite of widespread awareness of the ills of inequality in society, studies to examine multidimensional inequality in Kenya are seldom undertaken and the literature is sparse on this respect (Kabubo-Mariara et al., 2012). Given the dearth of studies on multidimensional well-being inequalities in Kenya, policies targeting well-being inequality, more so amongst children, are lacking. The research presented in this essay makes a significant contribution to the creation of policies and programmes for addressing unequal opportunities among Kenyan children. The analyses are organized around four specific research questions and objectives.

3.1.3 Research Questions

The following research questions will be covered in this essay:

(i) What are the magnitude and trends of multidimensional well-being inequality among the Kenyan children?

(ii) How are distributive indices of multi-dimensional well-being inequality amongst the Kenyan children?

(iii) What are the determinants of multidimensional well-being inequality among Kenyan children?

(iv) What policy options can lead to reduced multidimensional well-being inequality?

3.1.4 Objectives of the Study

The primary goal of this essay is to analyze the multidimensional child well-being inequality in Kenya. In particular, the essay seeks to:

(i) Analyse the levels and trends of multidimensional child well-being inequalities in Kenyan;

(ii) Analyze the distributive indices of multidimensional well-being inequality amongst Kenya children;

(iii) Investigate the determinants of multidimensional child well-being inequality in Kenyan children; and

(iv) Draw policy options for addressing multidimensional child well-being inequality in Kenya.

3.1.5 Contributions of the Study

This essay makes three contributions. First, it the measures the levels and trends of well-being inequalities among Kenyan children using a multifaceted approach. This has important policy implications since unidimensional measures of inequality do not offer complete information about well-being, which in turn affects policy design, monitoring and evaluation. The UN agenda 2030, SDG 10 identifies inequality between and within societies as challenge in the world. Secondly, the essay examines spatial and gender disparities in well-being inequalities between 1993 and 2014 for which no empirical evidence is available to date. Spatial and gender characteristics have a compounding effect on child well-being and the ability to escape from this menace is confounding. Thirdly, we decompose inequality to examine the key drivers of multidimensional inequality. This should help policy makers identify variables that exacerbate inequality and design appropriate policy interventions to target these factors.

3.1.6 Source of Data

The KDHS data from the years 1993 to 2014 were used in the study. A detailed exposition of data is presented in chapter one of this thesis.

3.1.7 Outline of the study

The literature on the measurement, breakdown, and causes of inequality is presented in the following section. The approaches utilized to accomplish the study's goals are described in part 3.3, and the empirical findings are shown in section 3.4. The study is concluded in Section 3.5, which also makes some recommendations for future policy.

3.2 Literature Review

3.2.1 Introduction

Theoretical research pertinent to the subject is included in this section, along with research on how inequality is measured empirically and a summary of the literature.

3.2.2 Theoretical Literature

Inequality refers to dispersion in the distribution of a welfare indicator, such as income. The literature offers two approaches to the conceptualization of inequality; absolute inequality, which refers to disparity in levels of welfare indicators; and relative inequality, which refers to the disparity in welfare indicator shares that accrue to the poor relative to the rich (Araar, 2009).

The literature offers the basic properties of a measure of inequality. These properties, which are described by Bourguignon (1979), Cowell (1980) and Shorrocks (1980) include the following:

- *Anonymity principle*; which states that it does not matter who earns the income, or put differently, inequality indices do not reveal or make public names or characteristics of persons other than their standards of living.
- *Population principle*; which means that the size of the population does not matter, but the proportion of the population earning different levels of income is important. This principle necessitates that inequality measures are considered invariant to replications of the population.
- *Pigou-Dalton transfer principle*; which stipulates that if there is a transfer of income from a richer person to a poorer person, inequality reduces and vice versa.

- *The scale or mean independence*; which stipulates that if the income of all individuals is multiplied by a scale, then the level of inequality remains unchanged.
- *Subgroup (additive) decomposability*: this property means that inequality can be broken down to population sub-groups such as urban versus rural, female versus male or by dimensions or any other factors of income.

Several inequality measures have been developed (Atkinson, 1970; Cowell, 1985; Sen, 1973; & Shorrocks, 1982; Josa & Aguado, 2020). The most common measures include Range, Gini coefficient of inequality, Kuznets ratio, Atkinson's inequality measure, mean absolute deviation and coefficient of variation, and general entropy (Theil) measures (Duclos & Araar, 2009). Gini coefficient is easy to understand and can be represented graphically by the Lorenz curve and thus most preferred in most empirical studies. However, it does not satisfy the decomposability principle and statistical testability over time. The Gini index ranges from 0 to 100 denoting perfect equality and perfect inequality respectively. The Theil index ranges between zero (equality) and infinity (inequality) and is superior to all the inequality indices listed because it satisfies all the above properties of an inequality index.

3.2.2.1 Measurement of inequality

Several theoretical approaches have been identified for measuring inequality. These can be divided into three strands (Nilsson, 2010) as the unidimensional approach, aggregative approach and non-aggregative approach.

Unidimensional Approach

In this approach, each attribute of interest is analyzed singularly without making any association or interrelations with other dimensions. The best-known measure of welfare inequality using unidimensional approach is the Gini coefficient of inequality. However, this summary measure is not additively decomposable; that is, it cannot be disaggregated to its sources (Maasoumi, 1999). Other unidimensional indices of distribution include generalized entropy index, Atkinson index and comparisons based on the dominance approach (see for example Atkinson and Bourguignon 1982, 1987; Bourguignon, 1987; Lugo, 2004; and Justino, 2005). Justino, Litchfield, and Niimi (2004) and Decancq and Lugo (2009) have criticized this method for failing to take into consideration that some dimensions are correlated and interrelated.

Aggregative Approach

This approach combines various attributes of well-being into one index (composite index), whose distribution can then be analyzed and evaluated from a unidimensional perspective. Examples of indices developed using this approach include the human development index (HDI) that combines three dimensions of well-being and aggregates them into a single index (UNDP, 2010); the Maasoumi index and Tsui index which use information theory to analyze inequality (Maasoumi, 1986; Tsui, 1995; 1999). A criticism of the aggregative approach, however, is the use of arbitrary and subjective weighting criteria. For instance, HDI uses uniform weights to aggregate the per capita income, health, and education dimensions to generate a scalar index of living standards in the world. Duclos et al. (2001) argues that aggregating multiple indicators into a single real-value leads to loss of information and could mislead policy makers if poorly constructed. The advantage of a composite measure, however, is that it summarizes a battery of indicators into one value,

which is easy to interpret and hence facilitates decision-making (Coromaldi & Zoli, 2012). The Maasoumi index and Tsui index have been criticized as being sensitive to different parts of the welfare distribution, and therefore rankings are ambiguous (Litchfield, 1999).

Non-Aggregative Approach

This approach analyses indicators of well-being independently by constructing composite indices specific to each dimension. The indices are thereafter partially ordered or ranked to examine the distribution of these dimensions. This strategy is called the "dominance approach" and was originated by Atkinson (1970) for unidimensional inequality analysis and Foster and Shorrocks (1988) for unidimensional poverty analysis. The method has also been extended to the multidimensional analysis of well-being. For instance, extension to multidimensional inequality was pioneered by Bourguignon (1979) and Atkinson and Bourguignon (1982; 1987) while application to multidimensional poverty was pioneered by Bourguignon and Chakravarty (2003) and Duclos, Sahn and Younger (2006). Atkinson and Bourguignon (1982) illustrated how to construct multi-dimensioned inequality using two dimensions, that is, income per capita and life expectancy for 61 countries while Atkinson and Bourguignon (1987) is concerned with income distribution in the face of different needs of individuals or households.

Some of the advantages of the Dominance Approach include being a tool for producing strong empirical assertions about welfare comparisons, considers joint distribution, and can use both discrete and continuous data. The Dominance Approach, however, has the following weaknesses: lack of a summary measure or complete ordering, it does not show the meaningful difference

between pair-wise dominance, and it is cumbersome to rank many distributions (Atkinson, 2003; Duclos, Sahn & Younger, 2006).

From the foregoing theoretical review, it is apparent that there is no agreement on the best way to measure inequality because the different approaches have their own strengths and weaknesses. However, it is generally acknowledged that welfare inequality is multidimensional and that there are many attributes of well-being (Sen 1985; 1992). New developments have been made regarding analysis of well-being from a multidimensional perspective. Notable among the methodologies is the hybrid index of multidimensional inequality developed by Araar (2009).

The Araar index has the advantage of overcoming drawbacks of the previous methodologies. The index has a flexible functional form and possesses basic properties of a good inequality index. It also ranks completely different states of welfare. This index is simple to understand and interpret and, more importantly, it can be decomposed to its components. This property is of value for designing policies to target those attributes with the highest inequalities (Araar, 2009). This essay employed Araar's index of multidimensional inequality in measuring multidimensional inequality of children's well-being in Kenya.

3.2.2.2 Determinants of inequality

Inequality is a broader concept which refers distribution of wide-ranging attributes like income, consumption, health, education, opportunity, human capital, possession of land and wealth (McGregor, Smith and Wills, 2019). One set of literature have been put forth explaining the causes of inequality in a society. For example, Lenski (1966) attempted to explain social inequality based

on the conflict and consensus approach. Those who favour conflict believe that the dominant class uses norms as a means of dominating others and preserving their interests (Dahrendorfs, 1968). This approach is akin to what Karl Marx pointed out at the beginning of the 19th century. Karl Marx stated that the ruling class (those with power, property and resources) exploit the subjects (workers, poor). He suggested the cure for this menace is to resort to violence by the masses by carrying out a revolution to overthrow the ruling class (Campbell, 1981). However, these approaches have been rejected in the literature.

Another set of literature have suggested that macroeconomic changes affect inequality (Marrero and Rodriquez 2012). The authors stated inequality tend to increase when there is high unemployment and inflation rates, while real GDP growth reduces the inequality. The effect of inflation on inequality has been inconclusive. According to Roemer (1993), inequality is a result of both inequality of opportunity (IO) and inequality of effort (IE). Inequality of opportunity arises from circumstances which are beyond an individual, i.e., race, gender, socioeconomic background (i.e., parental education) while inequality of effort refers to inequality brought on by a person's personal decision, such as the number of hours worked or profession. World Bank (2016) espoused that we should take care of inequality of outcomes (income or consumption expenditures) because it will lead to inequality of opportunity among the future generation. However, this has been challenged in that reducing inequality of income does not result in reduced inequality in other non-income aspects of life like health and nutrition (Sen, 1992; 1999).

The IO and IE is supported by Sen (1992). He pointed out that the central question when assessing equality is equality of what? Sen noted that people are diverse in terms of characteristics and social environment they live in and thus the assessment of inequality depends on choice of the variable. He argued therefore, that when assessing equality or inequality, we examine the capabilities of an individual to achieve certain functionings.

From the review above, this essay examines the determinants of inequality viz-a viz individual child, household and community characteristics. This is because the Demographic and Health Surveys does not have information on macroeconomic variables like inflation, growth and employment.

3.2.2.3 Decomposition of inequality

Shorrocks (1980; 1982 and 1984) pioneered studies in the decomposition of inequality and derived methods of decomposing income inequality into its sources; for example, earnings (salary, wages, and dividends), income from investment, and transfer payments. This kind of disaggregation is very crucial for measuring the importance or contribution of each component to total inequality. Similarly, inequality can be decomposed by sub-groups of the population; for instance, age, civil status, rural-urban residence, regions, male-female headship, household size, occupation and several other attributes. Shorrocks (1980) also showed that a number of inequality measures were additively decomposable. Other authors in this realm are Bourguignon (1979), Cowell (1980) and Rani et al., (2017). The next sub-sections describe the breakdown of inequality by income sources and by subgroups of the population.

Decomposition by income components

Shorrocks (1982) introduced a methodology for breaking down income inequality into its sources. He disentangled total income into its components and further examined the influence of each component.

Let y_i^k be the income of an individual i(i=1,…n) from source k(k=1,…, K) and let $y = (y_i, \dots, y_n) = \sum_k y^k$ be the summation of various income components, such as wages, income transfers, etc., as shown in equation 1. Then,

$$\delta^2(y) = \sum_k \delta^2(y^k) + \sum_{j \neq k} \sum_k \rho_{jk} \sigma(y^j) \sigma(y^k) \quad (1)$$

Where ρ_{jk} denotes the correlation coefficient between y^j andy^k. If the different components of incomes are uncorrelated, ($\rho_{jk} = 0, for\ all\ j, k,$) equation (1) becomes

$$\delta^2(y) = \sum_k \delta^2(y^k) \quad (2)$$

The left-hand side term of equation (3) is the contribution of factor *k*

The contribution of factor k then becomes,

$$s_k^*(\delta^2) = \delta^2(y^k) + \sum_{j \neq k} \rho_{jk}\, \delta(y^j) \delta(y^k) = cov(y^k, y) \quad (3)$$

The sum of these contributions over *K* types of income gives the aggregate income inequality value. Let us define $s_k^*(I)$ as the proportion of total inequality contributed by factor k when inequality measure is *I*. Therefore, the proportional contribution of the variance is given by

$$s_k^*(\delta^2) = cov(y^k, y)/\sigma^2(y) \quad (4)$$

Such that $\sum_k s_k^* = 1$

Decomposition by Population Subgroups

Inequality can also be decomposed into different population characteristics such as age, rural versus urban, male versus female, female-headed household versus male-headed household, race, and many other factors as long as the population can be categorized into groups (Shorrocks, 1984). This approach is useful during policy making as it enables the identification of the source of the highest inequality for targeting. The total inequality is the result of the sum of the within-group and between-group inequalities. The Theil index of the generalized entropy measurements is the most effective summary measure of inequality that can be decomposed. This is because the index is fully decomposed without a residual term, making it more attractive than other inequality measures. It is also additively decomposable and differentiable as the weights of each subgroup adds up to 1.

The formula for inequality decomposition is shown as:

$$I(x) = I(x_1, \dots, x_G) = \sum_g w_g \, I(x_g) + B \tag{5}$$

Where $x_1, \dots, x_G$ denotes partition of the distribution in *x* into G sub-aggregates, w_g denotes within-group inequality while B denotes between-group inequality. Shorrocks (1980) and Cowell and Fiorio (2011) have demonstrated that in order to be aggregative, an inequality measure needs to have certain desired characteristics. This essay applies Shorrocks' (1982) methodology of decomposing income inequality into its sub-aggregates. The inequality indices in this essay are derived from children's composite well-being dimensions.

3.2.3 Empirical Literature

In this section, we examine earlier research on the measurement, determinants and breakdown of inequality. We start with research tackling measurement of inequality and then followed by the studies dealing with determinants of inequality and last but not least, we review studies on the decomposition of inequality.

3.2.3.1 Measurement of inequality

Many studies have been conducted to gauge inequality (Kakwani 1980; Shorrocks, 1984; Justino et al., 2004; Justino, 2005; Nilsson, 2010). However, Sub-Saharan Africa, and Kenya in particular, lacks a wealth of literature on multidimensional inequality. We cover a few papers on the measuring of multidimensional inequality in this section.

Nilsson (2010) used three techniques to measure multidimensional inequality in Zambia using four welfare attributes, namely consumption, land holdings, health, and education. The study used the Zambian Living Conditions Monitoring Survey data (LCMS II) for 1998 and (LCMS IV) of 2004. Using the unidimensional approach (analysing inequality in different attributes separately), the results indicated that the Gini coefficient of land holdings in Zambia was high at 0.675 in 1998 and 0.698 in 2004 while the Gini coefficient of health was lowest at 0.127 in 1998 and 0.138 in 2004. The second highest inequality was observed in consumption expenditure at 0.533 in 1998 and 0.544 in 2004. However, inequality increased between the two periods by 9.47% for the health dimension but decreased for education dimension by 9.1%.

The author also analysed Maasoumi multidimensional inequality index, which separately examined each of the three attributes and expenditure. The results showed that the inequality index

derived from one attribute is higher than when two, three or all attributes are combined. This suggest that univariate analysis of inequality may be misleading. For instance, analysis of health inequality separately showed an increase of inequality between 1998 and 2004, but when the health and education; health, education and land and health, education, land and expenditures were combined the Masoumi multidimensional inequality index remained constant at 0.047 in 1998. Lastly, using the non-aggregative technique, the results indicated that the distribution of expenditures in 1998 dominate corresponding expenditures for 2004 satisfying the conditions of dominance approach. Consequently, this shows that inequality was unequivocally higher in 2004 compared to inequality in 1998. Unlike her study which used the household as the basis of her analysis, in this essay the individual child is the unit of analysis. Further, the use of equalized expenditures in a household is considered problematic since it assumes uniform distribution of income in a household, and this is not always the case (Thorbecke, 2008).

Justino (2005) compares and contrasts different theoretical methodologies of analysing multidimensional inequality indices using Brazilian and Vietnamese household data. The study analysed three attributes of welfare; that is, per capita income in Brazil and per capita consumption in Vietnam which constitute monetary welfare attributes and education and health status, which constitute non-monetary attributes. The author calculated inequality for the two countries using each attribute of welfare independently and later used approaches that allow for the combination of attributes Maasoumi, (1986) and Tsui, (1999). The results show that inequalities derived from per capita income/per capita consumption and educational inequalities are higher in Brazil compared to Vietnam. Given the weaknesses of composite indices espoused in section 3.2.2.1 of this essay, Justino (2005) applied the partial stochastic dominance approach pioneered by Atkinson

and Bourguignon (1982). The results of first order dominance were not conclusive because the Lorenz curves cross one another at low ends for expenditures and educational inequalities. One weakness of the dominance approach is that the technique may become intractable when many attributes are considered. Just like Nilsson (2010), Justino (2005) advocated for the analysis of welfare inequality using the multidimensional approach and argued that analysing multiple attributes of welfare independently does not constitute multidimensional approach. We argue that using only four attributes to examine welfare in a household is limiting, and that equivalized per capita income is a strong inference of equal shares of income in a household, which is not the case as Throbecke (2008) noted.

In an earlier study, Justino, Litchfield and Niimi (2004) used 2 strategies to calculate the extent of multidimensional inequality in Brazil. First, the authors compared the independent distribution of four welfare attributes. Next, they considered the pairwise joint distribution of the same attributes. The attributes were equivalized per capita income, completed number of years of education, health (measured by number of stillbirths in a household), and political participation (measured in terms of participation in labour unions). The data was sourced from Brazilian National Household Survey and Brazilian Demographic and Health Survey both collected in 1996. Using the unidimensional approach, Brazil was found to have huge income inequalities that have persisted since the 1980s. The inequalities vary by race and region where people of African descent and indigenous people have lower incomes compared with other races such as Portuguese. The authors found that income distribution does not portray a true picture of socio-economic inequality in a society. They found that education, health and political participation were more equally distributed

than income. In terms of joint distribution, the relationship between income and political representation was not strong, but the relationship between income and education was quite strong.

Another strand of literature has emerged that uses statistical approaches to construct asset indices for evaluating social welfare. Sahn and Stifel (2000) employed FA to compare "poverty" at two or more points in time within and between African countries. Their welfare measure is an index resulting from various household characteristics, durables, and household heads' education. In 2003, the they also employed FA to assess the well-being of eleven countries by constructing an asset-based index Sahn and Stifel (2003). They found that asset index is a very good predictor of multidimensional poverty-child health and nutrition. They argued that asset index is vital proxy for long-term wealth and has less flaws compared to income or consumption expenditures. In contrast, Filmer and Pritchet (2001) employed Principal Component Analysis (PCA) to construct a wealth index to evaluate the well-being of children in India by examining the relationship between wealth and enrolment in school in a household. The authors found that wealth index can predict education enrolments without consumption expenditures without apology or tears.

The third approach, Multiple Correspondence Analysis (MCA), was utilized by Booysen et al. (2007) to construct an asset-based index to evaluate poverty and inequality in seven African countries. They discovered that inequality was greater in rural areas compared to urban areas these trends in inequality mirrored trends in poverty. The authors also found that five countries, namely Tanzania, Ghana, Senegal, Zimbabwe and Kenya had experienced a reduction in inequality while in Zambia inequality had increased. Similarly, four countries experienced reduction of inequality in urban areas, namely Ghana, Kenya, Senegal, and Tanzania. Of these, only Tanzania also

experienced reduction in inequality in rural areas. Ambapour (2020) employed MCA to analyse multidimensional poverty in Congo. The basis for analysis in this essay is a child, as opposed to Booysen et al. (2007) who utilized the household as the basis of their analysis. Although there is sharing of household resources among all members of a household, there are some characteristics which are specific to children, such as health status as measured in terms of vaccinations of children against deadly diseases, and nutrition status as measured in terms of anthropometric measures. However, Ambapour (2020) noted that MCA do have some limitations relating to the breakdown of the index into a specific dimension and that it is impossible to rank dimensions and prioritize which one to tackle.

In Kenya, Kabubo-Mariara et al. (2012) used factor analysis to examine inequality among children based on asset index across child mortality groups. The study's findings demonstrated that the absolute Gini index for assets was highest amongst the group of children from households facing mortality. The authors pointed out that there was less asset inequality among children living in households that had child death compared with those from households that had not had a child death. The findings further showed that between-group inequalities were quite small at 5%, within-group inequality was about 21%, while the overlap explained about 7% of the total welfare inequality. Further analysis using the absolute Lorenz curve and concentration curves suggested that welfare inequality was more pronounced in terms of assets than in child survival, and that there was higher inequality in urban areas compared to rural areas. The foregoing study used only two indicators to capture child well-being inequality. We argue that other dimensions that are crucial for child development, such as nutrition status and education status that need to be brought to the fore in child-focused research.

Other studies have examined correlation between numerous attributes of well-being. Decancq and Lugo, (2009; 2012) proposed a study of multidimensional welfare of individuals using correlation between dimensions. Using annual data from Russian Longitudinal Monitoring Survey of Higher School of Economics (RLMS-HSE) between 1995 and 2005, the authors showed that the correlations between dimensions matter in the analysis of multidimensional inequality. They constructed composite indicator from four dimensions, namely housing, health, education, and expenditures and analysed their distribution. In the 2009 study, the authors found that inequality in expenditures increased between 1995 and the start of financial crisis in 1998 but dropped immediately to 1995 values. The inequalities in housing remained stable while for education, it has significantly dropped but increased for health. The resulting indices are a multivariate generalization of Gini coefficient. The authors preferred aggregation across dimensions of well-being than across individuals. The results suggest that when the dimensions are more correlated, multidimensional inequality is higher and vice versa (Decanq & Lugo, 2012). The results also highlight the empirical differences between multidimensional inequalities in the sequencing of the two procedures of aggregation.

Araar (2009) proposed a hybrid index of multidimensional inequality that satisfies desired properties of an inequality index. Using data from Cameroonian Household Survey 2001, the author used three attributes of welfare, namely: housing, health and education basic infrastructure. The author used MCA to estimate the normalized scores of these attributes. The results showed that urban households compared to their rural counterparts scored highly in housing, education and toilet facilities. Further, the findings indicated that there is higher absolute and relative multidimensional inequality in rural areas than semi-urban and urban areas, and that education

dimension contributed more to multidimensional inequality than the health dimension. This essay employs this approach in measuring distribution of welfare distribution indices among Kenyan children. The approach is attractive for policy targeting purposes and helps identify policies for addressing multidimensional inequality in the country.

3.2.3.2 Determinants of Inequality

The foregoing section examined the empirical literature on measurement of well-being inequality, while this part will look in to the determinants of inequality. The studies reviewed in this section are divided into two strands.

The first strand are studies which examine inequality viz-a-viz various macroeconomic variables. For instance, Kuznets (1955) examined the correlation between inequality and economic growth in three countries. The results showed that as the economy grows in United States, England, and Germany, inequality also rises until it reaches a maximum point then begins to decrease. This finding is supported by more recent literature such as Gregorio and Lee (2002) who found a convex association between income level and income inequality. Similar studies include Li, Xi and Zou (2000) who examined the impact of corruption and inequality and found n convex relationship suggesting that countries with high corruption experience low inequality. The findings also showed that corruption derails economic growth. In contrast, Barro (2000) found mixed results where inequality retards economic growth in poor countries but has the opposite effect in developed countries. However, the results supported Kuznets' hypothesis of inverted U-shape in the long-run.

Mocan (1999) investigated the influence of unemployment on income distribution in the United States and found a negative influence on income inequality. Auten and Carroll (1999) found that income tax increases raise inequality in household income distribution. Some studies have examined the influence of institutional and economic variables on income inequality. For example, Bourguignon and Morrison (1998) found that dualism or the existence of a high-tech modern sector and low productivity in agricultural sector increases inequality in society.

The second strand of studies has established the determinants of inequality at a micro level. The studies break down inequality into its population subgroups and income sources (Fields, 2003; Heshmati, 2004). We shall examine empirical literature on the decomposition of inequality based on population subgroups as well as regression techniques.

