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FAMILY STRUCTURE, EARLY MOTHERHOOD, CHILD OUTCOMES AND WELL-BEING: EVIDENCE FROM SOUTH AFRICA

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A thesis submitted to the School of Economics & Finance, Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the Degree of Doctor of Philosophy in Economics.

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Finally, to all my friends, I thank you all for your diverse supports during my studies.

Dedication

To my wife, Hilda Afenya Anakpo and my son, Skeuos Divine Anakpo

Declaration

I, Godfred Anakpo, declare that this is my own original work, except where acknowledged in the text. It has not been submitted previously either in part or in whole to this or any other university, for any other degree or examination.

Abstract

Family structure, early motherhood and child outcomes are cardinal social factors with potential effects on overall well-being, later life outcomes and inter-generational development. However, the existing literature has failed to fully explore these areas. This study therefore uses National Income Dynamic survey data on households, adults and children collected in 2 years interval from 2008-2014 in South Africa to investigate three main research questions: (1) How does family structure affect household well-being? (2) What are the effects of early motherhood on the later life outcomes of the mothers? And (3) How does early motherhood affect child outcomes? These three research questions set forth the direction of this study in three stages, each seeking to address the research question raised.

Family structure may be related to household's well-being; therefore, the first paper uses OLS regression, fixed effect and dynamic panel analysis techniques (System GMM) to examine the impact of family structure on household well-being in South Africa. Findings emanating from this study show that intact married households have significant positive relationship with household reported well-being, while the relationship of cohabiting with household reported well-being and subjective well-being is positively significant. Furthermore, extended households, households headed by females and grandparents, have significant negative relationship with household income and consumption, Lastly, while grandparent headed household has positve relationship with household reported well-being, bigger household size significantly decrease household reported well-being.

The pathway to motherhood and its later life outcomes have received considerable attention in both research and political agenda due to its fundamental and pivotal link to life-course and inter-generational development of mothers and their progenies. This paper uses National Income Dynamic survey data on mothers collected in 2 years interval from 2008-2014 in South Africa to examine the impacts of teen motherhood on mothers' later life outcomes using propensity score with different matching algorithms. The study reveals from most matching techniques that teen motherhood has significant negative effects on women's educational attainment, economic well-being, psychological well-being and life satisfaction. Additionally, the outcome on health is adverse only in underweight category while high perceived health and less obesity are associated with teen motherhood.

The previous paper on early motherhood documented that very few studies exist on the implications of early motherhood but focused mainly on the effects on mothers. The existing works on the impacts of early motherhood on children are either limited to childbirth weight or are descriptive in nature

with very limited findings on other areas of child outcomes. Therefore, the third paper examines the effects of early motherhood on child outcomes, especially on child's education, economic well-being, education, perceived health and birth weight using propensity weighted logistic regression. Findings from this study thus reveal that teen motherhood significantly increases child grade repetition and economic dependency. The effect on economic dependency however, became insignificant after controlling background precursors such as household income and parental marital status, family types and head composition of the household to which the child belongs. Furthermore, teen motherhood association with child health perceived health is significantly positive but insignificant for birth weight.

The findings from this study have policy implications and directions. The implications for policy of family structure stresses the importance of gender tailored policy (for instance for female headed household), built appropriate and adequate systems of support for healthy development and economic empowerment policy especially for disadvantaged families and households. Furthermore, proactive, reactive and post-active policy interventions, which require the complementary role of policymakers, government, parents, service providers and adolescents are recommended for mothers' later life and child outcomes of early motherhood. This policy needs to ensure that services and rights related to sex education and reproductive health are addressed in schools. Policy on family involvement strategies, childcare and regular health programmes such as job training to young and teenage mothers and returning to schoo after delivery are recommended. Additional training, capacity building and job counseling to young mothers are also highlighted.