3.2.3.3 Decomposition of inequality

The breakdown of total inequality by population sub-groups is the technique of apportioning overall inequality to each population sub-group. The technique involves two steps. First, a sample is divided into mutually exclusive categories (e.g., age, female versus male individuals, rural versus urban residents, different levels of education, civil status, etc). Second, the mean inequality for each subgroup is calculated (see, for example, Shorrocks, 1984; Jenkins, 1995; Cowell and Fiorio, 2011). Another strand of literature focuses on regression-based inequality decomposition as exemplified by Oaxaca (1973). The author stated that the regression-based approach of inequality decomposition overcomes the weaknesses encountered when inequality is broken down by population sub-groups. In regression-based decomposition, continuous variables are admissible and the problem of endogeneity can be controlled (Morduch & Sicular, 2002).

Jenkins (1995) evaluation of the evolution of income inequality in the United Kingdom from the year 1971 to 1986 found that most factors accounting for income inequality were employment structure and unemployment and earning differences, with unemployment having the highest impact.

Adams (2001) employed regression-based approach to evaluate the contribution of farm income and non-farm income to rural inequality in Egypt and Jordan. The author found that non-farm income from decreased inequality in Egypt but had the opposite effect in Jordan. This difference was attributed to the accessibility and productivity of land. The study noted that most poor Egyptians do not own or access land and therefore, they seek employment in non-farm sectors. In contrast, 30% of the land in Jordan is under irrigation and has low productivity, which means that people are not attracted to agriculture. The (rich) owners of the land in Jordan have poor returns.

Morduch and Sicular (2002) adopted the methodology developed by Shorrocks (1982) to decompose inequality in rural China. The authors concluded that the determinants of inequality depend on the type of inequality examined, for instance Gini coefficient, coefficient of variation or Theil index. The highest inequality-reducing characteristic was average education of adults at 94% followed by number of workers per household and size of household respectively. In contrast, spatial factors (villages) had a positive contribution to large inequalities (inequality-increasing). The results of this methodology depend on the type of inequality being considered and could be misleading to policy makers.

Fields (2003) and Rani et al., (2017) exemplified the method of decomposing inequality by its components in the traditional Shorrocks' (1982) approach. Applying this method, the author decomposed inequality in the USA for the period 1979 and 1999. The results showed that schooling contributed the most to inequality due to huge differences in earnings between workers of different school attainment levels. The second highest contributor to inequality was occupation followed by experience and gender respectively. This essay adopted this methodology to evaluate the effects of socio-economic and demographic factors on child inequality index in Kenya.

3.2.4 Overview of the Literature

Despite the rich theoretical and empirical literature available, there is a paucity of research on multidimensional well-being inequality in Kenya. Some authors provided evidence on distribution of income in Kenya in the early 1980s (Crawford & Thorbecke, 1978; Vandemoortele, 1982; and Bigsten, 1981; Bigsten et al., 2016). Other studies have examined inequality among Kenyan children on two attributes of child well-being, namely assets and survival (Kabubo-Mariara et al., 2012). These studies focus on unidimensional and/or bi-dimensional measures of well-being. Thus, the literature on assessment of inequality, and especially multidimensional inequality, in Kenya remains limited. This essay addresses this gap by analyzing multidimensional inequality among Kenyan children based on the composite well-being index from seven child-specific dimensions. Additionally, this essay applies the hybrid index of multidimensional inequality propagated by Araar (2009) to examine the distributive indices within the dimensions of child well-being. The index possesses desirable properties of an inequality index.

It is evident from the literature that there are a few studies dealing with the determinants of inequality in Kenya and more so among the children. Most of the available studies have focused on developed countries. This essay addresses this gap by examining these issues in the Kenyan context using composite well-being index for Kenyan children. The findings of the study will provide policy makers with knowledge to address inequality effectively. We decompose inequality using the methodology exemplified by Fields (2003) and Rani et al., (2017) because it does not matter the kind of inequality measure used.

3.3 Methodology

3.3.1 Introduction

This section presents the methodology utilized in this study. We use statistical techniques to construct composite well-being indices and subsequently measure the well-being inequalities among the Kenyan children. The statistical approaches combine various attributes of well-being and aggregate them into an index or deprivation scores. In this essay, these aggregated indices are then used to assess inequality of well-being among the Kenyan children (Alkire et al., 2015). We estimate distributive indices of inequality using the hybrid multidimensional inequality index pioneered by Araar (2009). Last but not least, we investigate the socio-economic determinates of inequality using Fields (2003) methodology.

3.3.2 Construction of Composite Welfare Indicator

The literature contains three statistical approaches for assessing well-being in society. These techniques are principal component analysis (PCA), multiple correspondences analysis (MCA) and factor analysis (FA) (Alkire et al., 2015). We shall describe these techniques briefly and subsequently choose a suitable one for our analysis.

3.3.2.1 Principal Component Analysis

This is a descriptive method of multivariate statistical analysis. It is the oldest technique used by most disciplines for assessing multivariate data (Abdi & Williams, 2010). The technique summarises well-being indicators into new variables called components, which are uncorrelated.).

The main goal of PCA is seeking total variance across the indicators. The first new variable created is referred to as 1st principal component. It has the highest variance (i.e., moment of inertia) and therefore explains the largest part of the data. The 2nd principal component is uncorrelated to the 1st principal component and has the second largest variance of the indicators. A similar procedure is applied up to the last component.

There are several uses of PCA, but the most important one applies in multivariate analysis where the main objective is to find a good representation of the data and also reduce redundancies (parsimony). For instance, it is very cumbersome to choose one dimension, among many, which can best represent overall welfare. PCA, therefore, combines the well-being indicators and creates new variables that provide information based on all of them. Moreover, some indicators are correlated (multicollinearity), which makes model predictions inaccurate and can lead to wrong conclusions.

Other aims of PCA include measuring unobserved variables or conceptual constructs and detection of implausible data (outliers) (Alkire et al., 2015). In the literature reviewed, PCA has been used to analyse health inequalities (Gwatkin et al., 2000), child nutrition (Sahn & Stifel, 2000), and child mortality (Fay et al., 2005). In addition, it is used when the variables are cardinal in scale; that is, continuous data (Asselin & Anh, 2008; Njong & Ningaye, 2008; Abdi & Williams, 2010). Most of the variables in this essay are categorical and therefore PCA is not appropriate as a method of analysis.

3.3.2.2 Multiple correspondence analysis

Similar to PCA, MCA is a descriptive method of analysing multivariate distribution of variables. However, unlike PCA, the latter is best suited for categorical or binary variables (Asselin and Anh, 2005). The new variables created using MCA are referred to as axes (Ballon and Duclos, 2015). The goal of MCA is to take into account as much variance along the first axis as possible; the second axis then takes into consideration the second-highest variance, and so on until the last axis.

The MCA technique can also be used to analyse quantitative variables but after transforming them into categorical variables or bins. MCA is a multivariate analysis for simple correspondence analysis (CA), but whereas the latter is a cross-tabulation of two variables, MCA is the cross-tabulation of more than two variables. Several studies have used MCA to analyse welfare. For instance, Booysen et al. (2007) used the technique to measure poverty and inequality in seven SSA nations. Similarly, Kabubo-Mariara et al. (2011) employed this technique to assess maternal and child well-being in Kenya, while Asselin and Anh (2005) used it to calculate the welfare index for Vietnam. Further, Ki et al. (2005) constructed a poverty index for Senegal and Njong and Ningaye (2008) did the same for Cameroon using this methodology. In this essay, we used MCA approach to analyze relationships of variables as most of the dimensions were categorical or binary in scale.

The aim of MCA is to generate a composite well-being indicator from many categorical variables. The notation for deriving the index is defined as:

$$W_i = \frac{\sum_{k=1}^{k} \sum_{j_k=1}^{J} W_{j_k} I_{i,j_k}}{K} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

Where W_i is composite well-being indicator of an individual, K is the number of categorical variables, jk is the number of categories for indicator k, $I_{j,jk}$ is the dummy variable taking 1 if the individual i has the category jk and W_{jk} is the normalized first axis score of category jk. After reducing the information from the $\Sigma_k J_k$ dimensions to the fewest one, the reduced space preserves the main disparities in well-being. The main part of this disparity is projected on the first axis - factor- of the reduced space. This is the reason for which one can use the categorical scores of the first axis as categorical weights. The weight obtained by the MCA corresponds to standardized scores on the first factorial axis.

The lowest point of the wellbeing index created by MCA frequently has a negative value (lower values mean more poverty while larger values mean higher welfare) thus making interpretation difficult. Nonetheless, this indicator can be made positive by a translate using the absolute value of the average C_{min} of the minimal categorical weight W_{min}^{k} of each indicator. Asselin (2002) expresses the average minimal weight as below:

$$C_{min} = \frac{\sum_{k=1}^{K} W_{min}^{k}}{K} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

The absolute value of C_{min} can be added to the W of each household to obtain the new positive W scores. The MCA was employed in this paper to examine the distribution of dimensions of well-being and construct the composite well-being indices in all five rounds of Kenya Demographic and Health Surveys. Consequently, the indices were used to calculate various well-being

inequalities. Finally, to investigate how different characteristics contribute to overall inequality, the inequality index was regressed against child household and community characteristics.

3.3.2.3 Factor Analysis

In contrast with PCA and MCA, factor analysis (FA) is a model-based approach for analysing welfare. Similar to PCA and MCA, FA is used to transform original variables to new variables that capture common factors that explain common variances in the original data. Since FA is a (model-based method) regression-based model, it is used to make predictions about the population (Alkire et al., 2015). Contrary to PCA, which explain the underlying structure of indicators on the basis of total variance, FA explains common variances across variables. This method is applied to both cardinal and binary variables. For cardinal variables, factor scores come from regression analysis while for binary or categorical variables, factor scores come from Bayesian estimation.

The FA models can either be exploratory or confirmatory models. Exploratory models make no assumptions about the patterns of the variables and the latent factors while confirmatory models assume a pre-specified pattern of relationship among the indicators.

3.3.3 Measures of inequality

There are several summary measures of inequality. These include the Theil index, the generalized entropy index, the Kuznets ratio, the Gini coefficient, the range, the coefficient of variation, the Kuznets ratio, and Atkinson's measurements (Cowell, 2011). The two metrics that are most well-known and frequently used in economic literature are the Gini coefficient and the Theil indices. This is because they possess desirable properties of an inequality index.

The Gini coefficient ranges from 0, which means there is equality in the distribution and 1, which denotes that there is perfect inequality in the distribution. This can also be derived graphically by the use of Lorenz curve. The Lorenz curve's diagonal line is a representation of the line of absolute equality. On the vertical axis, it plots the values of the attribute of well-being from the lowest to the highest while the cumulative proportion of the population is plotted on the horizontal axis. The Gini ratio is equivalent to twice the area between the Lorenz curve and the line of perfect equality.

The Gini coefficient, though easy to calculate and interpret, has a number of weaknesses (Ellison, 2002). For instance, it cannot be broken down to within and between subgroups of the population (Atkinson, 1970, Cowell, 2011). Inequality summary measures with desirable properties are the Theil indices and the entropy measures (Litchfield, 1999). Unlike the Gini ratio, the degree of inequality ranges from 0 to infinity. Just like before, 0 represents perfect equality while high value shows higher inequality. This index has a weighting parameter ranging from negative infinity to positive infinity. While the index is sensitive to changes at the upper tail of the welfare distribution for positive values, inequality is sensitive to changes at the lower tail for negative values (Cowell, 1980; Shorrocks, 1980). To measure the distributive indices of multidimensional inequality, this essay uses Araar (2009) hybrid multidimensional index of inequality of the following form:

$$MDI = \sum_{i=1}^{K} \varphi_k[\lambda_k I_k + (1 - \lambda_k)C_k] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 7$$

Where $\varphi_k$is the weight of the dimension k, $I_k$is the gini coefficient (relative or absolute), C_k is the concentration indices of dimension k. The sensitivity parameter λ_k, represent the correlations between dimensions.

The hybrid index MDI is attractive because of a number of reasons (Araar, 2009): It is simple to read and understand, has a variable functional form, and reflects a variety of social preferences. The index also enables the creation of a comprehensive hierarchy of social welfare services. The index may be broken down into its constituent parts at different levels, which is crucial for policy targeting in order to address both one-dimensional and multidimensional types of inequality at once.

Moreover, the index possesses several desirable properties for MDI indices. This index obeys the uniform Pigou-Dalton majorization principle and correlation increasing majorization principle proposed by Tsui (1999; 2002). The uniform Pigou-Dalton majorization axiom stipulates that a decrease in multidimensional inequality should not lead to an increase in unidimensional inequality, while the correlation increasing majorization principle stipulates that the welfare attributes should be highly correlated. A high correlation between dimensions increases unidimensional inequality. Araar (2009) used multidimensional inequality to evaluate the effects of correlation among the components.

3.3.4 Decomposition of inequality

According to Shorrocks (1982) inequality model, decomposition of total income into various components enables determination of the effect of various income sources to the overall inequality. This can be expressed in the following equation:

$$y_i = \sum_{i}^{n} y_i^k \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 8$$

Where y_i^k is income from individual i from source k and $y_i = \sum_i^n y_i^k$ denotes total income. Shorrocks (1982) demonstrated that the contribution of income from a particular source can be gotten by getting the covariance of that income source with total income divided by the variance of the total income. The notation is given by equation 9;

$$s_k = \frac{cov(Y^k, Y)}{\sigma^2(Y)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 9$$

The sum of all contributions from each income source add up to 1; that is $\sum_k s_k$=1, to be a good index of inequality.

Fields (2003) extended Shorrocks (1982) concept by arguing that income components can be treated as exogenous variables in an income generating equation as in equation 8. The standard income generating function can be formulated as follows:

$$lny_i = a'Z_i + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 10a$$

where, $$\alpha = [\alpha \;\; \beta_1 \;\; \beta_2 \dots \beta_j] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 10b$$

and $$Z_i = [1 \;\; x_{i1} \;\; x_{i2} \dots x_{ij}] \dots\dots\dots\dots\dots\dots\dots\dots\dots 10c$$

Where lny_i denotes natural logarithm of total income of an individual or household, Z represents a vector of independent variables, which include individual, household and community characteristics, parameters α and β*'s* are regression coefficients of independent variables, and ε is the error term.

Borrowing from Shorrocks (1982), we calculate the variance of equation (10a). On the left-hand side of equation (10a) gives us the log-variance which a measure of inequality. We then manipulate the equation on the right-hand side of equation (10a) based on a theorem pioneered by (Mood, Graybill & Boes, 1974).

Theorem: Assuming that A=A (1,…,p) and B=B(1,…q) are two random variables and a and b are constants, then:

$$cov\left[\sum_{p=1}^{P} a_p A_p, \sum_{q=1}^{Q} b_q B_q\right] = \sum_{p=1}^{P}\sum_{q=1}^{Q} a_p b_q \, cov[A_p B_q]$$

Applying this theorem to equation (10a) such that:

$$\ln Y = \sum_{j=1}^{J+2} \alpha_j Z_J \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 11$$

We have $cov\left[\sum_{j=1}^{j+2} \alpha_j Z_J\right] = \sum_{J=1}^{J+2} cov[\alpha_j Z_j, \ln Y] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 12$

Since the covariance of *lnY* and *lnY* is just the variance of *lnY*, equation 12 becomes:

$$\sigma^2(\ln Y) = \sum_{j=1}^{J+2} cov[\alpha_j Z_j, \ln Y] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 13a$$

If we divide both sides by σ^2 (*ln Y*), we get:

$$100\% = \frac{\sum_{j=1}^{J+2} cov[\alpha_j Z_j, \ln Y]}{\sigma^2(\ln Y)} \equiv \sum_{j=1}^{J+2} s_j(\ln Y) \ldots\ldots\ldots\ldots\ldots\ldots\ldots 13b$$

Where each $s_j(ln\, Y)$ is the relative factor inequality weight given by:

$$s_j(lny) = \frac{cov[\alpha_j Z_j, lnY]}{\sigma^2(lnY)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 13c$$

Assuming that the covariance of Z and the ε is equal to zero, then the weight of each variable is given as follows:

$\frac{\sum_{j=1}^{J+1} cov[\alpha_j Z_j, \ln Y]}{\sigma^2(\ln Y)}$ sums exactly to $R^2(ln\ Y)$

The correlation between two variables is related to the covariance between the two variables as follows:

$$corr[\alpha_j Z_j, ln\, Y] = \frac{cov[\alpha_j Z_j, lnY]}{\sigma^2(lnY)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 14$$

Substituting equation (13a-c) into 14 and let $s_j(lnY)$ represent the log-variance of income that is accredited to the j^{th} independent variable and let $R^2\,(lnY)$ be the fraction of log-variance explained by the model. Then the log-variance can be broken down as:

$$s_j(lny) = \frac{cov[\alpha_j Z_j, lnY]}{\sigma^2(lnY)} = \frac{\alpha_j * \sigma(Z_j) corr[Z_j, lnY]}{\sigma(\ln Y)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 15a$$

Where $\sum_{j=1}^{j+2} s_j\,(lnY) = 100\%$.....15b

and $$\sum_{j=1}^{j+1} s_j\, lnY) = R^2(lnY) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 15c$$

The proportion that is attributed to the j^{th} independent variable, $p_j(lnY)$, is then

$$\rho_i(lny) \equiv \frac{s_j(lnY)}{R^2(lnY)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 15d$$

Equation (15a-d) has espoused the breakdown of log-variance. The strength of this methodology is that it can be extended to other inequality measures using the additive factor components by Shorrocks' (1982) theorem.

Note that equation 10a is similar to equation 8, with y_i^k replacing $\alpha_j Z_j$ and *y* replacing *ln y*. Taking the advantage of Shorrocks (1982) theorem, the relative factor inequality weight by a variable is given by:

$$\rho_i(lny) \equiv \frac{s_j(lny)}{R^2(lny)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 16$$

Equation 16 holds for any inequality measure. Although the methodology uses income inequality as the dependent variable, this essay applied an inequality index calculated from the composite indicators of child welfare.

3.3.5 Empirical (Analytical) framework

We begin our estimation strategy by formulating the following welfare equation for children from income generating equation 10a, 10b and 10c above as follows:

$$Y_i = \alpha + X_{ij}\beta_j + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 17$$

Such that *i=1,2, …n and j=1, 2, …k*

Where n and k represent the number of observations (children) in the sample and parameters (regressors) respectively. Y_i is the inequality of well-being of child *i*, X_j are regressors assumed to be exogenous and no multicollinearity. The predictors include individual, household and community characteristics that affect welfare, β_i are regression coefficients of each regressors and

ϵ_i is the random variable representing unobserved. The parameters in equation 17 are estimated using OLS to examine the influence of each predictor on inequality of well-being.

3.3.6 Indicators of child well-being

Table 3.1 presents the variables used in the analysis. There are seven (7) dimensions and thirteen (13) indicators used for computing the composite indices of child well-being. To ensure comparability in all the Kenya Demographic and Household Surveys, we have grouped similar-phrased questions together. The earlier Kenya surveys in the 1990s fielded fewer questions and thus allowed for fewer responses compared to surveys in the 2000s. We applied MCA to the indicators of child well-being as shown in Table 3.1.

Table 3.1: List of variables used for measuring child well-being

No.	Dimensions	Indicators
1	Food (Nutrition)	Stunting Wasting Underweight
2	Health	0 No vaccination,1 BCG, 2 DPT-1, 3 DPT-2, 4 DPT-3, 5 Polio-1, 6 Polio-2, 7 Polio-3, 8 Measles
3	School attendance status (Education)	No education Incomplete primary Complete primary Incomplete secondary
4	Source of drinking water (Water)	Piped water (piped into dwelling, piped to yard/plot, public tap/standpipe) Borehole or well (tube well or borehole, protected well, unprotected well, protected spring, unprotected spring) Open surface (river, dam, lake, ponds, stream, canal, irrigation) rainwater Others (tanker truck, cart with small tank, bottled water)
5	Type of toilet facility (Sanitation)	Flush toilet (to piped sewer system, to septic tank, to pit latrine, to somewhere else, don't know where) Pit latrine (ventilated improved pit, with slab, without slab, open pit)

		No facility (bucket toilet, bush, field) others (composting toilet, hanging toilet, hanging latrine)
6	Type of floor and roof materials (Shelter)	Earth floor (earth, sand, dung, wood planks, palm, bamboo) Smart floor (parquet, polished wood, vinyl, asphalt strips) Modern floor (ceramic tiles, cement, carpet) Other floors Poor roof (thatch, palm leaf, dung, mud, tin cans) Iron sheets roof (corrugated iron (mabati), asbestos sheet) Modern roof (concrete, tiles) Other (no roof)
7	Access to information (Information)	Owns radio (No /Yes) Owns TV set (No /Yes)

3.4 Empirical Results

3.4.1 Introduction

In this section, we present results of welfare indices, trends of inequalities of well-being, distributive indices of multidimensional inequality and decomposition of inequality.

3.4.2 Estimation of MCA model

The composite well-being index was constructed using the MCA model. First, we transformed the nutritional z-scores to categorical variables for easier comparability. All the other dimensions used in the study were categorical in nature. It has been indicated that MCA is best suited for categorical (nominal) factors rather than cardinal variables (Booysen et al, 2007; Mckenzie, 2005; Asselin, 2009). In 1993 survey, 12 indicators were estimated using MCA model and the results are presented in Appendix A. The first two orthogonal axes in the 1993 survey accounted for 75.46% of total inertia (variability/eigen value) as shown in Table A1 while in the 1998 survey, the first and second orthogonal axes accounted for 75.13% of the total distribution (inertia) (Table A2). In the 2003, 2008 and 2014 surveys the first two orthogonal axes accounted for 82.81%, 81.23% and 80.43% of total inertia respectively (Table A3, A4 and A5). Filmer and Prichet (1999; 2001) used the first component to develop a household asset index because the first axis accounts for the highest dispersion of data (i.e., inertia). However, Asselin (2009) later criticized this approach and suggested use of more than the first factorial axis to calculate the multidimensional poverty index. In this essay, we used MCA approach to analyze relationships of variables as we were not interested in data reduction to calculate inequality.

The advantage of MCA is its optimal scaling property (Ballon & Duclos, 2015). This means that the approach identifies the categories/variables that contribute the most to the dimensions of

interest. The variables explain the variability in the data sets. In terms of coordinates, the components with positive values signify better quality of well-being while those with negative values suggest poor quality of life. For instance, in Table B1, the coordinates for stunted children (-0.793), wasted children (-1.136), and underweight children (-1.079) have negative values while those for children that are not stunted (0.406), not wasted (0.246), and not underweight (0.067) carry positive values. These results are consistent in all surveys (Tables B2, B3, B4, and B5 in Appendix B).

The weights, which are sometimes referred to as loadings are interpreted as relative contribution of the variables to the composite welfare index of child well-being (Njong & Ningaye, 2008). The variables of children who accessed drinking water from open sources scored -0.83 on weights, while those who used unprotected boreholes scored -0.424 on weights. The negative sign on the weights implies that the respective indicators are welfare reducing. Thus, the weights for children whose drinking water is piped into the house or those using harvested rainwater have positive weights, implying that the indicators are welfare-increasing. These results are consistent in all the surveys. Likewise, the weights of children from homesteads without proper sanitation facilities (toilets), those living in poor housing conditions (earth floor and poor roof), and those suffering poor health status (children that have not been fully immunized) have negative weights. Similarly, children who had never attended school although they were of school going age or those who quit school as well as children without access to media equipment had negative weight scores, implying that these variables aggravate the welfare of children. Similar results were observed in all the other surveys. On the other hand, children with access to radio scored 0.841 on weights and those having access to television scored 5.556 on weights in 1993. These results were consistent in all the

surveys. The weights declined steadily, suggesting that more households acquired media equipment over the period. Similar results were observed for variables like living in a house with a smart floor/roof, proper and improved sanitary facilities, and full immunization.

The 'other' categories/indicators captured under water, sanitation, and shelter dimensions presented mixed results with positive and negative weights. According to Booysen et al. (2007), this observation is not unusual in so far as this category represents non-specified, catch-all group alternative types of indicators. This finding corresponds to past studies such as Kabubo-Mariara et al. (2011) who discovered negative weights for children living in houses without television and radio, low quality floor, rudimentary roof, and no toilet facility. Ballon and Duclos (2015) also found that variables like "no toilet facility" and "open source of water" were on the left side of the bi-plots with negative weights in both South Sudan and Sudan.

From the surveys, we observed that marginal distributions (mass) were uniform across the categories. In 1993, the categories with the largest mass among the Kenyan children were children without television at 8.7%, and children who were underweight at 8.6%. This category was followed closely by children who had not completed primary education at 6.5%. The same pattern was observed in 1998 where the mass for children who were underweight was 8.4% followed by children without television access at 8.3%. Similar scenario was observed in 2003, 2008 and 2014 surveys. On the other hand, the categories with the lowest (0.00%) mass were 'other' types of roof and floor materials. The data had many categories with a mass of less than 1%, which include children that had received two (2) doses of vaccinations, children who had not completed primary education, and children who used rainwater as a source of water for drinking.

According to the proportion of inertia (variability), categories with the most inertia include children who lived in households with flush toilets at 14.1%, cement floor at 11.3%, and access to television at 10% in 1993. The results were consistent in all the surveys. According to Ballon and Duclos (2015), dimensions with low frequency (not common) deprivations have higher percentage of variability or inertia. In terms of contribution to overall well-being index, children with access to television contributed 20.3%, children living in households with cemented floors contributed 9.5% while kids who lived in homes with flushing toilets made up 9.7% of the population in 1993. The results also similar in all the surveys.

3.4.3 Construction of the composite well-being indices

We constructed composite indicators of child well-being for every survey and then one for all surveys (pooled). The descriptive statistics for the composite well-being indices are shown in Table 3.2. The sample size of children was 119,398. The lowest deprivation index was -3.143 realized in 2014 while the highest value was 9.398 realized in 1993. The deprivation indices for the pooled sample data were -2.697 and 6.295 minimum and maximum values respectively. We further observed that the mean value of the composite well-being indices declined from 0.438 in 1993 to 0.082 in 2014 suggesting that the well-being of children deteriorated during this period. The pooled sample mean composite welfare index was 0.165 for the period covered by the study.

Table 3.2: Descriptive statistics for the composite indices

	Statistic			
Variable	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Welfare index 1993	0.438	1.529	-2.138	9.398
Welfare index 1998	0.311	1.442	-2.505	9.198
Welfare index 2003	0.176	1.089	-2.424	5 .451
Welfare index 2008	0.133	1.172	-2.466	6.734
Welfare index 2014	0.082	1.206	-3.143	5.135
Welfare index pooled	0.165	1.238	-2.697	6.295
N				119,398

Source: Author's calculation from KDHS 1993-2014

3.4.4 Trends of summary measures of inequality

The theoretical and methodological ramifications of various popular inequality indicators are examined in this essay. Although it is determined that the Gini index satisfies the fundamental requirements of scale invariance and the principle of transfers, two additional measures—the coefficient of variation and Theil's measure—are typically preferred due to additive properties across population segments. We calculated the levels and examined the trends of various inequality indices. Inequality measures that have been widely used in literature are the Gini coefficient and the Theil indices and thus we interpret them. The other measures of inequality have been provided for comparison purposes. In Table 3.3, we notice that the indices have negative values and therefore they should be transformed. We achieved this by adding a scalar number equivalent to the highest minimum value to each composite index, thus enabling us to calculate the various inequality indices as shown in Table 3.3. This is because most inequality measures, except absolute inequality, do not calculate inequality using negative numbers (Asselin, 2002).

The Gini coefficient was 0.29 in 1993 and declined to 0.23 in 2014. The Gini index declined between 1993 and 2003 but rose in 2008, and declined again in the year 2014. These changes could be attributed to the political turmoil experienced in Kenya in December 2007 and the world economic meltdown, which occurred during the same period. The Gini index for the entire period was 0.23. Theil entropy measure declined from 0.15 in 1993 to 0.11 in 1998 and to 0.08 in 2003 but increased marginally to 0.09 in 2008 but declined to 0.07 in 2014. Generally, the well-being inequalities among children decreased during the research period. The other measures of inequality show similar trend as Gini index and Theil indices.

Table 3.3: Trends of various inequality well-being measures

Inequality measures	1993	1998	2003	2008	2014	Pooled
Relative mean deviation	0.21	0.18	0.15	0.16	0.14	0.16
Coefficient of variation	0.57	0.49	0.40	0.43	0.36	0.42
Standard deviation of logarithms	0.57	0.53	0.46	0.51	0.41	0.47
Gini coefficient	**0.29**	**0.26**	**0.22**	**0.24**	**0.20**	**0.23**
Mehran measure	0.40	0.37	0.32	0.34	0.30	0.33
Piesch measure	0.24	0.21	0.17	0.18	0.15	0.18
Kakwani measure	0.08	0.06	0.05	0.05	0.04	0.05
Theil index (GE(a), a = 1)	0.15	0.11	0.08	0.09	0.07	0.09
Mean log deviation (GE(a), a = 0)	0.15	0.13	0.09	0.11	0.08	0.10
Entropy index (GE(a), a = -1)	0.20	0.17	0.12	0.16	0.10	0.13
Half (Coeff.Var. squared) (GE(a), a = 2)	0.16	0.12	0.08	0.09	0.07	0.09

Source: Author's calculation using KDHS 1993-2014

Note: a = Represent inequality aversion parameter

3.4.5 Distribution of multidimensional inequality

Table 3.4 presents the distribution of MDI based on the area of residence. The estimate of MDI was 35% among children with the distribution of multidimensional inequality being more in rural areas compared to urban areas at 34% and 32% respectively.

In terms of relative contribution, the highest contributor to MDI was the nutrition dimension at 17.08% in which urban children contributed the highest at 18.68% compared to rural children at 12.08%. The second highest contributor to MDI was the information dimension at 15.23% in which 21.45% is from rural areas and 13.24% in urban areas. The third highest contributor to MDI was the shelter dimension at 19.45% in rural areas and 12.38% in urban areas and 15.22% overall. Conversely, the lowest contributor to MDI was health dimension, but surprisingly rural children performed better on this index compared with their counterparts in urban areas. Water dimension contributed the highest to MDI in urban areas compared to rural areas. This observation could be accredited to increase in the number of people living in slums (poor housing conditions) where availability of goods and services are wanting.

Findings by Araar (2009) show that households from urban areas in Cameroon experienced lower MDI than their counterparts in the rural areas. For instance, the total MDI for Cameroon was 21.4% consisting of 20.5% for rural, 11.7% for semi-rural, and 0.91 % for urban areas. Using three dimensions, Araar (2009) found that health dimension contributed the highest to MDI. This was followed by education and health dimensions respectively.

Table 3.5 presents decomposition of MDI by sex of the child. The findings show that boys contributed more to MDI than girls. This result corroborates previous findings that males are more malnourished than females (Kabubo-Mariara et al., 2009). Specifically, in the nutrition dimension boys contributed 18.41% to overall MDI compared with girls' contribution of 15.6%. In Table 3.6, we decompose the MDI by the sex of the household head. Overall, children from households headed by females contributed less to MDI than children from male headship. However, children

from female headship contributed more to MDI in nutrition, education, water, and information dimensions compared with children from households headed by males.

Examining the distribution of MDI indices by ethnicity is also crucial (see Appendix C, Table 1C). Kenya has about 45 sub-tribes, but these can be grouped into 23 major ethnic groups. The results show that children from the Somali ethnic group contributed the most to MDI followed by Mbeere, Samburu, and Maasai in that order. The lowest contributors to MDI were children from the Kuria ethnic group.

Another important feature of hybrid MDI is that we can establish the complete order of preference by altering the sensitivity of results using the parameter λ_k. Society could be sensitive to a vector of parameters K denoted by social preference trade-off denoted by λ. In Table 3.7, we show that the ordinal rank between the regions may change given the selection of this parameter. For instance, if we compare Eastern and Nyanza, the ordinal rank between them changes for $\lambda_k=0$ and $\lambda_k=0.1$.

Table 3. 4: Decomposition of MDI indices by area of residence

Group	Estimate
Urban	0.32
Rural	0.34
Population	0.35

Relative contribution in %

Variable	Nutrition	Health	Education	Shelter	Water	Sanitation	Information
Rural	12.08	8.54	12.38	19.45	7.69	15.89	21.45
Urban	18.68	12.67	14.09	12.38	16.31	12.64	13.24
Population	17.08	11.53	13.56	15.22	14.41	12.97	15.23

Table 3. 5: Decomposition of MDI by sex of the child

Group	Estimate
Male	0.357
Female	0.351
Population	0.354

Relative contribution in %

Variable	Nutrition	Health	Education	Shelter	Water	Sanitation	Information
Male	18.41	11.22	13.36	15.00	14.21	12.73	15.07
Female	15.60	11.86	13.78	15.46	14.64	13.24	15.42
Population	17.09	11.52	13.56	15.22	14.41	12.97	15.23

Table 3. 6: Decomposition of MDI indices by sex of the household head

Group	Estimate						
Male	0.35						
Female	0.34						
Population	0.35						
Relative contribution in %							
Variable	**Nutrition**	**Health**	**Education**	**Shelter**	**Water**	**Sanitation**	**Information**
Male	16.97	11.67	13.55	15.42	14.18	13.06	15.15
Female	17.46	11.14	13.58	14.73	15.15	12.70	15.23
Population	17.08	11.52	13.56	15.22	14.41	12.98	15.23

Table 3. 7: Estimated MDI indices by region (absolute approach)

Region	λ=0.00	λ=0.10	λ=0.50	λ=0.90	λ=1.00
Nairobi	0.18	0.20	0.28	0.35	0.37
Central	0.21	0.23	0.30	0.36	0.38
Coast	0.23	0.26	0.37	0.49	0.51
Eastern	0.21	0.23	0.33	0.43	0.45
Nyanza	0.21	0.23	0.34	0.44	0.47
Rift valley	0.22	0.24	0.35	0.46	0.49
Western	0.22	0.24	0.32	0.40	0.42
North eastern	0.22	0.25	0.39	0.53	0.56
National	0.23	0.25	0.35	0.46	0.48

3.4.6 Decomposition of inequality

Decomposition of inequality is important for establishing the influence of various components to total inequality and hence aids policy formulation and targeting. We begin by running a linear regression equation as shown in equation 17 where the dependent variable is the inequality derived from composite well-being index with the regressors being own child, family, and locational factors.

Table 3.8 presents the results which indicate that the residual variable made the highest contribution to overall inequality in all the surveys. This observation suggests that other variables (unobservable) not captured by the model contribute substantially to inequality amongst Kenyan children. The unobservable variables are all captured and controlled in the error term. This could be due to data unavailability.

In 1993, the residual term accounted for 41.68% rising to 46.13% in 2014. Similar earlier research also discovered considerably greater residual term contributions to inequality. For example, according to Morduch and Sicular (2009), the residual term was responsible for 90% of the overall inequality. Wan and Zhou (2005) reported that residual term contributed 40% of overall inequality while Yun (2006) established that the residual term contributed 78.3% to overall inequality. Fields (2003) found that the residual term explained 41.5% of inequality in earnings in 1979 and 38.5% in 1999.

The second highest contributor to overall inequality among Kenyan children was electricity. Access to electricity accounted for 32.18% of total inequality in 1993, which was the highest in all the surveys. However, this contribution declined steadily in all surveys to 24.31% in 2014. This change could be accredited to direct strategic interventions in the energy sector, which resulted in increased access to electricity to over 6 million households by end of June 2017 (Government of Kenya, 2018).

Other variables with sizeable contribution to inequality were area of residence and regional characteristics. The contribution of rural residence to overall inequality ranged between 9.38% in

1993 and 9.1% in 2014. This suggest that inequality is a rural phenomenon. Rural dummy increases overall inequality in rural areas because of the disproportionate levels of unemployment and limited access to goods and services.

On the regional dummies, children from Nairobi had the highest contribution to inequality of between 7.62% in 1993 and 5.56% in 2014. They were followed by children from Central region whose contribution to overall inequality was positive. This is because Nairobi being the capital city, most of the material goods and service for children are available and standard of living for most households is higher compared to other regions. Other regions showed mixed scenarios, with some positive and others negative but all less than 1%.

The estimate of age of the household head had negative sign and statistically significant at 99 per cent while its quadratic term was positive and also statistically significant at 99 percent demonstrate a concave relationship between inequality and age of the household head. The contribution of age of household head to overall inequality was negative 0.48 but reaching a turning point it increases by 1.08 in 1993. This suggest that when the household head is in his or her prime age of working, inequality reduces but as he grows older or after retirement inequality increases. Generally, older household heads are not working or in their retirement (dissaving) where they face difficulty in provision of children's goods and services.

The education variables had an expected positive sign with statistical significance at 1%. Of the categories of education investigated, no education level had a negative sign in all the surveys, suggesting that this factor had an equalizing effect on inequality. In 1993, a child whose mother

had received no education increased inequality by 1.54%, by 2.09% in 1998, and by 3.35% in 2003. This effect reduced to 2.89% in 2008 but increased to 3.5% in 2014. The highest contribution to inequality was observed in a child whose mother had completed secondary education. For instance, a child whose mother had completed secondary education increased inequality by 5.12% in 1993; 3.51% in 1998; 4.7% in 2003; 5.5% in 2008; and 5.34% in 2014. This is because an educated mother enhances her earning potential with increased earnings escalating inequality compared to her counterparts who do not have education.

The contribution of male household head dummy to inequality was positive at 0.3%. Although the magnitude is small, it is expected to increase inequality. This could be due to cultural norms that discriminate against women in inheritance, education, and level of earnings in a society. In most cases, women do not inherit wealth from their parents and they have low levels of education compared with men, and thus face limited opportunities. These factors exacerbate inequality in society.

The estimate of the size of household was positive and statistically significant at 1%. This means that an increase in household size by 1 member reduced inequality by 0.2% in 1993, 0.17 in 1998, 0.21% in 2003, 0.19% in 2008, and 0.23% in 2014.

Table 3. 8: The contribution of each explanatory variable to well-being inequality

	1993		1998		2003		2008		2014	
Variable	**Coeff.**	**Inequality Decomposition**	**Coeff.**	**Inequality Decomposition**	**Coeff.**	**Inequality Decomposition**	**Coeff.**	**Inequality Decomposition**	**Coeff.**	**Inequality Decomposition**
Residual		41.68		44.42		44.64		44.57		46.13
Child age	-0.0530***	-0.15	-0.00395	-0.01	-0.00575	-0.03	-0.0173**	-0.07	-0.0252***	-0.1
	(-6.67)		(-0.51)		(-0.98)		(-2.74)		(-3.84)	
Male child	0.0161*	0.01	0.0185**	0.01	0.0157***	0.02	0.0144**	0.01	0.0153**	0.01
	-2.54		-3.01		-3.38		-2.88		-2.93	
Male h/head	-0.166***	0.3	-0.163***	0.33	-0.134***	0.38	-0.138***	0.35	-0.142***	0.33
	(-23.42)		(-23.64)		(-25.81)		(-24.54)		(-24.23)	
Age h/head	0.00755***	-0.48	0.00665***	-0.49	0.00290**	-0.29	0.00346**	-0.32	0.00244*	-0.19
	-5.23		-4.73		-2.73		-3.03		-2.05	
Age sq. h/head	-0.149***	1.08	-0.138***	1.14	-0.0890***	1.01	-0.0966***	0.99	-0.0887***	0.81
	(-10.65)		(-10.16)		(-8.67)		(-8.73)		(-7.69)	
Never married	-0.196***	0.001	-0.101***	-0.01	-0.0174	-0.01	-0.0148	-0.003	-0.0508***	-0.01
	(-11.59)		(-6.10)		(-1.40)		(-1.10)		(-3.64)	
Married	-0.343***	1.38	-0.260***	0.99	-0.152***	0.71	-0.160***	0.69	-0.208***	1.01
	(-43.93)		(-34.22)		(-26.42)		(-25.84)		(-32.38)	
Living	-0.342***	0.08	-0.260***	0.05	-0.162***	0.04	-0.160***	0.35	-0.214***	0.05
	(-15.84)		(-12.36)		(-10.19)		(-9.38)		(-12.02)	
Widowed	-0.456***	0.17	-0.373***	0.14	-0.264***	0.14	-0.267***	0.12	-0.330***	0.15
	(-18.13)		(-15.23)		(-14.29)		(-13.41)		(-15.91)	
Divorced	-0.291***	0.17	-0.200***	0.01	-0.111***	0.01	-0.104***	0.006	-0.149***	0.01
	(-8.84)		(-6.22)		(-4.59)		(-4.00)		(-5.47)	
Separated	-0.278***	0.02	-0.184***	0.01	-0.0849***	-0.004	-0.0844***	-0.004	-0.121***	-0.004
	(-12.54)		(-8.51)		(-5.21)		(-4.81)		(-6.60)	
Size of household	0.0129***	-0.2	0.0103***	-0.17	0.0109***	-0.21	0.0107***	-0.19	0.0124***	-0.23
	-9.25		-7.55		-10.61		-9.7		-10.76	
No education	-0.279***	1.54	-0.318***	2.09	-0.305***	3.35	-0.301***	2.89	-0.341***	3.5
	(-4.71)		(-5.51)		(-7.02)		(-6.42)		(-6.98)	
Primary level	0.224***	0.34	0.254***	0.75	0.317***	1.87	0.311***	1.41	0.369***	2.02
	-3.8		-4.43		-7.32		-6.68		-7.61	

Secondary level	1.284***	5.12	0.971***	3.51	0.920***	4.7	1.079***	5.5	1.105***	5.34
	-21.2		-16.44		-20.66		-22.5		-22.13	
Higher	1.142***	0.03	0.980***	0.02	0.738***	0.02	0.815***	0.02	0.867***	0.02
	-5.6		-4.93		-4.92		-5.04		-5.15	
Nairobi	2.048***	7.62	2.165***	8.41	1.456***	6.82	1.570***	6.94	1.425***	5.56
	-84.76		-91.99		-82.01		-82.03		-71.55	
Central	1.112***	2.31	1.317***	3.23	1.065***	3.98	1.094***	3.6	1.200***	4.29
	-67.08		-81.48		-87.41		-83.25		-87.7	
Coast	0.681***	0.2	0.826***	0.16	0.618***	-0.05	0.632***	-0.44	0.620***	-0.35
	-44.56		-55.48		-54.98		-52.23		-49.16	
Eastern	0.837***	-0.08	0.997***	-0.01	0.792***	0.24	0.822***	0.22	0.882***	0.37
	-55.91		-68.34		-71.97		-69.29		-71.39	
Nyanza	0.693***	-0.61	0.870***	-0.66	0.698***	-0.45	0.714***	-0.48	0.796***	-0.22
	-46.2		-59.56		-63.35		-60.15		-64.42	
Rift valley	0.635***	-1.51	0.795***	-1.96	0.605***	-2.16	0.617***	-2.09	0.655***	-2.25
	-45.36		-58.31		-58.85		-55.7		-56.75	
Western	0.784***	0.43	0.973***	-0.33	0.783***	-0.05	0.824***	-0.003	0.915***	0.33
	-49.98		-63.66		-67.94		-66.3		-70.71	
Electricity	2.281***	32.18	2.049***	29.31	1.445***	26.22	1.559***	26.43	1.533***	24.31
	-205.82		-189.71		-177.43		-177.57		-167.66	
Rural dummy	-0.741***	9.38	-0.699***	9.02	-0.547***	9.1	-0.602***	9.43	-0.618***	9.1
	(-81.77)		(-79.13)		(-82.09)		(-83.80)		(-82.71)	
Constant	2.844***		2.845***		2.568***		2.619***		3.228***	
	-40.12		-41.19		-49.31		-46.64		-55.21	
R-squared	0.583		0.5557		0.5536		0.5542		0.53387	
N	107199		107199		107199		107199		107199	

Source: Author's calculation using KDHS 1993-2014

*** denotes that variable is significant at 1%, ** variable is significant at 5% and * variable is significant at 10%.
Figures in parentheses are the t-statistics.

3.5 Summary, Conclusions and Recommendations

3.5.1 Introduction

In this section, the essay's main findings are summarized. We have also drawn conclusions based on key findings followed by policy implications. Finally, we propose areas for further research.

3.5.2 Summary

The objective of this essay was to analyze multidimensional child well-being inequality among Kenyan children. Just like poverty, inequality has been acknowledged as a multifaceted phenomenon and thus should be analyzed from a multidimensional perspective. Besides income, people do differ in terms of where they live, educational achievement and health status among other factors. These factors should be considered when evaluating the well-being of individuals. In the literature, there is a wide view that it is impossible to eradicate poverty in the presence of high inequality. This essay employed seven child-centered dimensions to measure multidimensional inequality, namely sanitation, nutrition, water, health, information, education, and shelter. For this purpose, we used the KDHS data sets from 1993 to 2014.

We employed a multivariate statistical approach suitable for categorical variables; that is, multiple correspondence analysis (MCA), to examine the distribution of dimensions of well-being among the children. We then calculated a composite well-being index of each child based on the seven dimensions and consequently measured multidimensional inequality based on resultant index. We interpreted the Gini coefficient index of inequality and Theil indices because they possess desirable properties of an inequality index. We further carried out inequality decomposition to examine the contribution of each component to the overall multidimensional inequality (MDI). The study also

ran a regression of inequality against various child, household and community characteristics to evaluate the contribution of each characteristic to overall well-being inequality.

The study found that generally well-being inequality among Kenyan children declined between 1993 and 2003. In 1993, the Gini coefficient index was 0.29 which declined to 0.23 in 2003 but rose to 0.24 in 2008. Fortunately, the Gini coefficient declined to 0.23 in 2014. This increase in inequality in 2008 may be attributed to the political turmoil that was experienced in Kenya after the December 2007 general elections and which affected the well-being of children the most. The observation could have been compounded by the global economic and financial crises which occurred during the same period. Some studies have also linked the cause of violence or ethnic clashes in Kenya to the huge disparities existing between the rich and the poor (Stewart, 2010). Similar patterns were observed in all other inequality measures computed.

In terms of multidimensional inequality (MDI), the results revealed that inequality is largely a rural phenomenon. These results support the findings of Araar (2009) that MDI is still a rural phenomenon in Cameroon. Most malnourished children reside in rural areas and live in female-headed households. The nutrition dimension contributed the highest to overall MDI suggesting that Kenya is still insecure in terms of food and nutrition. This was followed by information and housing dimensions respectively. The health dimension contributed the lowest to overall MDI followed by sanitation and education dimensions. In Cameroon, the housing dimension contributed the most to MDI followed by education and health in that order (Araar, 2009).

Results of decomposition of well-being inequality revealed that the residual term contributed the highest to overall inequality. Other variables exacerbating well-being inequality were access to

electricity, rural area of residence, living in Nairobi region, and maternal education in that order. As the mother's level of education increases, so does the contribution to inequality. This observation could be attributed to differences in earning across the schooling levels. Equalizing variables on inequality included size of household, child age, and living in regions such as Eastern, Nyanza and Rift Valley.

3.5.3 Conclusions

In this chapter, we have detailed how we have conceptualized inequality in multidimensional perspective, unlike past studies that have conceptualized inequality based on income or consumption expenditure. In Kenya, there is limited documentation on the assessment of child well-being inequality in a multidimensional angle. A multidimensional analysis is paramount in formulating policies to reduce well-being disparities amongst children and across the space.

We found that welfare inequalities among children are modestly low and that nutrition dimension contributed the highest to multidimensional inequality. This was followed by information dimension. We recognize that a child's growth and development are significantly influenced by their diet. Studies have found that nutrition is very crucial in brain formation, which serves as a foundation of cognitive development of a child. Therefore, inadequacy of nutrition reinforces poverty and inequality because these children will not make it in schools and thereby have fewer chances of formal employment in the market. These unequal opportunities during childhood may be passed down the generations and may have long-lasting impacts on a child's lifespan.

This essay made a contribution to the body of knowledge on child well-being by using the seven dimensions of child well-being to analyse child inequality. To the best of our knowledge, no research has looked into children's well-being disparities in Kenya from a multifaceted approach.

3.5.4 Policy Implications

The essay focuses on well-being inequality amongst Kenyan children. It directly addresses Sustainable Development Goal No. 10 of reducing inequality within and between societies. The findings of this essay may guide policy makers to re-orient national resources through formulation of policies that alleviate well-being inequalities among children. The COVID-19 crisis is having an impact on society's most vulnerable and impoverished citizens and has exposed the profound inequalities that exist in Kenya.

It was discovered that the nutrition component contributed more to total multi-dimensional inequality. This dimension is critical for brain formation and boosting of immunity in children. The government should improve nutrition of mothers of reproductive age (15-59) so to promote child nutrition and health. Mothers should be sensitized on importance of exclusive breastfeeding and timely introduction of complimentary foods and micro-nutrients supplements such as vitamin A and other essential minerals targeting households with children younger than five years old. Alternatively, the government could provide food coupons to vulnerable families to enable them access fortified foods. Inequalities in nutrition exacerbates other dimensions such as education because a hungry child cannot concentrate in class, will perform poorly with low productivity and will end up in the lower paying jobs in the labour market. Policy makers should take immediate action to reverse this trend by giving nutrition dimension the emphasis it deserves and taking a

multi-pronged approach in addressing nutritional problems among children. The government should implement sustainable humanitarian assistance to households with a food security crisis.

There is need for policies targeting vulnerable families (for example, female-headed households) and delivery of public utilities and services to geographically remote places. This may include the provision of essential infrastructure services in hard-to-reach places and regions, such as electric power, educational facilities, and water distribution networks. Such interventions should specifically target children living in marginalized regions with higher MDI, such as North Eastern region where MDI rates were the highest followed by Coast and Rift Valley in that order.

Affirmative action should also be put in place by government to support the education of the girl child up to higher levels because this is important in reducing inequality. Results of past studies in Kenya (e.g., Kabubo-Mariara et al., 2009) found female education enhances child nutritional status. Thus, girl child education has enormous benefits for the society. This is because women nurture children and educated mothers gain more knowledge on how best to look after their children. They will ensure that children are fed a balanced diet, immunized, and sent to school at the right age. Guaranteeing girl child education could contribute in breaking the vicious cycle of poverty and inequality.

Children from the Somali ethnic group contributed the highest to MDI. They were followed by children from Mbeere and Samburu ethnic groups. In terms of distributive analysis, the main dimensions increasing inequality were nutrition among Turkana children; health among Samburu children; education among the Orma children; water among Iteso children; sanitation among the Mbeere children; and information among the Taita/Taveta children. Egalitarian-focused policies

should be targeted towards children in these regions so as to bridge the inequality gap and enable these children to grow and reach their potential just like children from other ethnic groups.

3.5.5 Suggestion for further research

This essay analyzed multidimensional inequality using non-monetary dimensions of child well-being based on KDHS data from 1993-2014. We note that KDHS do not collect data on income and expenditures and therefore we could not include income in the analysis. We note that income is a key component of well-being and therefore to obtain a complete picture of children's well-being, future research must examine the behavior of income inequality and non-monetary inequality and compare if they overlap or otherwise. Further, we suggest further analysis of regional and ethnic variations of multi-dimensional inequality in a devolved system of government. This would provide more information about how children are doing since the implementation of SDG number 10 of reducing within inequality in the society.

Another issue related to inequality is polarization. Recently, polarization has drawn a lot of attention both empirically and theoretically due to some drawbacks inherent in inequality measures. Future studies may examine polarization in child well-being in Kenya.

4.0 CHAPTER FOUR

4.1: SOCIO-ECONOMIC CORRELATES OF MULTIPLE CHILD DEPRIVATIONS IN KENYA

4.1.1 Introduction

Researchers and international organizations have been very interested in child deprivation since the turn of the millennium (Gordon et al., 2003; Bastos et al., 2004; UNICEF, 2005). This is due to the fact that child deprivation has been linked to vulnerabilities like impairments, stunting, early deaths, and the waste of human capital, as well as to adult poverty (Minujin & Delamonica, 2005; Cockburn & Kabubo-Mariara, 2010). The topic is extremely pertinent for a developing nation like Kenya, and literature keeps up with the latest discoveries in the field of well-being research (Minujin, 2011).

One important step forward in the study of well-being is that the term "well-being" has been rethought and rewritten to apply to a wider spectrum of situations, and the indicators and measures have been broadened to include non-metric factors. Sen (1985) suggests that well-being can be assessed using direct measures of poverty like housing conditions, nutritional status, education achievement, participation in the society, among others. This novel reformulation of well-being can help shape policy, improve targeting, increase government spending, and make sure people are held accountable in the execution of the budget and programmes. Promoting children's well-being throughout their lives requires an understanding of child well-being from this perspective.

Literature has also investigated determinants of poverty to inform interventions for alleviating poverty. This exercise in the literature is commonly carried out by regressing the various measures of poverty on several correlates of poverty clustered into individual, household, community and

locational characteristics (Batana et al., 2014). Nevertheless, adopting several poverty measures may result in varying and conflicting outcomes, which in turn calls for a different set of policy interventions. For instance, poverty measured in terms of income portrays an inaccurate picture of child well-being. Several studies have adopted this approach in evaluating poverty by examining alternative indicators of poverty such as caloric consumption expenditure (Oyugi, 2000; Mwabu et al., 2000). Others such as Kabubo-Mariara et al. (2009) examined nutritional status while Mutunga (2007) focused on health status in assessing child well-being. However, these approaches are open to misunderstandings and misinterpretations, which might result in lopsided policy formulation and design.

This essay takes a broader approach by evaluating seven dimensions of well-being that are distinct to children, counting the dimensions in which each child is deprived, and eventually ranking the children from the least to the most deprived. The more the deprivations a child faces, the more severe deprivations are considered to be. An indicator variable of multiple deprivations was regressed against various predictors of child well-being using an ordered logit model. It is hoped that a more concrete observation can be made, leading to policies that are effective for reducing the several facets of poverty facing children in a developing country like Kenya. This essay closes this gap by undertaking an analysis of association of social, economic and community factors with multiple child deprivations in Kenya.

4.1.2 Statement of the Problem

In the 2019, the percentage of population under 19 years of age stood at 50 per cent having dropped from 54 per cent in 2009 (KNBS, 2019). This demonstrates unequivocally that Kenya is still a young nation and affirm that Kenya's future is in the hands today’s children. Children of today will

be in charge of the economy. Given that the majority of Kenya's population is young, there is therefore a significant chance that the demographic dividend will be realized.

For a developing nation like Kenya, child deprivation is an issue since it has negative effects. A child's life cycle and ability to grow depends on their early years. The groundwork for future life and growth is being set during this time. This period is crucial for the development of their future adult lives' most crucial cognitive, sensory-motor, and socioemotional skills (Minujin and Delamonica, 2005). A child may become handicapped or die before their time if they are not immunized against deadly illnesses like polio, diphtheria, whooping cough, tuberculosis or measles.

These deprivations lead also to poor levels of education which are linked to meagre earnings in the job market. Unstimulating home environments also hinder the brain development and structure of the child. If these deprivations are not reversed, Kenya may continue to contend with social unrest and millions of unemployed youths in future.

Due to the fact that deprived children grow up to be impoverished adults who then pass on their poverty to their offspring, the repercussions of child deprivation can endure a lifetime and undermine government efforts to reduce poverty (Corak, 2006). While Vandemoortele (2012) emphasized that fairness in a community starts with children, UNICEF has argued that the best method for eradicating poverty in a society is to focus on child deprivation (UNICEF, 2004).

Further, the definition and conceptualization of poverty is a debated topic because of the subjectivity involved in constructing poverty measures (Thorbecke, 2008). Existing econometric

studies on poverty correlates in Kenya (Mwabu et al., 2000; Geda et al., 2005) employed consumption expenditure data. The few, albeit unidimensional, studies that have concentrated on child well-being include Mutunga (2007), which examined factors related to child mortality using data from the KDHS in 2003, and Kabubo-Mariara et al. (2009), who looked at factors related to nutritional status using KDHS data from 1993 to 2008.

There has been agreement that measurement of child well-being should be carried out in a multidimensional perspective and the attributes should be child-specific (De Neubourg et al., 2012). While multidimensional poverty has ignited a lot of interest in international literature, empirical evidence is still limited, and it is even scarcer in Kenya. Kabubo-Mariara et al. (2012) representing the major contribution in this respect used two dimensions (bi-dimensional) of child well-being. Therefore, their findings and policies formulated thereof towards reduction of child deprivations are inadequate. This essay analyses the correlates of multi-dimensional child deprivations in Kenya for the period 1993-2014. The analysis is based on three study questions and objectives as enumerated in the following sub-sections.

4.1.3 Research Questions

This essay seeks to answer the following questions;

(i) How is the distribution of multiple child deprivations in Kenya?

(ii) What are the main factors driving multiple child deprivations in Kenya?

(iii) What interventions should be considered to lessen the different forms of child deprivations in Kenya?

4.1.4 Objectives of the Study

This essay's main goal is to look into the socioeconomic causes of various forms of child deprivation in Kenya. The essay aims to do the following things in particular:

i. Construct a deprivation profile for children;
ii. Examine the distribution of deprivation profile by different groups;
iii. Examine the correlates of the deprivation profile among the Kenyan children; and
iv. Come up with policy recommendations for removing child deprivations in Kenya.

4.1.5 Contribution of the Study

There are three contributions made by this study on the factors associated with multiple child deprivation in Kenya. First, there exists a knowledge gap in child deprivation in Kenya. This essay fills this gap by undertaking a comprehensive analysis of child deprivation in Kenya using seven (7) child-specific dimensions over a period of two decades. Moreover, the essay also assesses Kenyan children's wellbeing since the early 1990s, when the Child Rights Convention (CRC, 1989) was ratified and acts as a benchmark for the implementation of Sustainable Development Goals (SDGs).

Secondly, Kenya’s long-term development blueprint, the Vision 2030, envisages an extremely competitive and knowledge-based economy. This requires a highly trained labour force. Thus, the success of the Vision depends on today’s children and therefore it is vital to know how the Kenyan children are doing to inform policy design and evaluation. Children of today could offer enormous gains to Kenya if their basic needs are met when they are still young.

Thirdly, child deprivation negatively influences the growth and development of the child, thus a major concern in any society. Poor children tend to have low school outcomes, low self-esteem, low immunity and low levels of intelligence. If these deprivations are not tackled, their children's children will also be poor, reinforcing the vicious cycle of poverty. Therefore, this study would help the policy makers to identify critical areas and formulate policies to reverse the trend and improve the lives of children to reach their full potential.

4.1.6 Outline of the Study

The remainder of the research is structured as follows. The literature review is presented in section 4.2, and the study's methodology is presented in section 4.3. The results are presented in Section 4.4, and the conclusion and policy implications are presented in Section 4.5.

4.2 Literature Review

4.2.1 Introduction

This section presents a review of theoretical approaches to child poverty and previous studies on correlates of child deprivations, and finally a summary of the literature review is given.

4.2.2 Theoretical Literature

Since the beginning of the 19th century, many experts have struggled with how to conceptualize and assess poverty because it is a complicated and puzzling phenomenon. During the late 19th century and early 20th century, both Booth and Rowntree conceptualize and evaluated poverty in terms of monetary standards (Laderchi, Saith & Stewart, 2003). This strategy is still widely employed today. However, this strategy has faced harsh criticism due to the fact that monetary measures are limited, inadequate, and do not account for intra-household distributions, which might be enormous (Sen, 1985; Thorbecke, 2008). Deaton (1997) improved this methodology by using survey data—especially consumption data—to quantify poverty and living standards. He argued that consumption expenditure more closely approximate welfare than income. Nevertheless, income or consumption indices of welfare have revealed considerable variations in the population (Hulme & Mckay, 2013).

The absolute approach was criticized by Townsend (1979) and he suggested a different, more comprehensive understanding of poverty based on relative deprivation during the late 1970s. This definition opened the door for multidimensional poverty measurement. He further defined deprivation is *"a state of observable and demonstrable disadvantage relative to the local community or the larger society or nation to which a person, family, or group belongs."* Deprivation is, in other words, the lack of sufficient material conditions and social circumstances that have an impact on individuals in society.

Amartya Sen, who acknowledges the "relative approach's" significance while also maintaining identification of “absolute approach” in the concept of poverty, has sharply attacked it (Sen, 1983; Hick, 2012). This strategy is referred to as a capability framework in the literature. According to this concept, poverty means failure to meet minimum capabilities and functionings (Sen, 1999). This thorough-going theoretical viewpoint introduces the idea that deprivation is a multifaceted concept.

Since 1990, the UNDP and Oxford Poverty and Human Development Initiative (OPHI) have used three domains and ten indicators to analyze and update the global multidimensional poverty index (Alkire et al., 2019). These dimensions include: health which incorporate nutrition and child mortality; education which is measured by years of schooling and school attendance; and lastly, standard of living which comprise clean cooking fuel, sanitation, safe drinking water, electricity, housing and assets.

This essay constructs the children deprivation profile based on seven child centered dimensions and examine its distribution by different groups. These dimensions are embedded in the Kenya’s constitution and also spelt out in the international children rights.

Concept and measurement of child well-being

There are three approaches used to assess child well-being. The first one is monetary approach where poor children are identified to be residing in household with income below the poverty line. The defects of this approach are that monetary measures of poverty are unidimensional and based on adult responses or needs (Minujin et al., 2005). In contrast to adult poverty, childhood poverty has a greater impact on children's physical, social, and emotional health (Minujin, 2011). In

addition, this approach assumes that income is equally distributed in a household which is not the case (Thorbecke, 2008). This approach therefore does not tell us the whole picture of the situation of children.

The Bristol Deprivation Framework is the second method for assessing child poverty (Gordon et al., 2003; UNICEF, 2004). This approach was developed specifically for developing countries using international best practices. Gordon et al., (2003) studied child deprivations in developing countries in a multifaceted approach and the deprivation bundles were anchored on child rights and basic needs (UN, 1989). Non-compliance or denial of these rights contributes to child deprivation. However, Waddington (2004) criticized this approach because it relies only on household surveys, which means that children outside the household set up are left out, such as street children, immigrant (refugees) children, abandoned children and orphans.

The third approach of measuring child well-being is using composite indices. A number of studies including Land et al., (2001) in USA and Bradshaw et al., (2007) in EU, for example, have constructed well known indices to assess children's well-being. The composite indices combine various dimensions to come up with a single index and are therefore regarded as multidimensional. Land et al., (2001) used 28 indicators clustered into seven areas of social life while Bradshaw et al., (2007) used 8 domains representing 51 indicators. In underdeveloped nations like Kenya, the majority of the dimensions employed in these studies are not readily available. Thus, in this thesis, we adopt the Bristol deprivation framework to assess the well-being of Kenyan children.

According to the (UN, 1995), poverty has been defined as, *"a state marked by severe deprivation of fundamental human necessities, including food; safe drinking water; sanitation facilities;*

health; education and information." In the meantime, UNICEF, an organization championing the rights and protection of child rights in over 190 countries has laid down the international accepted definition of child poverty as, "*Children living in poverty are deprived of nutrition, water and sanitation facilities, access to basic healthcare services, shelter, education, participation and protection, and that while a severe lack of goods and services hurts every human being, it is most threatening and harmful to children, leaving them unable to enjoy their rights, to reach their full potential and to participate as full members of society"* (UNICEF, 2007*).* This definition has enabled researchers to analyze child poverty independently from adults and use child-specific dimensions of well-being.

4.2.3 Empirical Literature

This section synthesizes previous research on correlates of child deprivations. It is organized thematically, with the discussion grouped according to theoretical approaches used in the analysis. The section starts with multidimensional approaches and ends with unidimensional approaches to child poverty.

Kabubo-Mariara et al. (2011; 2012) used two dimensions to evaluate child well-being in Kenya. In their 2011 study, the authors used composite welfare index and child-health dimensions to assess the well-being of children while in their 2012 study, the authors used asset index and child survival dimensions. These two studies were a novelty in child well-being analysis in Kenya in that the studies moved away from unidimensional measurement of poverty. In their 2012 study, the authors utilized a survival model to examine the risk variables for child mortality, while in their 2011 study, they employed a bivariate probit model to estimate the determinants multidimensional poverty among Kenyan children. Characteristics of the child, household,

maternal, and environment were the correlates. The two research' findings support one another. For instance, a 2011 study discovered that boys were more malnourished than girls, and a 2012 study discovered that boys had higher chances of dying than girls. In both studies, mothers' education and physical environment (include assets and urban areas) were found to increase the probability of child survival.

Despite the significance of the two aspects for children's well-being, many other crucial dimensions have been overlooked. Additionally, the two studies only looked at kids under the age of five using data from 1993 to 2003. This paper aims to update the data to 2014, take into account all children under the age of 18, and consider all seven aspects of child well-being.

Batana et al. (2014) employed a logit model to analyze the determinants of multiple deprivations of Ugandan children between 2000 and 2009 using the Uganda Demographic and Health Survey (UDHS) data set. For children who were deprived in two or more, three or more, or four or more domains, the authors used three models. The findings highlight the importance of individual child's factors, household's characteristics and regional characteristics in determining child deprivation. Specifically, age of the child, household size, and orphaned children are positively associated with multiple deprivations while education of the household head, secondary school-age children reduce the odds of a child suffering multiple deprivation. This essay adopts the same conceptualization of child well-being and use the dimensions of Bristol deprivation framework but unlike Batana et al. (2014) who used binary logistic model, this essay used an ordered logit model. This essay ranks child deprivations to reveal the depth of child deprivations.

Fernandes et al., (2012) evaluated the factors associated with child well-being in Portugal. In this study, children were interviewed about their perspectives on their own well-being. It was found that asking children about their own perspectives changes the results well-being, particularly the order of main correlates of their overall well-being. The authors discovered that mothers' level of education was an important determinant of child well-being. Children whose parents were unemployed were more deprived than children whose parents were employed. Further, the authors noted that children whose fathers were unemployed worsens child well-being than mothers' who are unemployed.

The findings of earlier research in the same nation are supported by these results (Bastos et al., 2004; Bastos & Machado, 2009). In order to determine whether the two categories overlap, Bastos et al. (2004) examined child well-being in Portugal from two approaches: monetary poverty based on household income and non-monetary indicators. They estimated a logit model with the dependent variable being deprivation status. According to the survey, children from pure Portuguese households fared better than those from mixed-nationality homes.

Fernandes et al., (2012) and Bastos and Machado (2009) used different weighting criteria when aggregating the various indicators and domains of child well-being while Bastos et al., (2004) applied uniform weighting criteria. However, Bastos and Machado (2009) assigned weights based on the possession of items by children in 3rd and 4th grade in public schools while Fernandes et al., (2012) assigned weights based on the ranking of items by children and increased the sample to 5th and 6th grade in schools. Although these studies present major contributions in the literature by considering children's perspective of their well-being, they left out children in pre-school age.

Other studies have analyzed one aspect of child well-being (Mutunga, 2007; Kabubo-Mariara et al., 2009; Makhalima et al., 2014). Kabubo-Mariara et al., (2009) investigated the correlates of children's anthropometric measures while Mutunga (2007) estimated the hazard rate function and examined the factors influencing child mortality in Kenya. All these measures are unidimensional. Any single dimension of well-being cannot paint a whole picture of a child's well-being.

In South Africa, Makhalima et al. (2014) evaluated the factors associated with child poverty. The study analyzed 300 questionnaires administered to the residents of Boipatong Township. The household income/expenditure was adjusted by adult equivalent scale to reflect the age difference in a household. The authors calculated the headcount ratios and the poverty rate of children. The dependent variable, a binary variable indicating if a child was poor or not, was regressed against individual, household and community characteristics using a logistic regression. The results indicate that children in male-headed households had a lower risk of being poor than did children in female-headed households, and that a child's risk of being poor was lowered by the age of the household head. The coefficient of the size of the household was positive and statistically significant implying that the larger the number of people in a household, the higher the probability of the children being poor. The coefficient of the employment status of the household head had a negative sign implying that being employed reduced the chances of a child being poor. What Geda et al. (2005) found in Kenya corroborated these results, although they used an ordered logit model to model factors associated with extreme poverty.

Use of income/consumption expenditure is crucial, however, it does not capture the complete picture of child well-being. It may understate or overstate the child poverty rate. For example, income poverty estimates for children may not necessarily capture public goods and services.

Similarly, Geda et al. (2005) lumped together poverty of children and adults by using adult equivalent scale to adjust for expenditure of children in households. Batana, Bussolo and Cockburn (2013) have argued that poverty among children should be evaluated separately from that among adults to get the true situation of children in the society.

4.2.4 Overview of the Literature

From the foregoing literature, there is unanimity that child, household, regional and communal characteristics have fundamental influence on child well-being.

Except for Batana et al. (2014) who analyzed the correlates of child deprivation in Uganda, empirical studies in Kenya have measured child poverty using one or two dimensions. But this does not fully capture constraints to growth and development of a child. Other studies have investigated child welfare in terms of income or expenditure of the household, notwithstanding that poverty is a multifarious phenomenon.

In this essay, children facing deprivation in one dimension ranks differently with those facing deprivations in two or more dimensions. Therefore, this essay ranks children in terms of deprivations from those not deprived in any dimension to those deprived with at least four dimensions and examines correlates of multiple child deprivations.

4.3 Methodology

4.3.1 Introduction

The methods used in this essay are elaborated in this section. We begin with the theoretical framework and then followed by analytical framework. We then construct a deprivation profile for children. The analytical framework ties individual, household, and societal characteristics to the likelihood that a child will fall into a specific deprivation outcome.

4.3.2 Theoretical framework

Becker (1965) was the first economist to apply the principals of economics to the family in household production model. Since then, his ideas have influenced and shaped the tools of economic research.

This essay adapts the household production model exemplified by Becker (1965) to model the relationship between child deprivations and its covariates. The model has been extended by Grossman (1972a; 1972b) and has been used in several investigations (see for example, Rosenzweig & Shultz, 1983; Mwabu, 2009).

The application presented in this essay borrows from the works of Ajakaiye and Mwabu (2007) and Mwabu (2009). A household utility function can be specified as:

$$U = U(X, Y, H) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. (1)$$

Where *U*, stands for utility which is presumed to depend on (X), a health-neutral good with no impact on health status of a household, for instance clothing, (Y) denotes health-related goods or behaviour, for example drinking, smoking, physical exercise, etc. The (Y) good yield utility to the household but also affects health (H), which stands for health status of a household.

The health status (H) is produced by a household (Mwabu, 2007); the notation for health production is as follows;

$$H = f(Y, M, \mu) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, M stands for market and /or non-market inputs into the health production function such as medical care services that affect health status of the household directly but enters the utility function through the effect on health, and μ captures the component of health due to unobserved factors such as genetic endowments, environmental factors and other components not influenced by preferences.

Thus, the objective function becomes:

$$Max\ U = U(X, Y, H) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Subject to the budget and time constraint presented in equation (4) and (5) below:

$$wh = XP_x + YP_y + MP_m \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where *w* is the wage rate, *h* the number of hours worked and P_x, P_y, P_m are prices of health-neutral goods, health-related consumer goods, and health inputs such as medical care services, respectively.

The time constraint is also given as:

$$T = h + l \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where, *T*, is total time available, and *L* is leisure. Substituting (5) into (4) yields:

$$w(T - L) = XP_x + YP_y + MP_m \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Maximizing the objective function subject to the constraints yields the Langragian function as follows:

$$L = U(X, Y, H) + \lambda_1\{w(T - L) - (XP_x - YP_y - MP_m)\} + \lambda_2\{H - F(Y, M, \mu)\} \ldots\ldots (7)$$

The household's objective is to select the right combination of health-related, health-neutral, and health-production inputs in order to maximize utility. The best approach to the problem is to take first order conditions and jointly solve the ensuing equations. The resulting reduced form health demand functions for *X*, *Y* and *M* are expressed by:

$$X = D_x(P_x, P_y, P_m, w, h, \mu) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$Y = D_y(P_x, P_y, P_m, , w, h, \mu) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$M = D_m(P_x, P_y, P_m, w, h, \mu) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Where $D_{x,y,m}$ are, respectively, the input demand of health-neutral good, health-related good and health inputs. The effects of changes in prices of the three goods on health can be derived from equations (8-10) since, from equation (7), a change in health status can be expressed as:

$$dH = F_y X dY + F_m X dM + F_u X du \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where F_y and F_m are marginal products of health inputs *Y* and *M*, respectively (see equation (7)). From equation (7), the change in health can be related to changes in respective prices of health inputs demand equations (Ajakaiye and Mwabu, 2007; Mwabu 2009) as in equations (12) to (14).

$$\frac{dH}{dP_x} = \frac{F_y X dY}{dP_x} + \frac{F_m X dM}{dP_x} + \frac{F_\mu X d\mu}{dP_x} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$$\frac{dH}{dP_y} = \frac{F_y X dY}{dP_y} + \frac{F_m X dM}{dP_y} + \frac{F_\mu X d\mu}{dP_y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

$$\frac{dH}{dP_m} = \frac{F_y X dY}{dP_z} + \frac{F_M X dM}{dP_z} + \frac{F_\mu X d\mu}{dP_z} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (14)$$

Where, $\frac{d\mu}{dP_i} = 0, for\ i = x, y, m$ so that in equations (12, 13 and 14), the terms *FμX(.)* = 0, as μ is an error term uncorrelated with the prices of goods and services.

4.3.3 Empirical framework

The first objective of this essay was to construct a deprivation profile for the children. To do this, we follow three steps to construct the deprivation profile as shown in essay 1 in chapter two of this thesis.

At the indicator level, the notation is as follows:

$$IV = \frac{\sum_{i=1}^{n} I}{n} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . . (15)$$

Where *IV* represents "*vulnerable indicator*," "*I*" is a "*dummy variable*" with a value of "1" if a child is poor and "0" if not, and "*n*" is the sample of children for which the *I* indicator can be seen. The following gives the equation for dimension deprivation:

$$DV = \frac{\sum_{i=1}^{n} D_i}{n} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . . (16)$$

Where *D* is a dummy variable whose value is 1 if the child is lacking in that dimension and 0 otherwise, *DV* stands for dimension vulnerability. If a child experiences deficiency in at least one

indicator within a given dimension, the child is considered to be deprived in that dimension utilizing the union approach (Atkinson, 2003; Alkire and Foster, 2011). The notation can be expressed using equation 3 as follows:

$$D_i = 1, \quad if \sum_{i=1}^{d} I_i \geq 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (17)$$

Where *d* refers to the total number of indicators that are contained within a certain dimension.

4.3.4 Ordered logit model specification

Investigating the key correlates of the children's deprivation profile was the study's second goal. The children were ranked from those who did not experience deprivation to those who did so in at least four dimensions. The study made the assumption that a child experiencing deprivation in four or more dimensions is worse-off than a youngster experiencing deprivation in one dimension. This led us to use an ordered logit model to estimate our model (Long & Freese, 2001).

The reduced form demand equation (9) is extended to examine the correlates of child deprivation using the ordinal regression model. The values of the dependent variable, Yi, are ordered integer values from 0 representing children who are not deprived to 4 representing children facing at least four deprivations; Y_i {0, 1, . . ., 4}. The ordinal response model for Y (conditional on explanatory variables X) can be derived from a latent variable model Y*. Following Wooldridge (2002), the continuous unobserved variable is defined as:

$$Y_i^* = X_i\beta + u_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (18)$$

Where *i* indicates the observation and *u* is the random error and *Y** has various threshold points. The relationship between observed outcomes *Y*, and the unobserved outcomes Y^*, are shown in the

equations below. The value of the observed variable *Y* depends on whether a child has crossed a particular threshold or not. Let $\alpha_0<\alpha_1<\alpha_2<\alpha_3<\alpha_4$ be unknown cut-off points (or threshold parameters), and define:

$$Y = 0 \ if \ Y^* \leq \alpha_0$$
$$Y = 1 \ if \ \alpha_0 < Y^* \leq \alpha_1$$
$$Y = 2 \ if \ a_1 < Y^* \leq a_2$$
$$Y = 3 \ if \ a_2 < Y^* \leq a_3$$
$$Y = 4 \ if \ Y^* > \alpha_3$$

In this essay, the observed ordinal variable *Y* takes on the values of 0, 1, 2, 3 and 4 and therefore there are 4 cut-off points.

The observed response variables are associated with the unobserved variables as described below:

$$Y = \left\{ \begin{array}{l} 0 - If \ a \ child \ is \ not \ deprived \ in \ any \ dimension \\ 1 - If \ a \ child \ is \ deprived \ in \ one \ dimension \\ 2 - If \ a \ child \ is \ deprived \ in \ two \ dimensions \\ 3 - If \ a \ child \ is \ deprived \ in \ three \ dimensions \\ 4 - If \ a \ child \ is \ deprived \ in \ four \ or \ more \ dimension \end{array} \right\}$$

Where *X*, is a set of independent variables, which include child, household, locational and communal characteristics. Communal characteristics include availability of infrastructure and services (e.g., electricity) in the community. β is a column vector of parameter estimates and μ is the error term. This thesis assumed that μ is distributed logistically with a mean of 0 and variance of $\pi^2/3$, ($\mu_i \sim \Lambda\left(0, \frac{\pi^2}{3}\right)$). This leads to ordered logit model. This is because the distribution of child deprivations does not follow a normal distribution. Further, the coefficients in logit model are not affected by unequal sampling rates unlike probit model (Maddala, 1983). The estimated regression coefficients from an ordered logit model are about 1.71 times the values from an ordered probit model (Amemiya 1981).

We then have the following probabilities;

$$P(Y=0|X) = P(Y^* \leq \alpha_0|X) = P(X\beta + \mu \leq \alpha_0|X) = \Lambda(\alpha_0 - X\beta) \ldots\ldots\ldots\ldots\ldots\ldots 19$$

$$P(Y=1|X) = P(\alpha_0 < Y^* \leq \alpha_1)|X) = \Lambda(\alpha_1 - X\beta) - \Lambda(\alpha_0 - X\beta) \ldots\ldots\ldots\ldots\ldots\ldots 20$$

$$P(Y=2|X) = P(a_1 < Y^* \leq a_2)|X) = \Lambda(\alpha_2 - X\beta) - \Lambda(\alpha_1 - X\beta) \ldots\ldots\ldots\ldots\ldots\ldots 21$$

$$P(Y=3|X) = P(\alpha_2 < Y^* \leq \alpha_3)|X) = \Lambda(a_3 - X\beta) - \Lambda(\alpha_2 - X\beta) \ldots\ldots\ldots\ldots\ldots\ldots 22$$

$$P(Y=4|X) = P(Y^* > \alpha_3|X) = 1 - \Lambda(\alpha_3 - X\beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 23$$

Where, Λ is the probability density function or distribution. The maximum likelihood method (MLM) is used to estimate the ordered logit model. In ordered logit model, an underlying score is estimated as a linear function of the independent variables and a set of cut-off points (or threshold parameters). The probability of observing outcome *i* corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut-off points estimated for the outcome. We are not interested in $E(Y^*|X) = X\beta$, as *Y** is an abstract construct and therefore difficult to interpret (Greene, 2012). What we are interested in is the marginal effects which are computed differently for continuous and discrete variables.

For the five probabilities in equation (19 - 23), the marginal effects in the changes of independent variables are as shown in the equations below:

$$\frac{\partial\, Prob(y=0|x)}{\partial x} = -\lambda(\alpha_0 - \beta' x)\beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 24$$

$$\frac{\partial\, Prob\,(y=1|x)}{\partial x} = -\lambda(\alpha_1 - \beta' x)\beta + \lambda(\alpha_0 - \beta' x)\beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 25$$

$$\frac{\partial\, Prob\,(y=2|x)}{\partial x} = -\lambda(\alpha_2 - \beta' x)\beta + \lambda(\alpha_1 - \beta' x)\beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 26$$

$$\frac{\partial\, Prob(y=3|x)}{\partial x} = -\lambda(\alpha_3 - \beta' x) + \lambda(\alpha_2 - \beta' x)\beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 27$$

$$\frac{\partial\, Prob(y=4|x)}{\partial x} = \lambda(\alpha_3 - \beta' x)\beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 28$$

Where λ in equation (24-28) is the probability density function. In our model, we have both binary and continuous regressors. The marginal effects for discrete (i.e., categorical) and continuous variables are calculated differently. The marginal effects of binary regressors measure the change in probabilities when the binary variable changes from 0 to 1, with all other independent variables at their means values. The marginal effects of a continuous variable measure the amount of change in the dependent variable produced by a one-unit change in the independent variable, with all other variables kept at their means.

The marginal effect of a binary variable is:

$$X_k = Prob(Y = 1|X, X_k = 1) - Prob(Y = 1|X, X_k = 0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 29$$

4.3.5 Definition and Measurement of variables

4.3.5.1 Measurement of child deprivation

The aspects of child deprivation are based on globally accepted standards rooted in children's rights (UN, 1989), to which 194 States have ratified them (UN, 2014). In accordance with the Convention on the Rights of the Child, children have the right to survive, develop, participate, and be protected in any given society. The State is obligated to respect, preserve, and uphold these rights in accordance with the best interests of the child (Gordon et al., 2003; UNICEF, 2004 and UN, 1989). As a result, the idea of child poverty represents a breach of these basic human rights.

The children's rights were clustered together to produce a list of direct or indirect indicators whereby the fulfilment or non-fulfilment of rights could be ascertained (Gordon et al., 2003). This is shown in Table 4.1.

Table 4.1: Measurement of child deprivations

Categories	Dimensions	Source	Age group	Indicator
Survival, Development, Protection and Participation	Right to health care	CRC Art. 24 CoK Art. 43, 53 SDG 3	<5 years	Immunization against BCG, DPT, Polio and Measles
	Right to adequate food and nutrition	CRC Art. 24 CoK Art. 43, 53 SDG 2	<5 years	Stunted Wasted Underweight
	Right to drinking water	CRC Art. 24 CoK Art. 43 SDG 6	(0-17) years	Source of drinking water Time to get to source of drinking water
	Right to sanitation and hygiene	CRC Art. 24 CK Art. 43	(0-17) years	Type of toilet facility
	Right to education	CRC Art. 28 CoK Art. 43, 53 SDG 4	(6-17) years	School attendance
	Right to adequate housing and a standard of living adequate for the child's physical, mental, spiritual, moral and social development	CRC Art. 27 CoK Art. 43, 53 SDG 11	(0-17) years	Type of materials of floors and roofs
	Right to freedom to seek, receive and impart information; Right to access to information, media	CRC Art. 13 CRC Art. 17 CoK Art. 35	(3-17) years	Access to both television and radio

Source: Constitution of Kenya (2010);
Convention of the Rights of the Child (UN, 1989)

4.3.5.2 Definition of child deprivations

Table 4.2 presents the definition of child deprivations and their deprivation cut-offs. We describe each of the dimensions below.

Food (Nutrition) deprivation

This dimension is measured using three indicators, namely height-for-age, weight-for-age and weight-for-height. Children are identified as deprived in these indicators if their Z-scores are below -2 standard deviation of the reference population median (WHO, 2006). This dimension reveals a situation where there is insufficient food or unbalanced diet in the households. These indicators affect the physical and brain (intelligence quotient) development of children. Further, undernutrition also decreases the immunity of children, thus increasing morbidity and mortality of children (Gordon et al., 2003; Kabubo-Mariara et al., 2009).

Water deprivation

This dimension measures the source of drinking water and distance to the source of drinking water. Children whose source of drinking water is open surface and it takes more than half-an-hour round trip to collect water are considered deprived. The effects of children lacking safe drinking water are manifold. Children lacking safe drinking water are vulnerable to diarrhoea, cholera and typhoid, which can lead to death. UNICEF has stated that a child is lost in every eight seconds due to water-borne diseases. Moreover, these diseases reduce school attendance among the children, thereby affecting their school performance and later reduces their future job competitiveness (Horne et al., 2018). Similarly, the burden of fetching water lies squarely on children and it eats into time that could have been spent in school or playing (UNICEF & WHO, 2000).

Sanitation deprivation

Sanitation in this study refers to lack of toilet facilities of any kind. Toilet facilities are important for safe disposal of human waste. Lack of toilet facilities could lead to many children dying because of water borne-diseases such as dysentery, cholera or diarrhoea. This is because open

defecation can come into contact with surface water. For the purpose of this essay, children lacking access to toilet facility and who uses bucket or open/hanging latrines are considered to be deprived in terms of sanitation (UNEP, 2002; UN-HABITAT, 2003).

Health deprivation

In this dimension, a child who has not been vaccinated against any disease is regarded as deprived in health. These diseases are Diphtheria, Pertussis (Whooping Cough) and Tetanus (DPT), Polio, Tuberculosis (BCG) and Measles. This dimension applies only to children below 5 years. Immunization coverage in a country can be used as a proxy for a performance of healthcare system in a country. Low levels of immunization coverage in a country indicate poor provision of healthcare services in the country. However, high immunization coverage may not necessarily show effectiveness of healthcare system because there could be deficiencies in other provisions of health services (Gordon et al., 2003).

Shelter deprivation

The measurement of shelter dimension is through the type of materials used to construct houses where the children reside. There are two indicators under this dimension. We examine the types of materials used for flooring and roofing. Children are deprived if both flooring and roofing materials are made of earth, sand and mud or grass, bamboo or planks. The housing condition negatively affects the emotional and physical development of children. Children living in poor housing conditions are susceptible to diseases such as Cholera, Diarrhoea, Respiratory Infections, Malaria, Measles and Dengue Fever (Gordon et al., 2003).

Education deprivation

This dimension applies to children aged 6-17 years. According to Kenya's Constitution, a child should start primary education at age six. Children facing deprivation in this dimension are those who have not attended school and they are of school-age. Children who have also dropped out of school are deprived in this dimension. An illiterate child misses out in formal employment and is more likely to be poor by modern standards. Illiteracy impairs cognitive development and therefore affects the decision making of an individual (Gordon et al, 2003; Roelen & Gassmann, 2008).

Information deprivation

This dimension applies to children aged 3-17 years. It is measured through access of information through television or radio in households. According to the Constitution, information is critical as human right and fundamental aspect in child development. To fast-track development, educated and well-informed citizenry is important. Information to children is very important as it helps them understand what is happening outside their community and other cultures.

Table 4.2: Definitions of child deprivations

Dimension	Indicator	Age Groups	Deprivation cut-off
Nutrition	Height for age Weight for age Height for weight	< 5 years < 5 years < 5 years	z-scores -2 standard deviation below reference median (WHO, 2006)
Health	Immunization against BCG, DPT, Polio and Measles	< 5 years	Have not been immunized against any disease (WHO, 2006)
Water	Source of drinking water and distance to water source	All children	Children using surface water such as rivers, dam, lake, ponds, streams and for whom a return trip to collect water takes 30 minutes or longer (UNGA 2015)
Sanitation	Type of toilet facility	All children	No access to toilet facility of any kind in or near dwelling (WHO standards)
Shelter	Main material of floor, and roof	All children	Floor: Earth sand dung Roof: Thatch palm leaf (UN-Habitat standards)
Education	School attendance	6-17 years	Children of school age who have never been to school (UNESCO standards)
Information	Possession of radio and television	3-17 years	No access to both radio and television

Source: Adapted from Gordon et al. (2003)

Children were ordered from a child with no deprivation to a child deprived in all dimensions. There are six dimensions applicable to children under 5 years, namely: nutrition, health, shelter, water, sanitation and information. Education dimension is excluded from this cohort. The dimensions applicable to children over five years are: education, shelter, water, sanitation and information. Health and nutritional status are excluded from this cohort. This is because the indicators used to capture these dimensions are only applicable to children under 5 years, e.g., anthropometric failures and immunization against deadly diseases. The child deprivations responses were regressed against a set of children, household, locational and communal characteristics as described in Table 4.3.

4.3.5.3 Explanatory Variables

The individual child variables include age of the child in months for children under five years but for children between 6-17 years, we created a dummy to capture children in primary-school aged (6-13 years) and secondary-school aged (14-17 years). Others include sex of the child, order of the child birth and type of birth, i.e., if a child was born of a single or multiple birth (twins). The characteristics of the household level include age of the household head, which may capture biological factors and socio-economic consideration of the household head, level of education and sex of the household head, size of the household and religion of the household head all included as covariates. Variables at the community level include access to electricity in a household, rural-urban residence and regional factors. A description of explanatory variables is presented in Table 4.3.

Table 4.3: Description of explanatory variables

Independent Variable	Measurement	Expected Sign	Literature Source
Child Age	Age of the child in months (0-59 months)	Age is positively correlated with deprivations Age is inversely related to probability of a child being poor	Batana et al., (2014) Kabubo_Mariara et al., (2011)
	1 if secondary school age, 0 otherwise	Children in primary school are more likely to be deprived than those in secondary school	Kabubo-Mariara et al., (2011) Batana et al., (2014)
Child sex	1 if female, 0 otherwise	Boys are more likely to be multi-deprived than girls	Kabubo-Mariara et al., (2011 ; 2012) Batana et al., (2014)
Birth order of the child	Number of birth order	A child of lower birth order (first born) is less likely to be deprived than a child of higher birth order.	Kabubo-Mariara et al., (2011)
Child twin	1if multiple births, 0 otherwise	A child of multiple birth is more likely to be deprived than a singleton	Kabubo-Mariara et al., (2011) Kabubo-Mariara et al., (2008)
Area of Residence	1 if rural, 0 otherwise	Child deprivations are higher in rural areas than in urban areas because of unequal distribution of services	Mwabu et al., (2000), Kabubo-Mariara et al., (2011) Batana et al. (2014)
Sex of household head	1 if female, 0 otherwise	Children from female-headed households are expected to be more deprived than those from male-headed households due to feminisation of poverty	Batana et al., (2014) Chant, (2008)
Household Size	Number of members in a household	Each additional member increases the probability of the child being multi-deprived because of competition for resources	Batana et al, (2014)
Age of household head	Age of household head in years Age of household head in years squared	Age of the household head reduces the chances of a child being multi-deprived up to a certain point when the head retires/ages	Kabubo-Mariara et al., (2012)
Respondent employment status	I if employed (reference group), 0 otherwise	Being unemployed increases, the probability of a child suffering multiple deprivations	Bastos and Nunes (2009)
Marital status of	4 marital status dummies with	Children from married couples are less likely to be multi-deprived as	Bastos and Machado (2009)

household head	married as the reference group	compared to children from singles/divorcees/widowers, due to pooling of household resources for nurturing the children	
Age of the mother at first birth	Age in years	Children born to women who become mothers in their teens are more likely to be multi-deprived	Kiernan (1997) Hobcraft and Kiernan (2001)
Level of education of the mother	4 educational level dummies with no education as reference group	A child whose mother has some education has a lower probability of being multi-deprived as compared to a child whose mother has no education	Batana et al., (2014)
Religion	4 religion dummies with Catholics as the reference group	Children from Muslim faith could be more deprived than children from Catholics faith because Muslims have lower rates of economic activity and higher rates of unemployment	Achia et al., (2010) Heath and Li (2015)
Region	8 regional dummies with Nairobi region as reference region	Child deprivations are expected to be high in other regions relative to Nairobi region because of the level of development in terms of infrastructure and proximity of services	Kabubo-Mariara at al., (2011)
Rounds of KDHS	5 year of survey dummies with 1993 as reference period	Child deprivations are expected to have decreased over subsequent surveys relative to 1993	Batana et al., (2014) Kabubo-Mariara et al., (2011)

4.4 Empirical Results

4.4.1 Introduction

The findings of this essay are presented in this section. First, we present the descriptive statistics followed by the distribution of children deprivation profiles and finally present the correlates associated with deprivation profiles for the children.

4.4.2 Summary Statistics

We present descriptive statistics for the variables used in the ordered logit models in Tables 4.4 and 4.5. Table 4.4 presents the means and standard deviations statistics for children under 5 years while Table 4.5 shows means and standard deviations statistics for children from 6 to 17 years. The first objective of this essay was to construct a deprivation profile for children using the Bristol framework (Gordon et al., 2003) as espoused in essay one of chapter two in this thesis. The deprivation profile is the dependent variable in the regression equations. The dependent variable is categorical-derived from the number of deprivations children are facing, starting with children not deprived as the best outcome through to four or more deprivations at the extreme. The number of deprivations show the depth and severity of child deprivations. This count approach takes the methodological advantage of multidimensional indices and it's an important tool for targeting. There are about 3.8% of children under 5 years and another 7.2% of children aged between 6-17 years who are not deprived in any dimension. About 38.5% of children aged 5 years and below and 32.3% of children aged between 6-17 years face deprivations in at least four dimensions.

Children aged 0 to 5 years are 27.9 months old on average while for children above 6 years, about 26.9% of them are in secondary-school age. About 28.4% of children aged 0-5 years live in families headed by females while 35.6% of children aged 6-17 years live in families headed by

females. About 20.3% of children aged 0-5 years are raised by mothers without education, 56% completed primary education, 0.46% had a college degree or higher education, and 19% had completed secondary school. About 15.8% of children aged 0-5 years and 13.3% of children aged 6-17 years have access to electricity in their households. In terms of religion, 60.3% of children are from Protestants households, 21.5% are from Catholics households, 14.9% are from Muslims households and 0.34% are from households with no religion.

Table 4.4: Descriptive statistic for children aged 0-5 years

Variables	Mean	SD
Number of deprivations		
Children not deprived	0.038	0.192
Deprived in one dimension	0.112	0.315
Deprived in two dimensions	0.184	0.387
Deprived in three dimensions	0.281	0.450
Deprived in four or more dimensions	0.385	0.487
Child characteristics		
Female child dummy	0.495	0.5
Child age in months	27.89	17.010
Child age squared/1000	1.067	1.020
Birth order of the child	3.542	2.411
Child is a twin	0.0293	0.1687
Household characteristics		
Age of household head in years	38.29	12.6
Age squared/1000	1.625	1.186
Female household head dummy	0.284	0.451
Household size	6.086	2.648
Respondent working dummy	0.565	0.496
Age at first birth in years	19.031	3.416
Marital Status of mother		
Never married	0.066	0.249
Married/living with partner	0.850	0.357
Widowed	0.024	0.152
Divorced/Separated	0.059	.0236
Age of woman at 1st birth	19.10	3.4
Mother's education level		
No education	0.203	0.402
Primary level	0.560	0.496
Secondary level	0.191	0.393
Higher	0.046	0.21
Communal characteristics		
Has access to electricity	0.158	0.365
Regional characteristics		
Nairobi	0.042	0.2
Central	0.085	0.28
Coast	0.128	0.334
Eastern	0.140	0.347
Nyanza	0.150	0.357
Rift Valley	0.277	0.447

Western	0.117	0.321
North Eastern	0.061	0.24
Area of residence		
Urban residence dummy	0.744	0.437
Religion		
Catholic	0.213	0.409
Protestant	0.614	0.487
Muslim	0.143	0.35
No religion	0.030	0.17
Sample size	39,318	

Source: Author's calculations using KDHS 1993-2014

Table 4.5: Descriptive statistics for children aged 6-17 years

Variables	Mean	SD
Number of deprivations		
Not deprived	0.072	0.259
Deprived in one dimension	0.124	0.330
Deprived in two dimensions	0.209	0.407
Deprived in three dimensions	0.271	0.445
Deprived in four or more dimensions	0.323	0.468
Child characteristics		
Female child dummy	0.495	0.5
Birth order of the child	0.4227	2.621
Child is a twin	0.0230	0.150
Secondary school age dummy	0.269	0.443
Household characteristics		
Age of household head in years	45.67	13.35
Age squared/1000	2.264	1.366
Female household head dummy	0.356	0.479
Household size	6.647	2.641
Respondent working dummy	0.574	0.494
Age at first birth in years	18.885	3.365
Marital Status of mother		
Married	0.839	0.367
Never married	0.073	0.259
Widowed	0.029	0.168
Divorced	0.017	0.130
Separated	0.042	0.201
Mother's education level		
No education	0.193	0.436
Primary level	0.757	0.467
Secondary level	0.062	0.304
Higher level	0.005	0.197
Communal characteristics		
Has access to electricity	0.133	0.34
Regional characteristics		
Nairobi	0.027	0.161
Central	0.096	0.294
Coast	0.121	0.327
Eastern	0.154	0.361
Nyanza	0.155	0.362
Rift valley	0.263	0.440
Western	0.116	0.320
North eastern	0.068	0.252

Area of residence		
Rural dummy	0.773	0.419
Religion		
Catholic	0.215	0.410
Protestant	0.603	0.489
Muslim	0.149	0.356
No religion	0.339	0.181
Sample Size	107514	

Source: Author's calculations using KDHS 1993-2014

4.4.3 Distribution of Multidimensional Child Deprivation

Examining the distribution of numerous child deprivations in Kenya in relation to various individual, household, and regional factors was the primary goal of this essay. For children aged 0 to 5, Table 4.6 displays the prevalence of multiple child deprivations by child sex. We found no appreciable gender differences among young Kenyans. For instance, although 30.45% of girls and 32.04% of boys experienced deprivation in four or more dimensions, 6.71% of females and 6.75% of boys did not experience any deprivation. But girls are more impoverished in one, two, and three dimensions than boys are. For females and boys, respectively, there were 2.62 and 2.66 averagely experienced deprivations across all dimensions.

Table 4.6: Distribution of deprivations by sex of the child (%)

Number of Deprivations	Female	Male
0	6.71	6.75
1	13.08	12.52
2	21.78	20.47
3	27.98	28.22
4+	30.45	32.04
Mean	2.62	2.66
Total	100	100

Source: Authors' calculations from KDHS 1993-2014

However, there was a significant difference in child deprivations when it came to urban-rural disparities (Table 4.7). The findings are consistent with earlier research on the spatial phenomena of poverty (Kabubo-Mariara et al., 2011; 2012). As poverty increases, children from rural areas were more likely experience more deprivations than their urban counterparts. According to the findings, 2.36% of children in rural areas and 20.44% of urban children do not experience any form of deprivation, whereas 8.95% of urban children do and 38.36% of children in rural areas do. The fact that more children from rural areas are overrepresented among those who lack in various ways supports earlier studies indicating poverty is a rural phenomenon. Children in rural areas experienced deprivation on average on 2.97 dimensions as opposed to 1.62 dimensions in urban areas.

Table 4.7: Distribution of deprivations by area of residence (%)

Number of Deprivations	Rural	Urban
0	2.36	20.44
1	7.41	29.71
2	19.59	25.90
3	32.28	15.00
4+	38.36	8.95
Mean	2.97	1.62
Total	100	100

Source: Author's calculation KDHS 1993-2014

According to the literature, female-headed households experience higher levels of poverty than male-headed households, thus the phrase "feminization of poverty" (UN, 1995; Chant, 2008; Chopra, 2020). According to Table 4.8, 33.5% of children in households with a female head of

household experienced deprivation in at least four dimensions, compared to 30.33% of children in households with a male head of family. About 7.23 per cent of children from male-headed homes not be deprived compared to 5.53 per cent of children from female-headed households. On average, children living with female headed household suffered 2.71 deprivations as opposed to 2.61 in male-headed households. This demonstrates how poverty in Kenya is feminized from a young age.

Table 4.8: Distribution of deprivations by sex of the household head (%)

Number of Deprivations	Female	Male
0	5.53	7.23
1	12.14	13.07
2	21.56	20.94
3	27.27	28.44
4+	33.50	30.33
Mean	2.71	2.61
Total	100	100

Source: Authors' calculations from KDHS1993-2014

Regional disparities are closely tied to rural-urban disparities. Regional differences in child deprivations are shown in Table 4.9. We discovered that the Nairobi region had the most youngsters who were not deprived. Particularly, very few children about 3.01% from the North-Eastern region were not deprived compared to 29.03% of children from the Nairobi region. Children who faced deprivation in only one dimension were many in Nairobi region. A small proportion of children who were suffering four or more dimensions was likewise found Nairobi. Particularly, about 1.02% of children experienced four or more deprivation from the Nairobi region compared 60% from North-Eastern region. This finding might be explained by the Nairobi region's

relative ease of access to infrastructure and services, including as schools, hospitals, electricity, and indoor plumbing. Children in the Nairobi region experienced 1.13 deprivations on average, compared to 3.30 for children in the North Eastern region.

Table 4.9: Distribution of deprivations by region of residence (%)

Number of Deprivations	Nairobi	Central	Coast	Eastern	Nyanza	Rift Valley	Western	North Eastern
0	29.03	11.58	6.08	4.87	5.73	6.10	3.73	3.01
1	38.03	17.51	14.23	11.52	11.51	10.51	11.40	6.82
2	24.45	27.25	18.58	20.67	21.72	17.78	32.00	10.03
3	7.47	29.82	24.41	30.31	32.41	27.90	35.18	18.36
4+	1.02	13.85	36.71	32.63	28.62	37.71	17.70	61.79
Mean	1.14	2.17	2.71	2.74	2.67	2.80	2.52	3.27
Total	100	100	100	100	100	100	100	100

Source: Authors' calculations from KDHS1993-2014

Table 4.10 shows the distribution of child deprivations in terms of access to electricity. Access to electricity has been found to be a significant indicator of well-being (Kabubo-Mariara et al., 2012). Children living in homes without electricity were 1.47% as compared to 37.32% from homes with electricity were not deprived any area of social life. However, when we look at children deprived in four or more dimensions, about 0.89% of children accessed electricity while 36.62% did not. Children without electricity experienced 2.94 deprivations on average, compared to less than 1 for those who did. It is obvious that having power at home lessens child deprivations.

Table 4.10: Distribution of deprivations by access to electricity (%)

Number of deprivations	No Electricity	Has Electricity
0	1.47	37.32
1	8.01	40.66
2	21.96	16.18
3	31.94	4.95
4+	36.62	0.89
Mean	2.94	0.91
Total	100	100

Source: Author's calculation from KDHS 1993-2014

The distribution of child deprivations in relation to the mother's educational attainment is shown in Table 4.11. We discovered that a child's wellbeing significantly improves as the mother's education level rises. For instance, compared to 0.93% of children whose moms had no education, approximately 39.01% of children living in families where the mother had higher education were not deprived in any way. Children whose mothers lack education make up more than half of those who experience deprivation in at least four different ways. These findings support earlier research (see for example, Bastos et al., 2004; Bastos & Machado, 2009; Kabubo-Mariara et al., 2012; and Mwabu et al., 2009) that found that the child's well-being is greatly improved by the level of education of the mother. Children whose moms had greater levels of education endured less than one degree of deprivation on average, while children whose mothers had no education suffered in 2.38 dimensions.

Table 4.11: Distributions of deprivations by mother's education level (%)

Number of deprivations	Level of education			
	No education	Primary	Secondary	Higher
0	0.93	4.40	12.94	39.01
1	4.58	10.74	22.69	37.99
2	10.08	22.84	29.98	16.01
3	22.65	33.55	23.04	5.97
4+	61.76	28.47	11.36	1.02
Mean	2.38	2.71	1.98	0.93
total	100	100	100	100

Source: Authors' calculation from KDHS 1993-2014

Table 4.12 presents the relationship between child deprivations and marital status of their parents. The findings indicate that 40.50 percent of children from bereaved families experience four or more characteristics of deprivation. The lowest deprivations were observed in children from households never in union where only 21.41% were deprived. As expected, the lowest proportion of non-deprived children were from widows where 2.97% were not deprived. Compared to children of single moms, who are often poor in two dimensions, children of widowed households are typically deprived in three dimensions. According to these findings, children of widowed parents are more susceptible to poverty.

Table 4.12: Distributions of deprivations by marital status (%)

Number of deprivations	Never married	Married	Widowed	Divorced
0	8.94	6.69	2.97	6.81
1	17.41	12.27	8.70	16.00
2	25.06	20.94	20.14	24.22
3	27.18	28.59	27.69	26.05
4+	21.41	31.50	40.50	26.92
Mean	2.35	2.66	2.94	2.50
Total	100	100	100	100

Source: Author's calculation from KDHS 1993-2014

There is now more information available about how religion affects a child's development (Moore et al., 2007; Graham & Haidt, 2010; Hoverd & Sibley, 2010). In this essay, we examined the parent's religiosity on well-being of the child (see Table 4.13). The results show differential effects of child deprivation by parents' religion. Overall, we observe that a huge proportion of children from non-religious families were deprived compared to those that profess religion. But when Christians and Muslims are compared, we find that Muslim children are worse off than Christians. However, children with no religion were more deprived than children from all other faiths. As an illustration, 60.84% of children who did not belong to any religion experienced four or more deprived conditions, compared to 47.02% of Muslim, 31.19% of Protestant, and 31.19% of Catholic religion. On average, the number of deprivations encountered in each religion encountered was 2.66 for Catholics, 2.52 for Protestants, 2.96 for Muslims, and 3.36 for those who did not identify with a particular religion.

Table 4.13: Distributions of deprivations by religion (%)

Number of deprivations	Catholic	Protestant	Muslim	No religion
0	6.73	7.62	4.15	0.84
1	12.37	13.56	11.42	5.26
2	19.86	23.43	15.48	10.95
3	29.85	29.36	21.92	22.11
4+	31.19	31.19	47.02	60.84
Mean	2.66	2.52	2.96	3.36
Total	100	100	100	100

Source: Author's calculations using KDHS 1993-2014

4.4.4 Correlation of dimensions

We calculated the correlations between the dimensions of child well-being that we took into account while calculating child deprivations. A coefficient value of 1 or -1 denotes a perfect positive or negative correlation between the two variables. If there is no correlation between the dimensions, then the correlation coefficient is 0. A correlation matrix between seven dimensions is shown in Table 4.14. From a broad perspective, there are no clear correlations between the various child well-being dimensions, according to the values of the various correlation coefficients. The findings show that nutrition and health, as well as health and water, are negatively and significantly correlated. Positive and significant correlations exist between the remaining dimensions. The strongest connections were reported between sanitation and housing (45.88%), information and housing (28.51%), and water and sanitation (21.01%). There was no pairwise correlations more than 50% indicating that each dimension is distinct and reflects a different aspect of a child's well-being. This indicates that there is no multicollinearity because there is insufficient data to support a link between the dimensions.

Table 4.14: Correlation coefficients between dimensions of well-being for children aged 0-5 years

	Nutrition	Health	Shelter	Water	Sanitation	Information
Nutrition	1.0000					
Health	-0.0685*	1.0000				
Shelter	0.0633*	0.0821*	1.0000			
Information	0.0075	0.0732*	0.2851*	1.0000		
Water	0.1212*	-0.0244*	0.1758*	0.0561*	1.0000	
Sanitation	0.0263*	0.0686*	0.4588*	0.2101*	0.0805*	1.0000

Source: Authors' calculation from KDHS 1993-2014
** Correlation is significant at 0.05 level*

4.4.5 Correlates of Multiple Child Deprivations

This essay's second goal was to look into the primary correlates of multiple deprivations. This objective extends the analysis of multidimensional child deprivations in the previous section and takes into account the explanatory power of individual, household and community/locational characteristics. Table 4.15 and 4.16 present marginal effects from maximum likelihood estimates of ordered logit regression.

For children aged 0 to 5 years and for children aged 6 to 17 years, we separately provide regression results. The estimations are shown in columns with the numbers (1) to (6). The ordered logit coefficients from column 1 are provided by equation 18. The direction of the projected probability of the extreme outcomes, in our example, children with no deprivation and those who experience four or more deprivations, is indicated by the sign of the coefficients in the ordered logit model (Wittenberg, 2012). For categories in the interior of the range, the effect is ambiguous. Increases in the index will move some individual from the preceding category up, but it will also move some

individuals out in the next bracket. The net effect depends on how many individuals are close to the threshold at either end of the bracket (Wittenberg, 2012). The marginal effects of the independent variables are shown in columns (2) to (6) after estimating equations 24 to 28 as a guide. Hitherto, the findings are discussed simultaneously.

The results demonstrate that children's individual traits affected their likelihood of experiencing several deprivations. In both cohort of children, the estimate of the female child was negative and statistically significant, indicating that female children were less likely than male children to experience multiple deprivations. The marginal effects of observing a female child suffering four or more deprivations was 1.61% lower than it was for a male child for children under five years. For children between 6-17 years, the marginal effects of observing a female child deprived in four or more dimensions was 0.78% lower than their male counterparts. The findings indicate that male children are more likely to suffer multiple deprivations as compared to their male counterparts. This finding corroborates Kabubo-Mariara et al., (2009) results who discovered that boys were more malnourished than girls.

The likelihood of experiencing several deprivations was positively and significantly impacted by a child's age in months. With the inflexion point at 32.25 months, the coefficient of age squared, on the other hand, had a negative value, suggesting that the the relationship between age of the child and deprivation was convex. These findings imply that factors like eating and weaning techniques at different growth stages have an impact on children's wellbeing. Similar findings were made by Kabubo-Mariara et al. (2009), who discovered that older children experience malnutrition compared to young children who are still being breastfed. The authors contend who have stopped breastfeeding and have started taking solid foods are susceptible to malnutrition, but they grow,

they are more likely to get enough nutrients from regular food intake, leading to an improvement in nutritional status.

For children aged 6 to 17 years, they were grouped into primary and secondary school-aged children with primary school-aged children serving as the base. Children in secondary school age-group were more likely to experience deprivation in four or more aspects compared their counterpart in primary-school age group. Particularly, the likelihood of observing a secondary school-aged child deprived in four or more aspects was 1.43% higher than it was for a child in primary school-aged. This could be attributed to drop-outs associated with teenage pregnancies, lack of school fees and poverty, child labour, early marriages and other indiscipline cases.

At a 1 percent level of confidence, the child's birth order coefficient was positive and significant. According to this conclusion, every additional unit in the child's birth order increases the likelihood that they will experience deprivation in a number of different aspects. As the birth order of a child increases, the likelihood of finding a child who is not experiencing any deprivation decreases by 0.03% while the likelihood of finding a child who is experiencing four or more deprivations goes up by 0.69%. This result is in line with that of Kabubo-Mariara et al. (2009), who discovered that children born of higher birth orders experience malnutrition compared to their peers of lower birth orders.

The coefficient of multiple birth was positive and statistically significant indicating that twins are more likely to experience multiple deprivations. For instance, a twin has a 5.55% higher chance than a singleton of being observed to be suffering in four or more dimensions. This might arise as

a result of the difficulties faced by families with multiple births in comparison to households with singletons.

The effect of the age of the household head and the deprivation indicator portray a concave relationship. The coefficient of the age of the household head was negative but its quadratic term was negative indicating that the likelihood of experiencing deprivation in several dimensions is reducing up to a certain point and then increase (U-shaped relationship). This may imply that at old age, the household age could have retired or unable to work or even sick and hence unable to provide for their children. For children aged 6-17 years, the statistics were inconsequential.

A child's wellbeing was also looked at in relation to whether a home was headed by a woman or a man. Children from female headed households were more likely to face deprivation in four or more dimensions. Children in female-headed homes, for example, were 1.53% more likely to experience deprivation in four or more areas than their male-headed peers. However, for children under the age of five, the statistics on this aspect were negligible.

In many researches, the size of the household has been shown to negatively affect the wellbeing of an individual or a household. In this study, it was unexpectedly negative and significant in the cohort of children under the age of five. It seems that the likelihood of a youngster experiencing deprivation in four or more dimensions decreases with each new household member. When monitoring deprivation in one dimension, the marginal effects grow by 0.02%, while in two dimensions, they grow by 0.37%. However, for every additional household member, the marginal impacts of seeing a child suffer from deprivation in three and four or more dimensions decrease by 0.2% and 0.4%, respectively. This fact runs counter to the findings of earlier studies on the

causes of poverty, which showed that bigger household size tended to be poorer (Mwabu et al., 2000; Geda et al., 2005). According to Kabubo-Mariara et al., (2009), the inverse relationship between family size and children's nutritional health suggests that siblings compete for food.

Across all child groups, the coefficient of the mother's educational attainment was clear. The negative coefficients of the levels of education of the mother indicate that the number of child deprivations decreases with the increase of the mother's education level. Thus, compared to children whose mothers had no education, children whose mothers had completed primary level education had a 22.39% less likelihood of experiencing four or more deprivation. In a similar vein, a child whose mother had a secondary education had a 30.92% less likelihood of experiencing deprivation in four or more dimensions compared to a child whose mother had no education.

We discovered that as the level of education of the mother increases, the magnitude of the percentage in reduction in child deprivation increased further. For example, a child whose mother had post-secondary education was 32.74% lower than a child whose mother had no education. The children in the cohort of age 6 – 17 years, saw similar outcomes. This outcome supports research by Kabubo-Mariara et al., (2009) who opined that mother's education key determinants of the nutritional status and physical health of children. According to research by Mwabu et al. (2000) and Geda et al. (2005), mothers with no formal education were more likely to be poor. According to Kabubo-Mariara et al. (2012), educating women in secondary and higher education can significantly lower the infant and child death rates.

Concerns about early marriages and child development are often discussed in the literature (Hoffman & Maynard, 2008). The results demonstrate that as a mother gets older, the risk that her

kid will be deprived in four or more dimensions declines in both cohorts of children. According to this information, young mothers are more likely to produce children who have worse health, educational, and cognitive results than older mothers (Cooksey, 1997). This study suggests that educating girls is crucial for preventing or postponing early marriages.

For children under 5 years, children from divorced households had higher chances of of being deprived in several dimension. The likelihood of observing a child from a divorced household suffering four or more domains was 6.08% higher than it was for children from couples. Other marital statuses have little marginal effects. For the older cohort of children, similar scenario was observed from separated families as the marginal effects was 3.79 higher than the likelihood of a child raised by a couple. A child living with widowed mother had a 3.13% higher chance of witnessing deprivation in four or more dimensions than a child raised by a couple.

The impact of geographical factors was also investigated, and it was shown that both groups of children had statistically significant positive rural residence coefficients. This finding suggests that children from rural areas were more likely to experience deprivation in four or more domains than those from urban areas. Therefore, compared to children from urban regions, children from rural areas had a 13.62% higher likelihood of experiencing deprivation in four or more domains.

A child from a rural area had a 14.64% higher likelihood than a child from an urban area of suffering deprivation in four or more dimensions for the cohort f o 6 to 17 years. This result is in line with past studies conducted in Kenya, where the majority of the nation's impoverished and children live in rural areas (see for example, Mwabu et al., 2000; Geda et al., 2005; Kabubo-

Mariara et al., 2009; 2011 & 2012). This is a result of the inadequate infrastructure and lack of resources in rural areas.

To account for geographical variations, the study used regional dummies. Except for the North Eastern province, where the estimate was positive and significant, we discovered that all of the regional coefficients were negative in comparison to Nairobi (the reference group). According to this finding, children from the North Eastern region were more likely to endure numerous deprivations than children from Nairobi region. In particular, a child living in North Eastern region had a 17.73% higher chance of experiencing four or more deprivations than a child from the Nairobi region. However, a child living in the central region had a 4.69% lower risk of experiencing four or more deprivation compared to a child living in Nairobi region. For the Nyanza region in relation to Nairobi, the likelihood of a similar event was 4.11%. These findings support the previous studies like Kabubo-Mariara et al. (2011) who discovered that children in all regions were generally poorer than those in the Nairobi region. The authors noted that these areas are predicted to be underdeveloped because of their remoteness from other areas, lack of resources, low levels of rainfall, and other unfavorable climatic factors.

The respondent's employment situation turned out to be a crucial factor in determining the well-being of the child. The negative coefficient of working status of the responder suggests that children whose caregivers/guardians are employed are less likely to endure multiple deprivations than those from respondents' who are not employed. Children with employed caregivers had a 1.15% and 1.69% reduced risk of experiencing in four or more deprivations than children with unemployed caregivers, respectively, for the 0–5 years cohort and the 6–17 years cohort.

The availability of electricity was utilized to measure household standards of living and community-level infrastructure development. The household's access to power had a negative and statistically significant coefficient. According to this study, children who lived in homes with electricity were less likely than their counterparts without electricity to experience multiple deprivations. With regard to the 0–5 years cohort and the 6–17 years cohort, a child who had access to electricity at home was 19.21% and 22.23% less likely than their counterparts to experience four or more characteristics of deprivation respectively. This result confirms earlier research by Kabubo-Mariara et al. (2011) that community infrastructure has a significant role in helping people to escape poverty.

In order to unpack the dynamics of child deprivation across time, with the 1993 survey serving as our reference point, dummies representing the years of the survey were included in the regression equation. All the estimates of the survey years were negative and statistically significant in the first cohort of children, demonstrating a decrease in the number of deprivations afflicting the children during the study period. The coefficients for the surveys conducted in 1998, 2003 and 2014 in both cohorts of children were positive implying that the well-being of children have improved over the period. We predict that these changes will prevent multidimensional poverty from being passed down through the generations.

The cut points indicate where the continuous latent variables is cut to make the five categories that we observe in our data. The cut points are similar to thresholds which are reported by other statistics packages. This cut points are similar to intercept or constant of a regression (Greene, 2018).

Table 4.15: Marginal effects after ordered logit of multiple child deprivations for children aged 0-5 years

Variables	(1) Coeff.	(2) ME 0	(3) ME 1	(4) ME 2	(5) ME 3	(6) ME 4
Female child	-0.0990***	0.0007***	0.0086***	0.0148***	-0.0079***	-0.0161***
	(0.0223)	(0.0002)	(0.0019)	(0.0033)	(0.0018)	(0.0036)
Age of child in months	0.0188***	-0.0001***	-0.0016***	-0.0028***	0.0015***	0.0031***
	(0.0026)	(0.0000)	(0.0002)	(0.0004)	(0.0002)	(0.0004)
Age squared	-0.3211***	0.0022***	0.0278***	0.0480***	-0.0257***	-0.0523***
	(0.0429)	(0.0003)	(0.0037)	(0.0064)	(0.0035)	(0.0070)
Birth order	0.0423***	-0.0003***	-0.0037***	-0.0063***	0.0034***	0.0069***
	(0.0060)	(0.0000)	(0.0005)	(0.0009)	(0.0005)	(0.0010)
Child twin	0.3134***	-0.0019***	-0.0242***	-0.0477***	0.0182***	0.0555***
	(0.0720)	(0.0004)	(0.0049)	(0.0110)	(0.0026)	(0.0138)
Female headed household	0.0332	-0.0002	-0.0029	-0.0050	0.0026	0.0054
	(0.0277)	(0.0002)	(0.0024)	(0.0042)	(0.0022)	(0.0046)
Age of household head	-0.0280***	0.0002***	0.0024***	0.0042***	-0.0022***	-0.0046***
	(0.0052)	(0.0000)	(0.0005)	(0.0008)	(0.0004)	(0.0008)
Age squared	0.2750***	-0.0019***	-0.0238***	-0.0411***	0.0220***	0.0448***
	(0.0530)	(0.0004)	(0.0046)	(0.0079)	(0.0043)	(0.0086)
Size of household	-0.0248***	0.0002***	0.0022***	0.0037***	-0.0020***	-0.0040***
	(0.0055)	(0.0000)	(0.0005)	(0.0008)	(0.0004)	(0.0009)
Never Married	-0.0659	0.0009	0.0051	0.0096	-0.0036	-0.012
	-0.0907	-0.0013	-0.0071	-0.0131	-0.0053	-0.0162
Widowed	0.0495	-0.0006	-0.0036	-0.0072	0.0022	0.0092
	-0.1176	-0.0015	-0.0085	-0.0172	-0.0049	-0.0222
Divorced	0.3063**	-0.0035**	-0.0204**	-0.0445**	0.0076***	0.0608*
	-0.1495	-0.0015	-0.0088	-0.0214	-0.0011	-0.0316
Separated	0.0027	-0.0000	-0.0002	-0.0004	0.0001	0.0005
	-0.1025	-0.0014	-0.0077	-0.0149	-0.005	-0.0189
Primary level	-1.0875***	0.0048***	0.0649***	0.1572***	-0.0030	-0.2239***
	(0.0367)	(0.0003)	(0.0020)	(0.0049)	(0.0029)	(0.0083)
Secondary level	-1.7582***	0.0117***	0.1423***	0.2389***	-0.0837***	-0.3092***
	(0.0453)	(0.0006)	(0.0044)	(0.0056)	(0.0045)	(0.0085)
Higher level	-1.9570***	0.0147***	0.1722***	0.2528***	-0.1124***	-0.3274***
	(0.0727)	(0.0012)	(0.0101)	(0.0062)	(0.0093)	(0.0097)
Age at first birth in years	-0.0260***	0.0003***	0.0019***	0.0039***	-0.0013***	-0.0048***
	-0.0062	-0.0001	-0.0005	-0.0009	-0.0003	-0.0011
Respondent working	-0.0707***	0.0005***	0.0061***	0.0106***	-0.0056***	-0.0115***
	(0.0241)	(0.0002)	(0.0021)	(0.0036)	(0.0019)	(0.0039)
Rural dummy	0.9831***	-0.0091***	-0.1050***	-0.1265***	0.1045***	0.1362***
	(0.0339)	(0.0006)	(0.0045)	(0.0038)	(0.0045)	(0.0041)
Central	-0.2832***	0.0019***	0.0240***	0.0424***	-0.0214***	-0.0469***
	(0.0689)	(0.0004)	(0.0056)	(0.0104)	(0.0047)	(0.0119)
Coast	-0.0018	0.0000	0.0001	0.0003	-0.0001	-0.0003
	(0.0688)	(0.0004)	(0.0052)	(0.0105)	(0.0038)	(0.0123)
Eastern	-0.0565	0.0003	0.0044	0.0086	-0.0034	-0.0100
	(0.0677)	(0.0004)	(0.0052)	(0.0103)	(0.0039)	(0.0120)
Nyanza	-0.2455***	0.0016***	0.0205***	0.0369***	-0.0180***	-0.0411***
	(0.0671)	(0.0004)	(0.0053)	(0.0102)	(0.0043)	(0.0117)

Rift valley	-0.0992	0.0006	0.0078	0.0151	-0.0062*	-0.0173
	(0.0643)	(0.0004)	(0.0049)	(0.0098)	(0.0037)	(0.0114)
Western	-0.9754***	0.0095***	0.1078***	0.1218***	-0.1084***	-0.1307***
	(0.0680)	(0.0007)	(0.0067)	(0.0095)	(0.0059)	(0.0111)
North Eastern	0.8274***	-0.0033***	-0.0450***	-0.1189***	-0.0101	0.1773***
	(0.0921)	(0.0004)	(0.0052)	(0.0127)	(0.0062)	(0.0200)
Has electricity	-1.7369***	0.0247***	0.2339***	0.1432***	-0.2097***	-0.1921***
	(0.0432)	(0.0014)	(0.0080)	(0.0032)	(0.0057)	(0.0035)
Protestant	-0.0264	0.0002	0.0024	0.0039	-0.0022	-0.0042
	(0.0276)	(0.0002)	(0.0024)	(0.0041)	(0.0023)	(0.0044)
Muslim	0.1171**	-0.0008**	-0.0099**	-0.0176**	0.0088**	0.0195**
	(0.0537)	(0.0003)	(0.0044)	(0.0081)	(0.0038)	(0.0091)
No religion	0.7194***	-0.0036***	-0.0481***	-0.1079***	0.0200***	0.1396***
	(0.0769)	(0.0003)	(0.0042)	(0.0110)	(0.0030)	(0.0168)
1998 survey	0.1639***	-0.0006***	-0.0087***	-0.0239***	-0.0022**	0.0355***
	(0.0425)	(0.0002)	(0.0022)	(0.0062)	(0.0009)	(0.0093)
2003 survey	-0.4671***	0.0025***	0.0327***	0.0710***	-0.0180***	-0.0881***
	(0.0371)	(0.0002)	(0.0027)	(0.0056)	(0.0020)	(0.0070)
2008 survey	-0.6978***	0.0042***	0.0539***	0.1047***	-0.0387***	-0.1240***
	(0.0372)	(0.0003)	(0.0031)	(0.0055)	(0.0028)	(0.0067)
2014 survey	-0.9644***	0.0067***	0.0833***	0.1393***	-0.0700***	-0.1593***
	(0.0340)	(0.0004)	(0.0031)	(0.0050)	(0.0029)	(0.0061)
Constant cut1	-6.6494***					
	(0.1406)					
Constant cut2	-3.8306***					
	(0.1330)					
Constant cut3	-2.0212***					
	(0.1317)					
Constant cut4	-0.3252**					
	(0.1311)					
Observations	28,277	28,277	28,277	28,277	28,277	28,277

Source: Author's calculations from KDHS 1993-2014
*Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1*

Table 4.16: Marginal effects after ordered logit of multiple child deprivations for children aged 6-17 years

Variables	(1) Coeff.	(2) ME 0	(3) ME 1	(4) ME 2	(5) ME 3	(6) ME 4
Sec. school-age child	0.0931***	-0.0013***	-0.0064***	-0.0140***	0.0075***	0.0143***
	(0.0218)	(0.0003)	(0.0015)	(0.0033)	(0.0017)	(0.0034)
Female child dummy	-0.0515***	0.0008***	0.0036***	0.0077***	-0.0043***	-0.0078***
	(0.0168)	(0.0002)	(0.0012)	(0.0025)	(0.0014)	(0.0025)
Age of the household head	-0.0064	0.0001	0.0004	0.0010	-0.0005	-0.0010
	(0.0042)	(0.0001)	(0.0003)	(0.0006)	(0.0004)	(0.0006)
Age squared	0.1050**	-0.0016**	-0.0074**	-0.0158**	0.0088**	0.0159**
	(0.0418)	(0.0006)	(0.0029)	(0.0063)	(0.0035)	(0.0063)

Female headed household	0.1001***	-0.0015***	-0.0070***	-0.0151***	0.0081***	0.0153***
	(0.0205)	(0.0003)	(0.0014)	(0.0031)	(0.0016)	(0.0032)
Never married	-0.3436***	0.0057***	0.0269***	0.0505***	-0.0357***	-0.0474***
	(0.0326)	(0.0006)	(0.0028)	(0.0046)	(0.0040)	(0.0041)
widowed	0.1915***	-0.0025***	-0.0122***	-0.0289***	0.0123***	0.0313***
	(0.0483)	(0.0006)	(0.0029)	(0.0073)	(0.0024)	(0.0083)
Divorced	-0.0734	0.0011	0.0052	0.0111	-0.0063	-0.0110
	(0.0635)	(0.0010)	(0.0046)	(0.0095)	(0.0057)	(0.0093)
Separated	-0.2679***	0.0043***	0.0204***	0.0397***	-0.0265***	-0.0379***
	(0.0421)	(0.0008)	(0.0035)	(0.0061)	(0.0048)	(0.0055)
Primary level	-1.9369***	0.0191***	0.0939***	0.2490***	0.0196***	-0.3816***
	(0.0237)	(0.0005)	(0.0015)	(0.0028)	(0.0033)	(0.0052)
Secondary level	-2.8023***	0.0483***	0.2002***	0.3205***	-0.1154***	-0.4535***
	(0.0539)	(0.0025)	(0.0074)	(0.0034)	(0.0080)	(0.0059)
Higher level	-2.2927***	0.0283	0.1318*	0.2903***	-0.0331	-0.4173***
	(0.5696)	(0.0174)	(0.0674)	(0.0550)	(0.0901)	(0.0499)
Size of household	-0.0011	0.0000	0.0001	0.0002	-0.0001	-0.0002
	(0.0036)	(0.0001)	(0.0003)	(0.0005)	(0.0003)	(0.0005)
Age at first birth in years	-0.0462***	0.0007***	0.0032***	0.0070***	-0.0039***	-0.0070***
	-0.0027	0.0000	-0.0002	-0.0004	-0.0002	-0.0004
Respondent working	-0.1065***	0.0013***	0.0066***	0.0162***	-0.0073***	-0.0169***
	(0.0210)	(0.0003)	(0.0013)	(0.0032)	(0.0014)	(0.0034)
Rural dummy	1.2222***	-0.0272***	-0.1144***	-0.1538***	0.1491***	0.1464***
	(0.0257)	(0.0010)	(0.0032)	(0.0028)	(0.0039)	(0.0026)
Central	-0.5682***	0.0114***	0.0504***	0.0781***	-0.0696***	-0.0704***
	(0.0677)	(0.0012)	(0.0054)	(0.0098)	(0.0070)	(0.0096)
Coast	0.2835***	-0.0037***	-0.0182***	-0.0426***	0.0184***	0.0462***
	(0.0652)	(0.0010)	(0.0046)	(0.0098)	(0.0054)	(0.0100)
Eastern	-0.0450	0.0007	0.0033	0.0067	-0.0041	-0.0066
	(0.0655)	(0.0010)	(0.0047)	(0.0098)	(0.0058)	(0.0098)
Nyanza	-0.0726	0.0011	0.0053	0.0108	-0.0067	-0.0106
	(0.0648)	(0.0010)	(0.0047)	(0.0097)	(0.0057)	(0.0096)
Rift valley	0.1405**	-0.0020**	-0.0095**	-0.0212**	0.0107*	0.0219**
	(0.0638)	(0.0010)	(0.0045)	(0.0096)	(0.0055)	(0.0096)
Western	-0.7144***	0.0155***	0.0668***	0.0939***	-0.0920***	-0.0842***
	(0.0661)	(0.0012)	(0.0053)	(0.0096)	(0.0066)	(0.0094)
North eastern	1.2185***	-0.0107***	-0.0548***	-0.1632***	-0.0192***	0.2480***
	(0.0711)	(0.0010)	(0.0045)	(0.0099)	(0.0069)	(0.0128)
Has electricity	-2.8846***	0.1538***	0.3499***	0.0774***	-0.3582***	-0.2229***
	(0.0347)	(0.0042)	(0.0054)	(0.0049)	(0.0035)	(0.0022)
Protestant	-0.0413*	0.0005*	0.0028*	0.0063*	-0.0035*	-0.0061*
	-0.0239	-0.0003	-0.0016	-0.0036	-0.002	-0.0036
Muslim	0.4238***	-0.0045***	-0.0238***	-0.0634***	0.0192***	0.0725***
	-0.0477	-0.0005	-0.0025	-0.007	-0.0018	-0.0086
No religion	0.9961***	-0.0082***	-0.0448***	-0.1372***	-0.0055	0.1957***
	-0.0639	-0.0005	-0.0023	-0.0076	-0.0056	-0.0145
1998 survey	0.1245***	-0.0017***	-0.0081***	-0.0188***	0.0085***	0.0201***
	(0.0324)	(0.0004)	(0.0021)	(0.0049)	(0.0022)	(0.0053)
2003 survey	0.9860***	-0.0090***	-0.0459***	-0.1355***	-0.0069**	0.1973***
	(0.0337)	(0.0004)	(0.0017)	(0.0044)	(0.0029)	(0.0070)
2008 survey	-0.4173***	0.0073***	0.0335***	0.0605***	-0.0446***	-0.0567***

	(0.0320)	(0.0006)	(0.0027)	(0.0046)	(0.0036)	(0.0043)
2014 survey	-0.2498***	0.0040***	0.0188***	0.0371***	-0.0240***	-0.0359***
	(0.0248)	(0.0004)	(0.0018)	(0.0037)	(0.0022)	(0.0037)
Constant cut1	-5.1723***					
	(0.1197)					
Constant cut2	-3.2522***					
	(0.1170)					
Constant cut3	-1.4787***					
	(0.1165)					
Constant cut4	0.4873***					
	(0.1163)					
Observations	51,479	51,479	51,479	51,479	51,479	51,479

Source: Author's calculations from KDHS 1993-2014
*Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1*

4.5 Summary, Conclusion and Policy Implications

4.5.1 Introduction

The essay's summary is presented here followed by conclusions drawn from the key findings. Further, we discuss policy implications and propose some areas for further research.

4.5.2 Summary

Several issues motivate the focus of this essay and distinguishes it from previous studies. First off, despite the fact that it is well known in the research community that well-being is a multidimensional phenomenon, the majority of empirical studies on well-being in Kenya have only examined one aspect of well-being (usually income or consumption and expenditure, nutritional status, mortality). There are a number of problems with using money or consumption expenditure as a gauge of well-being. It first implies that all the members of household share income equally, which is not always the case. Second, it is arbitrary to modify children's intake using equal scales as youngsters have different needs than adults (Thorbecke, 2008). The majority of developing nations understate children's requirements when calculating income, which leaves out important details about how children experience poverty (Gordon et al., 2003).

Few empirical studies in Kenya have been undertaken examining child well-being in a multidimensional perspective. Some studies have attempted to use child-specific attributes though but have used only one or two dimensions. Many dimensions, which are important for child development, have been left out. To comprehensively analyse child well-being, this essay used seven child-specific dimensions using data from KDHS 1993-2014. These dimensions are adopted from the Bristol deprivation indicators (Gordon et al., 2003) and operationalized into the Kenyan

context. These dimensions are: sanitation, education, water, information, health, education and shelter,

The methodology used in this essay is intuitive as we identify children deprived in every dimension and then aggregate by counting the number of dimensions each child is deprived in. Thereafter, children are ranked from those who are not deprived in any dimension to those who are suffering the whole gamut of deprivations. Since those deprived in all dimensions are less than 1%, we grouped together children deprived in four or more dimensions. We then established the distributions of multiple child deprivations viz-a-viz child, household and community characteristics. Since the dimensions considered are specific to a certain age group, we categorized children into two groups: the first group were children below 5 years in which education dimension is not applicable to them. The second group were children aged 6-17 years in which health and nutritional dimensions were not applicable them. As a result, we looked into variables that are linked to multiple child deprivations. We contend that a child with one dimension of deprivation is better off than a child with four or more dimensions of deprivation. This enabled us to embed the deprivation indicator into an ordered logit model and derive the marginal effects of each outcome to measure the change in probability of being deprived as the covariates change by a unit or jump from one binary to another.

4.5.3 Conclusions

Between various socioeconomic categories of children, there are significant differences in levels of deprivation. Children in rural settings, for instance, are more susceptible to numerous deprivations than their peers in urban areas. Geographically speaking, children in Kenya's North-Eastern and Eastern regions are more likely to experience numerous deprivations, demonstrating

that there are significant horizontal inequalities in Kenya. Children in this kind of setting are likely to suffer geographical poverty traps due to poor conditions of local infrastructure, topography, weather or other natural or man-made factors. These could be detrimental in the pursuit of equitable and inclusive growth in Kenya which is against the international clarion call of 'leave no one behind'.

The mother's education degree was a prominent household trait that was proven to be crucial in lowering child deprivations. The findings indicated that a child experiences less deprivations as their mother's education level rises. Children who lived in homes with access to electricity were less likely to experience multiple deprivations than their counterparts who did not have access to electricity. This could be because electricity makes it easier to access other services such as television and radio and storage of food in the household. Electricity also improves learning environment by lighting at night thus increases the time for studying for children. Access to electricity also attracts investments in the villages where most children live, thus increases economic activities and productivity in the community.

Compared to children living with both parents, children whose moms are widows have a disproportionately high prevalence of multiple deprivations. The distribution of child deprivations along religious lines showed that children living in households who profess any religion have lower cases of multiple deprivations compared to children from households with no religion.

The well-being of the child deteriorates as the age of the child increases, but this is up to a turning point of 29.27 months. As children grow older, mothers reduce breastfeeding and provide solid foods that make them vulnerable because the food could be contaminated or lacks the requisite

nutrients. But this could change when the children are completely weaned (Kabubo-Mariara et al., 2009; Kabubo-Mariara et al., 2012). In relation to sex of the child, girls have better welfare than boys. This is also supported by past studies that found girls to have better nutritional status than boys (Kabubo-Mariara et al., 2009). Birth order of the child is positively related with multiple child deprivations. This is contrary to earlier finding by Kabubo-Mariara et al. (2009) which found that birth order of the child was inversely related to nutritional status.

The essay makes important contribution to the existing literature. As far as the author's knowledge is concerned, this essay is the first to model and analyse child deprivations in a multidimensional perspective in Kenya. Another novelty of this essay was counting the number of deprivations each child was suffering and ranking them to reveal the depth of poverty.

4.5.4 Policy Implications

Policy to address multidimensional deprivations may be affected by the findings of this article. In order to address the complex and diverse nature of well-being, we first propose that policy should concentrate on many dimensions. This is in line with the Agenda 2030, particularly SDG No. 1's goal of eradicating poverty in all of its forms everywhere.

The government should develop policies that specifically focus on the development of rural and marginalized areas where child deprivations is rife and offer simple access to vitally important basic infrastructure services like schools, hospitals, and water supply programs. The county and national governments should cooperate and prioritise their expenditure to develop rural areas so that they give a chance of equal opportunity for children to grow to their full potential. Every child has a right to be free from hunger and access to adequate balanced diet as per the provisions of the

Kenyan Constitution. This will require strategies on sustainable humanitarian assistance to these groups of people.

The effect of mother's education was unequivocal in improving child well-being. The essay suggests policies of ensuring that every girl child attend and complete school even up to university level. Existing policies targeting girls in school by giving them sanitary towels in school is still intermittent, and this should be promoted to reach all girls in school and ensure sustainability. By doing this, girls' rights will be upheld and protected, considerably expanding the range of options available to them as women. Women who did not access education in their childhood should be given an opportunity to undergo functional adult education that can enable them to learn and follow instructions on how to nurture their children. Vocational training also comes in handy to those women who never had opportunity to attend tertiary schools, so they can develop their skills and talents and hence become productive and increase their employability.

Children living with mothers who are widows were more vulnerable to multiple deprivations. These families and their children should receive special consideration from the society. All orphans and vulnerable children in the nation should be included in the current social security and income transfer policies, which should be broadened and expedited to include them.

There is need to sensitize both men and women on the importance of birth spacing of their children. They should be taken through family planning options which are readily available so that they can adopt and improve the birth spacing of their children. The government should promote access to family planning services and contraceptives to parents.

4.5.5 Areas for Further Research

One limitation of this study is that it does not capture some important dimensions of child development in terms of social relationships (with family and friends), domestic violence, child labour, leisure and emotional/spiritual well-being. These are also key dimensions of child well-being which should be considered in future studies. In the literature, the indicators used to measure emotional/spiritual well-being of the child include suicide rates and monitoring of religious attendance while social domain can be measured by rate of teenage pregnancies, rate of cigarettes/alcohol smoking/drinking and rate of illicit drug use.

Although this essay makes important contribution to the literature in the realm of child well-being, it also reveals some gaps for further research. Firstly, this essay considered a conceptual framework based on multidimensional perspective as opposed to conventional money-metric perspective. Poverty is a complex phenomenon and there has been an unending debate on its measurement from the mid of the 20th century to date. There is need for further research to compare monetary and non-monetary measures of child well-being in Kenya to examine if there is any overlap or otherwise.

5.0 CHAPTER FIVE

5.1 SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1.1 Introduction

The summary, findings, and policy implications of the thesis are presented in this chapter. The chapter also lists the study's weaknesses and suggests new areas for future investigation.

5.1.2 Summary

This thesis has analysed child deprivations and well-being inequalities in Kenya using KDHS data for five rounds of surveys from 1993 to 2014. The thesis addressed three objectives which formed three independent and stand-alone essays. First, we estimated the incidence, depth, and severity of multiple child deprivations. Second, we analysed child inequalities from a multidimensional perspective. Last but not least, we looked into the main causes of deprivations profile for children. The seven child-specific elements of nutrition, health, education, shelter, water, sanitation, and information were utilized in the thesis as means of achieving these objectives.

The fact that served as the impetus for this inquiry was that poverty is a multidimensional phenomenon, and hence more than one dimension should be considered in order to achieve an effective and comprehensive analysis of child well-being. The idea of child deprivations is anchored in the framework of the Convention of the Rights of the Child and denial or lack of these rights constitutes child poverty. Persistent deprivation affects optimal child development. Research has also shown that child poverty affects sensory-motor, socio-emotional as well as cognitive functioning; educational achievement; and other capabilities of the child. It is, therefore, crucial to know the status of well-being of Kenyan children so that we can manipulate policies to counter the deprivations.

This thesis is divided into five chapters, the first of which introduces the thesis, provides background information about the study, defines the research gap, and outlines the thesis' goals. Chapter two contains essay one which analysed the incidence, depth and severity of multiple child deprivations using the Bristol deprivation framework propagated by Gordon et al. (2003) and the dual cut-off methodology pioneered by Alkire and Foster (2011). The former analyses the incidence or prevalence of multiple child deprivations and counts the number of deprivations in which a child suffers is deficient. However, the Bristol approach does not examine the intensity and severity of child deprivations. Thus, the Bristol approach is augmented by Alkire and Foster (2011), which analyses the depth and severity of the multiple child deprivations.

Results from essay one indicates that the highest form of deprivation among Kenyan children relates to the information dimension where over 90% of children were deprived in 1993 with this rate dropping to 80.29% in 2014. This statistic indicates that the majority of Kenyan children do not have access to radio or television as a source of information. The second highest form of deprivation was identified in the shelter dimension. In 1993, 76.53% of children suffered deprivation in the shelter dimension, dropping to 41.84% in 2014. The lowest form of deprivation was observed in the health dimension, which was below 10% for the study period in all the surveys. The second lowest form of deprivation was observed in nutrition dimension.

The proportion of children that did not suffer any form of deprivation rose from 5.03% in 1993 to 12.32% in 2014. Most children suffered deprivation in at least two dimensions, while less than 1% experienced deprivation in all the dimensions investigated. Using the union approach deprivation threshold, the percentage of kids that are deprived in at least one dimension was 94.98% in 1993,

dropping to 87.88% in 2014. In 1993, 78.03% of children suffered deprivation in two or more dimensions with this proportion declining to 59.5% in 2014.

Using the Alkire and Foster (2011) methodology, about 37.75%% of children were classified as multi-dimensionally poor in 1993, but this proportion declined to 26.09% in 2014. The MPI is innovative as it incorporates how severe the multidimensional poverty situation is for the poor. The change was, however, attributed more to change in multidimensional headcount ratios which was 72.77% in 1993 but dropped to 50.76% in 2014. In contrast, the average deprivations hardly changed from 51.87% in 1993 to 51.39% in 2014.

Regarding the censored headcount ratios, the information dimension represented the highest form of deprivation experienced among those considered as multidimensionally poor followed by the shelter dimension. This indicated that the main causes of multidimensional poverty were the information and housing aspects among the Kenyan children. The health dimension was the least form of deprivation among those classified as multi-dimensionally poor and therefore health dimension contributed the least to overall multidimensional poverty. The nutrition dimension was the second lowest form of deprivation in this group. The key message from this chapter is that child deprivations have declined from 1993 to 2014; but we still observe relatively high levels of deprivations. In general, the average number of deprivations the children are facing have remained constant which is very outrageous.

Chapter three carries essay two which is an extension of the first essay, analyses the multidimensional well-being inequalities among Kenyan children. The difference between poverty and inequality is that whereas poverty focuses on those below a deprivation cut-off of well-being,

inequality relates to the overall distribution of well-being dimensions in the population. We constructed composite welfare indices using multiple correspondence analysis (MCA) for all the seven dimensions of child well-being and subsequently calculated various welfare inequality measures. We also presented the decomposition of overall inequality into various characteristics and its components.

The results showed a general reduction in various inequality measures among the Kenyan children. In 1993 the Gini coefficient index was 29% but had declined to 23% in 2014. Critics of the Gini coefficient index have stated that the Lorenz curve can take different shapes with the same Gini coefficient and this can complicate the evaluation of inequality in the population sub-groups. Thus, the Theil index is considered more appropriate for the decompositions of overall inequality into its population sub-groups. Similarly, the results showed a general decline in general entropy indices. For example, in 1993, the Mean Logarithmic Deviation [GE (α=0)] declined from 15% to less than 8% in 2014 while Relative Theil Index [GE (α=1)] (decline from 15% in 1993 to 7% in 2014. Half the square of Coefficient of Variation stood at 16% in 1993 but declined to 7% in 2014. The implication of these results is that multidimensional inequality among the Kenyan children is low and that the inequality rates have reduced by half over the period. When the overall multidimensional inequality was broken down by its dimension, it was devastating to note that nutrition dimension contributed the highest to inequality. This was contrary to the finding of essay one of this thesis when multidimensional poverty was broken down by dimension and shelter dimension contributed the highest to multidimensional poverty among the Kenyan children.

Additionally, we decomposed overall inequality by fitting a linear regression model on individual, household and community characteristics. The findings show that having access to power

accounted for the highest inequality in all the surveys followed by the area of residence. These findings supported other studies that pointed to the rural nature of inequality and lack of public services in the remote areas. The age of the household head also accounted significantly to inequality suggesting that older household heads are dissaving as they are less active and unemployed and hence associated with poor well-being. Education of the mother was also associated with increased well-being inequality among the children because educated mothers, unlike their uneducated counterparts, have higher economic power due to access to more opportunities in life.

In the third essay, we examined the key causes that lead to multiple child deprivations and examined the distribution of deprivation profile by various characteristics. To indicate the severity of poverty, children were ranked from those who do not suffer from deprivation to those who do so in at least four different aspects. We assumed that a child experiencing a single deprivation would fare better than a child experiencing four or more deprivations. To this purpose, we examined the probabilities of a child being in any of deprivation profile using an ordered logit model in the regression.

The findings revealed children living in rural areas, on average, suffered a higher prevalence of multiple deprivations than their peers in urban areas. Maternal education was significantly important in lowering the number of deprivations in children. The results from regression model complement the results for the distribution of the deprivation profiles. From the empirical model, the results revealed that child characteristics, such as age, birth order, and sex were important correlates of child deprivations. The age of the child in months increases at a decreasing rate, which indicates the effects of changes in life cycle of a child. It was more common for boys to experience

several deprivations than it was for girls whereas children who were the result of multiple births were at a greater risk of experiencing several forms of deprivation than singletons.

5.1.3 Conclusions

This thesis analysed child deprivations and well-being inequalities in Kenya using five waves of KDHS data for the period 1993 to 2014. Despite the consensus that poverty is a multidimensional phenomenon, there is dearth of empirical literature for Kenya. In addition, conventional measures of well-being use the household rather than the individual as the unit of analysis. Using a household as a unit of analysis do not give complete information about interventions that might be suitable for individuals based on age, gender, and other factors. Of more serious concern is the fact that children have not received the special attention they deserve in relation to their well-being and policy debates. Therefore, this thesis examined child well-being from a multidimensional perspective and elucidated some important policies aimed at reducing child deprivations and well-being inequalities. The thesis employed seven dimensions which are unique to children. These attributes are; nutrition, health, education, shelter, water, sanitation, and information.

The results showed that most children experienced deprivations in information, shelter, and water dimensions, suggesting that children in Kenya are vulnerable to infrastructural public services. In contrast, nutrition, health, and education dimensions registered low deprivations implying that children were better off in terms of the human capital dimensions. The proportion of children not suffering deprivation in any dimension increased over the period of the study, suggesting improvement in the well-being of children. In a similar vein, the percentage of children suffering deprivations in all the dimensions investigated was less than 1% for the survey years. Despite this, there was still a significant number of youngsters who were deprived in one and two dimensions.

The estimated multidimensional poverty indices for Kenyan children declined over the period covered by the study. This finding was attributed to the decline in multidimensional headcount ratios rather than average number of deprivations suffered as this remained constant. The results further revealed that the information and shelter dimensions were the highest and second highest contributors to multidimensional poverty respectively. Conversely, the lowest contributor to multidimensional poverty was the health dimension with the education dimension being the second lowest in that regard.

The results for multidimensional well-being inequalities show that inequality among the children were low and have declined during the course of the research. In relation to distributive indices of multidimensional inequality, the nutrition dimension contributed the highest to overall inequality while the health dimension contributed the lowest. The decomposition of inequality showed that an additional level of education of the mother and access to electricity in a household increased well-being inequality among the children. The consequence is that mothers with higher levels of education have a greater chance of securing employment with higher salaries and being able to provide for their families. On the other hand, electricity enables children to gain access to information through television and radio and in the process improve their levels of cognition.

The empirical findings revealed that features of the kid, the household, and the community were significant correlates of several forms of child deprivation. For instance, an additional level of mother's education exerted a higher negative value of marginal effects of a suffers deprivation on at least four fronts. Similarly, access to electricity in a household lowered the marginal effects of a child's deprivation in four or more dimensions. Other covariates with negative marginal effects

were being female child and respondent who was employed. Also, children's rural residence increased the marginal effects of a child who is suffering four or more deprivations. A similar scenario was observed in children living in North Eastern region compared to their peers in Nairobi region. Children whose mothers were widows were more likely to be deprived in four or more dimensions than their peers from couples.

The thesis contributes both to literature on measurement of child well-being and inform policy design, monitoring, and evaluation. To the author's knowledge, multidimensional child poverty and well-being inequality have not been comprehensively analysed in Kenya. Previous studies concentrated on income/expenditures and these are categorized as unidimensional approaches. A more confounding problem is that previous measures of poverty and inequality have failed to disaggregate the population by age. Yet, it has been acknowledged that children's needs are different from those of adults and, therefore, children should be viewed independently from adults and accorded special attention. As a result, this thesis makes a contribution to the existing body of research in the following areas: (a) it offers an approach to the measurement of multidimensional child poverty and inequality using seven child-specific indicators; and (b) it highlights the plight of Kenyan children and also prescribes policies for improvement of child well-being.

5.1.4 Policy Implications

The findings of this thesis offer important policy options for addressing multidimensional child poverty and inequality among Kenya children. Deprivations can be categorized into two groups as human capital and physical capital/infrastructure issues. Dimensions addressing human capital issues include nutrition, health, and education while those that touch on physical infrastructure issues include information, sanitation, water, and shelter. The findings of this thesis suggest that

interventions for improving child well-being should target physical capital issues, key among them being accessibility of information through media such as television and radio. The government should make these types of information equipment affordable and thus safeguard the right by all children to receive information. Furthermore, the government should continue to expand the provision of basic infrastructural services such as electricity in rural areas as it facilitates access of information through television and radio. There are many households who are off-grid and the government can encourage private sector to venture into solar or wind power to enable the households who are off-grid to get electricity.

Similar to information is the shelter dimension, where interventions should be targeted at making building materials affordable to many households. The government should consider subsidizing the cost of modern building materials to promote the construction of decent houses by more households. The government should also facilitate the promotion of research and development and dissemination of appropriate building materials and technologies both in informal settlements and rural areas. Better housing conditions will improve the well-being of children by protecting them from unfavourable weather conditions and curb infection.

On water and sanitation, the government should expand the provision of piped water to all parts of the country through initiatives such as promotion of water supply schemes in the rural areas, sinking boreholes, or erecting water kiosks/points where the local population can obtain clean and safe drinking water. There is also need to encourage rainwater harvesting techniques for all households and compelling every household to harvest and store rain water for their domestic use.

Open water sources can be exacerbated by lack of sanitation facilities leading to environmental challenges and the spread of waterborne diseases. More needs to be done in rural areas where majority of children get their water from open water sources to ensure households built proper pit latrines and sensitization of the importance of using these facilities. Legislation and enforceable regulations should be put in place to support the proper disposal of human waste so as to conserve environment and avoid water borne diseases. In informal settlements, the government should provide public toilet facilities complete with running water to curb the use of "flying toilets" and "buckets".

Both national and county governments should intervene by allocating adequate resources for general development of rural areas to ensure availability of adequate infrastructure and public services including roads, schools, electricity, hospitals, and water points. The two levels of government should prioritize expenditure to give equal opportunity to children from rural areas, recognizing the constitutional right of every person to freedom from hunger and access to adequate balanced diet.

The second category of deprivations fell under human capital problems; nutrition, health and education. The government has managed to reduce the number of children not immunized to less than 10%. There is further need to sensitize mothers on the importance of immunization of their children alongside efforts to scale up immunization coverage to 100% to ensure that all children under five years of age are immunized against the deadly diseases to reduce child mortality.

It is a matter of great concern that the nutritional dimension was the highest contributor to overall multidimensional inequality given the importance of this dimension in the formation of the brain

in children as well as boosting immunity against diseases (Kabubo-Mariara et al., 2010). The government should target households with vulnerable children and provide them with humanitarian assistance, such as conditional cash transfers to purchase fortified foodstuffs or supply nutritional supplements especially to households with children under the age of five years. Inadequacies in the nutritional dimension exacerbate other dimensions such as education because a hungry child cannot concentrate in school and hence perform poorly. This will lead to low productivity, unfavourable labour market opportunities, and low incomes making the effort to lift people out of poverty very difficult in the society. This situation is reinforced by a vicious cycle of poverty often leading to intergenerational poverty.

The results further show existence of a strong link between maternal education and child deprivations. Some past studies in Kenya (for example, Kabubo-Mariara et al., 2009) have supported the importance of girl child education because of the enormous benefits accrued to the society when a girl child is educated. It is believed that educating a girl child promotes the education of all children. Women nurture children and with education, mothers gain more knowledge on how best to bring up their children. They will ensure that children are fed on balanced diet, immunized, and attend school at the right age. Education also ensure that girls delay the age of bearing children where the literature has shown that the well-being of children from young mothers are prone to poor outcomes in all attributes of child well-being. We recommend that policy makers put in extra effort to ensure that the girl-child not only attends school but also retained until completion up to college or university. This goal can be achieved by addressing the socio-economic and cultural barriers that keep girls away from school.

There is evidence that children whose mothers are widowed are more vulnerable to multiple deprivations compared to children having both parents. Widows and their children in society should be given special attention. The government programmes for social security and income transfer policies targeting widows and orphans should be expanded to cover more of this group to cushion children from adverse effects of severe deprivations. Finally, children living in households not professing any form of religion are more vulnerable to poverty than those from households that profess some religion. This observation suggests that religion plays a role in addressing child well-being. Religion can motivate people to engage in economic activities and self-support programs especially in the rural areas.

5.1.5 Areas of Further Research

This thesis is not exhaustive in capturing the dimensions of child well-being. For instance, due to data limitations, we did not cover social factors or relationships (with family and friends) and emotional/spiritual well-being, which are equally important dimensions of child development. We recommend these aspects for future studies. In the literature, the indicators used in the measurement of emotional/spiritual well-being of the child include suicide rates and monitoring of church or mosque attendance (Land et al., 2001). The social domain can be measured using the rate of teenage pregnancies, early marriages, rate of cigarette smoking or alcohol consumption, and rate of use of illicit drugs. Data collected on these factors can be used to examine children's status alongside the underlying causes of the vices.

Finally, the debate that households with considerable purchasing power are able to fulfil their basic needs continues alongside arguments from research indicating that income alone does not provide a true picture of well-being. The need for further research is apparent for purposes of making

comparisons between monetary and non-monetary measures of poverty in the Kenyan context including the search for overlaps or the existence of disparities between metric and non-metric dimensions of well-being.

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APPENDICES

Appendix A: Dimensions of child deprivations

Table A1: MCA on indicators of child deprivation using KDHS 1993

Dimension	Principal Inertia	Percent	Cumulative percent
dim 1	0.03030770	67.08	67.08
dim 2	0.00379000	8.39	75.46
dim 3	0.00285980	6.33	81.79
dim 4	0.00013910	0.31	82.10
dim 5	0.00006960	0.15	82.25
dim 6	0.00003880	0.09	82.34
dim 7	0.00002680	0.06	82.40
dim 8	0.00001240	0.03	82.43
dim 9	0.00000764	0.02	82.44
dim 10	0.00000437	0.01	82.45
dim 11	0.00000053	0.00	82.46
dim 12	0.00000012	0.00	82.46
Total	**0.0451842**	**100.00**	

Source: Author's calculation using KDHS 1993

Table A2: MCA on indicators of child deprivation using KDHS 1998

Dimension	Principal inertia	Percent	Cumulative percent
dim 1	0.0288669000	64.44	64.44
dim 2	0.0047882000	10.69	75.13
dim 3	0.0016952000	3.78	78.92
dim 4	0.0006076000	1.36	80.28
dim 5	0.0000976000	0.22	80.49
dim 6	0.0000654000	0.15	80.64
dim 7	0.0000615000	0.14	80.78
dim 8	0.0000353000	0.08	80.85
dim 9	0.0000235000	0.05	80.91
dim 10	0.0000088100	0.02	80.93
dim 11	0.0000039600	0.01	80.94
dim 12	0.0000002440	0.00	80.94
dim 13	0.0000000011	0.00	80.94
Total	**4.4793200E-02**	**100.00**	

Source: Author's calculation using KDHS 1998

Table A3: MCA on indicators of child deprivation using KDHS 2003

Dimension	Principal inertia	Percent	Cumulative percent
dim 1	0.05839300	68.15	68.15
dim 2	0.01255740	14.66	82.81
dim 3	0.00154180	1.80	84.61
dim 4	0.00057290	0.67	85.27
dim 5	0.00022300	0.26	85.53
dim 6	0.00011120	0.13	85.66
dim 7	0.00006310	0.07	85.74
dim 8	0.00003750	0.04	85.78
dim 9	0.00001450	0.02	85.80
dim 10	0.00000069	0.00	85.80
dim 11	0.00000000	0.00	85.80
Total	**0.08568270**	**100.00**	

Source: Author's calculation using KDHS 2003

Table A4: MCA on indicators of child deprivation using KDHS 2008

Dimension	Principal inertia	percent	Cumulative percent
dim 1	0.045108500	69.03	69.03
dim 2	0.007972700	12.20	81.23
dim 3	0.001677500	2.57	83.79
dim 4	0.000219200	0.34	84.13
dim 5	0.000061000	0.09	84.22
dim 6	0.000055300	0.08	84.31
dim 7	0.000038900	0.06	84.37
dim 8	0.000026900	0.04	84.41
dim 9	0.000015500	0.02	84.43
dim 10	0.000004920	0.01	84.44
dim 11	0.000002120	0.00	84.44
dim 12	0.000000141	0.00	84.44
Total	**6.53492E-02**	**100.00**	

Source: Author's calculation using KDHS 2008

Table A5: MCA on indicators of child deprivation using KDHS 2014

Dimension	Principal inertia	percent	Cumulative percent
dim 1	0.039685700	72.78	72.78
dim 2	0.004199300	7.70	80.48
dim 3	0.001901600	3.49	83.97
dim 4	0.000208700	0.38	84.35
dim 5	0.000124300	0.23	84.58
dim 6	0.000022300	0.04	84.62
dim 7	0.000019700	0.04	84.66
dim 8	0.000008190	0.02	84.67
dim 9	0.000001450	0.00	84.68
dim 10	0.000000611	0.00	84.68
dim 11	0.000000349	0.00	84.68
dim 12	0.000000014	0.00	84.68
Total	**5.452660E-02**	**100.00**	

Source: Author's calculation using KDHS 2014

Appendix B: Multiple correspondence analysis results

Table B1: Results for MCA applied on child deprivations, KDHS 1993

Indicators	Mass	% inertia	Coordinates	Sq. corr	Contribution
Nutrition					
Not stunted	0.060	0.018	0.406	0.372	0.010
Stunted	0.031	0.035	-0.793	0.372	0.019
Not wasted	0.075	0.014	0.246	0.223	0.005
Wasted	0.016	0.063	-1.136	0.223	0.021
Not underweight	0.086	0.002	0.067	0.131	0.000
Underweight	0.005	0.032	-1.079	0.131	0.006
Health					
No vaccination	0.007	0.010	-0.853	0.382	0.005
1 dose	0.001	0.001	-0.366	0.156	0.000
2 doses	0.001	0.001	-0.825	0.290	0.001
3 doses	0.002	0.002	0.240	0.037	0.000
4 doses	0.002	0.002	-1.142	0.785	0.002
5 doses	0.004	0.002	-0.590	0.470	0.001
6 doses	0.005	0.002	-0.190	0.066	0.000
7 doses	0.012	0.002	-0.134	0.084	0.000
8 doses	0.057	0.005	0.236	0.464	0.003
Education					
No education	0.018	0.009	-0.700	0.689	0.009
Incomplete pry	0.065	0.001	0.074	0.260	0.000
Complete pry	0.006	0.003	0.776	0.732	0.004
Incomplete sec.	0.001	0.006	2.550	0.965	0.008
Water source					
Piped water	0.023	0.060	1.861	0.899	0.080
Well and b/hole	0.022	0.006	-0.424	0.443	0.004
Open surface	0.043	0.022	-0.830	0.908	0.030
Rain water	0.001	0.003	1.229	0.350	0.002
others	0.002	0.002	0.222	0.025	0.000
Sanitation					
Flush toilet	0.004	0.141	5.884	0.733	0.154
Pit latrine	0.070	0.008	0.019	0.002	0.000
No facility	0.016	0.050	-1.717	0.645	0.048
other	0.000	0.004	3.940	0.288	0.002
Shelter					
Poor roof	0.038	0.061	-1.340	0.736	0.067
Iron sheets	0.052	0.035	0.777	0.601	0.031
Modern roof	0.001	0.077	8.308	0.684	0.078
Others	0.000	0.003	2.133	0.315	0.001
Earth floor	0.072	0.031	-0.750	0.866	0.040
Smart floor	0.000	0.004	5.699	0.631	0.004
Cement floor	0.019	0.113	2.751	0.865	0.146
Information					
No radio	0.039	0.038	-1.099	0.840	0.048

Has radio	0.051	0.029	0.841	0.840	0.036
No television	0.087	0.005	-0.263	0.845	0.006
Has television	0.004	0.100	5.556	0.845	0.127

Source: Author's calculation using KDHS 1993

Table B2: Results for MCA applied on child deprivations, KDHS 1998

Indicators	Mass	% inertia	Coordinates	Sq. corr	Contribution
Nutrition					
Not stunted	0.059	0.019	0.448	0.396	0.012
Stunted	0.031	0.037	-0.848	0.396	0.023
Not wasted	0.075	0.013	0.272	0.286	0.006
Wasted	0.016	0.060	-1.308	0.286	0.027
Not underweight	0.084	0.002	0.067	0.112	0.000
Underweight	0.007	0.027	-0.844	0.112	0.005
Health					
No vaccination	0.006	0.004	-0.771	0.551	0.004
1 dose	0.003	0.004	0.254	0.029	0.000
2 doses	0.001	0.001	-0.901	0.355	0.001
3 doses	0.004	0.004	-0.092	0.005	0.000
4 doses	0.003	0.002	-0.618	0.326	0.001
5 doses	0.006	0.002	-0.420	0.288	0.001
6 doses	0.007	0.002	-0.447	0.447	0.001
7 doses	0.020	0.003	0.249	0.281	0.001
8 doses	0.041	0.004	0.202	0.299	0.002
Education					
No education	0.010	0.013	-0.988	0.475	0.010
Incomplete pry.	0.078	0.001	0.044	0.102	0.000
Complete pry.	0.002	0.006	2.055	0.873	0.009
Incomplete sec.	0.001	0.003	1.390	0.577	0.003
Water source					
Piped water	0.019	0.060	1.993	0.794	0.074
Well and b/hole	0.024	0.003	-0.157	0.139	0.001
Open surface	0.046	0.022	-0.791	0.864	0.029
Rain water	0.001	0.006	2.101	0.472	0.005
others	0.001	0.003	0.749	0.147	0.001
Sanitation					
Flush toilet	0.004	0.116	5.666	0.644	0.116
Pit latrine	0.071	0.009	0.170	0.141	0.002
No facility	0.017	0.057	-1.949	0.706	0.063
other	0.000	0.002	-2.665	0.218	0.001
Shelter					
Thatched roof	0.033	0.071	-1.613	0.785	0.087
Iron sheets	0.056	0.036	0.831	0.697	0.039
Tiles	0.001	0.055	7.781	0.502	0.043
Other roof	0.001	0.008	3.013	0.353	0.005
Earth floor	0.069	0.034	-0.801	0.833	0.044
Smart floor	0.000	0.026	7.244	0.532	0.021
Cement floor	0.021	0.101	2.473	0.830	0.130
Other floors	0.000	0.002	3.599	0.100	0.000
Information					
No radio	0.031	0.052	-1.446	0.809	0.066

Has radio	0.059	0.028	0.766	0.809	0.035
No television	0.083	0.009	-0.384	0.884	0.012
Has television	0.008	0.090	3.886	0.884	0.123

Source: Author's calculation using KDHS 1998

Table B3: Results for MCA applied on child deprivations, KDHS 2003

Nutrition	Mass	% inertia	Coordinates	Sq. Corr	Contribution
Not stunted	0.061	0.007	0.268	0.414	0.004
Stunted	0.029	0.015	-0.560	0.414	0.009
Not wasted	0.076	0.007	0.269	0.518	0.005
Wasted	0.015	0.037	-1.362	0.518	0.028
Not underweight	0.084	0.002	0.141	0.521	0.002
Underweight	0.007	0.028	-1.827	0.521	0.022
Health					
No vaccination	0.011	0.027	-1.654	0.723	0.029
1 dose	0.002	0.001	-0.677	0.612	0.001
2 doses	0.002	0.002	-0.996	0.747	0.002
3 doses	0.004	0.003	-0.553	0.325	0.001
4 doses	0.003	0.002	-0.920	0.820	0.002
5 doses	0.005	0.000	0.048	0.028	0.000
6 doses	0.006	0.001	0.279	0.265	0.000
7 doses	0.018	0.003	0.407	0.728	0.003
8 doses	0.039	0.007	0.429	0.682	0.007
Education					
No education	0.027	0.032	-1.128	0.728	0.034
Incomplete pry	0.060	0.010	0.370	0.556	0.008
Complete pry	0.002	0.006	1.946	0.911	0.008
Incomplete sec.	0.002	0.005	1.816	0.929	0.007
Water source					
Piped water	0.022	0.057	1.795	0.852	0.071
Well and b/hole	0.019	0.005	-0.466	0.599	0.004
Open surface	0.044	0.020	-0.681	0.708	0.020
Rain water	0.002	0.002	0.360	0.108	0.000
others	0.004	0.006	-0.362	0.062	0.001
Sanitation					
Flush toilet	0.006	0.110	4.036	0.601	0.097
Pit latrine	0.060	0.023	0.363	0.234	0.008
No facility	0.024	0.080	-1.879	0.732	0.086
other	0.000	0.002	0.245	0.010	0.000
Shelter					
Thatched roof	0.031	0.061	-1.535	0.810	0.072
Iron sheets	0.055	0.033	0.689	0.543	0.026
Tiles	0.003	0.088	4.648	0.536	0.069
Other roof	0.002	0.019	-2.192	0.412	0.012
Earth floor	0.068	0.029	-0.732	0.856	0.036
Smart floor	0.000	0.011	4.364	0.489	0.008
Cement floor	0.022	0.076	2.062	0.858	0.095
Other floors	0.000	0.012	5.128	0.433	0.008
Information					
No radio	0.028	0.052	-1.507	0.826	0.063
Has radio	0.063	0.022	0.655	0.826	0.027
No television	0.077	0.015	-0.491	0.855	0.019
Has television	0.014	0.082	2.729	0.855	0.103

Source: Author's calculation using KDHS 2003

Table B4: Results for MCA applied on child deprivations, KDHS 2008

Nutrition	Mass	% inertia	Coordinates	Sq. Corr	Contribution
Not stunted	0.060	0.011	0.334	0.405	0.007
Stunted	0.031	0.022	-0.648	0.405	0.013
Not wasted	0.074	0.010	0.277	0.408	0.006
Wasted	0.017	0.043	-1.244	0.408	0.026
Not underweight	0.083	0.002	0.131	0.460	0.001
Underweight	0.008	0.024	-1.438	0.460	0.016
Health					
No vaccination	0.006	0.010	-1.321	0.768	0.011
1 dose	0.002	0.000	0.183	0.105	0.000
2 doses	0.001	0.001	-0.508	0.286	0.000
3 doses	0.003	0.001	-0.214	0.102	0.000
4 doses	0.003	0.001	-0.438	0.322	0.001
5 doses	0.005	0.001	-0.175	0.143	0.000
6 doses	0.006	0.001	0.032	0.007	0.000
7 doses	0.017	0.002	0.214	0.292	0.001
8 doses	0.048	0.003	0.154	0.229	0.001
Education					
No education	0.024	0.024	-1.095	0.827	0.028
Incomplete pry	0.062	0.005	0.258	0.598	0.004
Complete pry	0.003	0.006	1.552	0.933	0.008
Incomplete sec.	0.002	0.008	2.168	0.911	0.011
Water source					
Piped water	0.021	0.052	1.710	0.807	0.061
Well and b/hole	0.040	0.007	-0.180	0.122	0.001
Open surface	0.027	0.025	-1.122	0.919	0.033
Rain water	0.002	0.003	0.973	0.374	0.002
Others	0.002	0.002	-0.058	0.002	0.000
Sanitation					
Flush toilet	0.005	0.112	4.243	0.593	0.096
Pit latrine	0.061	0.020	0.370	0.286	0.008
No facility	0.024	0.076	-1.858	0.762	0.084
Others	0.001	0.001	0.147	0.008	0.000
Shelter					
Thatched roof	0.031	0.077	-1.690	0.801	0.090
Iron sheets	0.057	0.033	0.723	0.617	0.030
Tiles	0.002	0.089	5.378	0.500	0.065
Other	0.000	0.001	-0.750	0.082	0.000
Earth floor	0.066	0.034	-0.805	0.869	0.043
Smart floor	0.000	0.023	7.019	0.370	0.012
Cement floor	0.024	0.088	2.143	0.868	0.111
Others	0.000	0.001	0.197	0.003	0.000
Information					
No radio	0.029	0.048	-1.412	0.839	0.058
Owns radio	0.062	0.022	0.663	0.839	0.027
No television	0.073	0.022	-0.635	0.907	0.029
Owns television	0.018	0.088	2.518	0.907	0.116

Source: Author's calculation using KDHS 2008

Table B5: Results for MCA applied on child deprivations, KDHS 2014

Indicators	Mass	%inertia	Coordinates	Sq. Corr	contribution
Nutrition					
Not stunted	0.067	0.012	0.348	0.474	0.008
Stunted	0.024	0.034	-0.966	0.474	0.022
Not wasted	0.078	0.010	0.286	0.466	0.006
Wasted	0.013	0.062	-1.782	0.466	0.040
Not underweight	0.086	0.002	0.116	0.488	0.001
Underweight	0.005	0.029	-1.944	0.488	0.019
Health					
No vaccination	0.004	0.011	-1.866	0.817	0.012
1 dose	0.001	0.001	-0.245	0.111	0.000
2 doses	0.001	0.002	-1.314	0.589	0.001
3 doses	0.002	0.001	-0.609	0.571	0.001
4 doses	0.001	0.001	-0.352	0.174	0.000
5 doses	0.004	0.001	-0.557	0.790	0.001
6 doses	0.005	0.001	-0.337	0.441	0.001
7 doses	0.020	0.001	0.121	0.347	0.000
8 doses	0.052	0.003	0.220	0.544	0.003
Education					
No education	0.022	0.030	-1.258	0.871	0.035
Incomplete pry	0.063	0.005	0.281	0.686	0.005
Complete pry	0.001	0.002	1.325	0.957	0.002
Incomplete sec.	0.005	0.012	1.910	0.983	0.017
Water source					
Piped water	0.024	0.035	1.251	0.785	0.038
Well and b/hole	0.039	0.008	-0.223	0.176	0.002
Open surface	0.023	0.025	-1.182	0.934	0.032
Rain water	0.002	0.006	1.654	0.738	0.006
others	0.003	0.006	0.721	0.173	0.002
Sanitation					
Flush toilet	0.005	0.074	3.570	0.575	0.058
Pit latrine	0.062	0.023	0.526	0.540	0.017
No facility	0.023	0.097	-2.178	0.806	0.108
other	0.002	0.003	0.283	0.027	0.000
Shelter					
Thatched roof	0.024	0.082	-1.990	0.831	0.094
Iron sheets	0.065	0.033	0.742	0.776	0.036
Tiles	0.001	0.029	4.653	0.474	0.019
Other roof	0.002	0.016	-2.982	0.675	0.015
Earth floor	0.065	0.039	-0.834	0.837	0.045
Smart floor	0.000	0.006	3.261	0.374	0.003
Cement floor	0.025	0.098	2.111	0.840	0.113
Other floors	0.000	0.000	0.372	0.014	0.000
Information					
No radio	0.039	0.041	-1.147	0.900	0.051
Has radio	0.052	0.031	0.855	0.900	0.038
No television	0.072	0.026	-0.654	0.846	0.031
Has television	0.019	0.100	2.483	0.846	0.117

Source: Author's calculation using KDHS 2014

Appendix C: Decomposition of multidimensional inequality indices

Table C1: Decomposition of MDI indices by ethnic group

Ethnic group	Estimate
Embu	0.34
Kalenjin	0.34
Kamba	0.33
Kikuyu	0.32
Kisii	0.34
Luhya	0.34
Luo	0.34
Maasai	0.37
Meru	0.32
Mijikenda/Swahili	0.35
Somali	0.42
Taita/Taveta	0.30
Turkana	0.34
Samburu	0.38
Pokomo	0.35
Iteso	0.28
Boran	0.34
Gabbra	0.34
Kuria	0.27
Orma	0.30
Mbere	0.40
Rendille	0.32
Other	0.40
Population	0.35

Relative contribution in %

	Nutrition	Health	Education	Shelter	Water	Sanitation	Information
Mijikenda/ Swahili	19.22	9.93	15.92	14.06	11.57	15.31	13.99
Somali	16.29	16.44	12.61	18.36	12.01	10.97	13.33
Taita/ Taveta	16.51	7.92	14.15	17.55	7.62	13.87	22.38
Turkana	27.35	15.1	15.96	10.68	10.89	11.67	8.35
Samburu	20.79	19.59	15.6	8.34	11.07	14.17	10.45
Pokomo	17.57	9.54	16.82	9.15	17.88	15.4	13.64
Iteso	13.11	7.29	17.41	14.39	23.43	9.42	14.96
Boran	17.63	6.31	14.1	15.72	10.14	14.34	21.77
Gabbra	26.78	3.11	16.69	11.86	15.03	15.95	10.58
Kuria	12.06	9.31	17.66	9.92	24.24	13.03	13.78
Embu	21.00	12.41	11.95	13.89	13.53	14.57	12.66
Orma	24.44	5.6	22.67	5.42	21.69	12.00	8.19

Mbere	20.78	16.55	16.61	4.63	19.81	18.31	3.31
Rendille	29.07	4.9	18.05	11.75	14.27	13.27	8.69
Other	17.43	12.17	12.65	19.05	11.12	12.64	14.95
Kalenjin	20.92	10.31	13.85	13.24	16.23	12.38	13.06
Kamba	18.9	8.85	13.54	14.98	15.9	12.02	15.82
Kikuya	15.97	9.86	14.79	16.3	10.93	12.03	20.14
Kisii	15.57	13.1	13.49	16.71	16.06	10.12	14.95
Luhya	14.14	13.34	13.41	14.93	16.33	11.38	16.46
Luo	13.54	13.11	13.84	14.91	13.95	14.35	16.3
Maasai	20.39	14.43	14.59	12.4	11.67	14.46	12.07
Meru	20.25	8.29	14.05	15.24	12.48	12.38	17.31
Population	17.09	11.53	13.56	15.22	14.4	12.97	15.23

Source: Author's calculation using KDHS 1993-2014