Key words: Family structure, Household well-being, Early motherhood, Later life outcome, Child outcomes, South Africa

Table of Contents

Acknowledgement ……. ….i

Dedication……ii

Declaration……...iii

Abstract……iv

CHAPTER ONE……..11

Introduction……..11

1.1 Background……..…….11

1.2 Objectives…….....14

1.3 Data..... 15

1.4 Research Significance…….…..16

1.5 Structure of the Thesis..... 17

CHAPTER TWO..... 18

2.1 Introduction 18

2.2 Literature Review 21

2.3 Methodology 29

2.4 Results and Discussion..... 49

2.5 Conclusions and Recommendations 73

2.6 Appendices..... 74

CHAPTER THREE 77

3.1 Introduction 77

3.2 Literature Review 79

3.3 Methodology…..... 92

3.4 Results and Discussion..... ….106

3.5 Conclusions and Recommendation..... 118

3.6 Appendices..... 120

CHAPTER FOUR .....……..123

4.1 Introduction 123
4.2 Literature Review 127
4.3 Methodology 134
4.4 Results and Discussion……147
4.5 Conclusions and Recommendations 161
4.6 Appendices 162
CHAPTER FIVE……164
Summary, Conclusions and Suggestions for Further Research..……...164
5.1 Introduction.……164
5.2 Summary and Conclusions……..164
5.3 Suggestions for Further Research……167
References…….……168

List of Tables

Table 2.1A Summary Statistics: Cross-sectional Data for Wave One……..…..33
Table 2.1B Summary Statistics: Panel Data for Wave One to Four…….……...35
Table 2.1C Household Well-being by Family Structure……..… ...39
Table 2.1D Family Structure Transition Across and Between All Waves ……...41
Table 2.2 OLS Results: Effects of Family Structure on Household Reported Well-being……....52
Table 2.3 Fixed Effect Results: Effects of Family Structure on Household Subjective Well-being..……...…….……57
Table 2.4 Pre-corrected Results: Effects of Family Structure on Household income……..... 59
Table 2.5 Results of Dynamic Panel with System GMM. Effects of Family Structure on Household Income ……63
Table 2.6 Pre-corrected Results. Effects of Family Structure on Household Consumption Expenditure ……..66
Table 2.7 Results of System GMM. Effects of Family Structure on Household Consumption Expenditure ……...……....70
Table 2.8 Multicollinearity Test: Household Reported Well-being ……....74

Table 2.9 Variable Definition ……..……..75

Table 3.1 Teenage birth rate by race and province, Census 2001, 2011 and 2016……..…..….82

Table 3.2A Summary Statistics for all the waves: ……...…95

Table 3.2B Summary Statistics Across each waves: …….…..96

Table 3.3 Results from Probit Model: Covariates on Teen Motherhood (pre-birth charateristics while at teenage)……...107

Table 3.4 Results of balancing and overlap assumption (pre-birth charateristics while at teenage…….……..….109

Table 3.5 Results from Propensity Score Matching Models: Effects of Teen Motherhood on Women's Later life Outcomes (Education, Income, Life Satisfaction and Psychology)……...113

Table 3.6 Results from Propensity Score Matching Models: Effects of Teen Motherhood on Women's Later life Outcomes (Health related outcomes)…….……..115

Table 3.7 Results of Sensitivity Analysis……..……....117

Table 3.8 Variable Definition…..…….....120

Table 4.1A Summary Statistics for all waves……..138

Table 4.1B Summary Statistics Across waves…….140

Table 4.2 Estimation of Propensity Score with Probit Model…….....148

Table 4.3 Evaluation of balancing property and overlap assumption ……..….150

Table 4.4 Results of Propensity Reweighted Logistic Regression Model: Effects of Early Motherhood on Child Education and Economic Well-being……..156

Table 4.5 Results of Propensity Reweighted Logistic Regression Model: Effects of Early Motherhood on Child Health……..…….….159

Table 4.6 Variable Definition……..…….……...…..170

List of Figures

Figure 3.1: Distribution of the estimated Propensity Scores – common support between teen and non-teen mothers……..…….....…110

Figure 3.2 Propensity Score Matching Analysis Procedure……..……..……..…..122

Figure 4.1: Distribution of the estimated Propensity Scores – common support between teen and non-teen mothers…….……151

CHAPTER ONE

Introduction

1.1 Background

Family structure, early motherhood and child outcomes are three potential determining engines for later life development and overall well-being (McLanahan, 2000; Hobcraft, and Kiernan, 2001; Adam and Corey, 2007; Hofferth, and Reid, 2001). However, the existing literature has failed to fully explore these areas. Fundamentally, from the very birth, individuals are born into family structure environment, which becomes intrinsic building block and nurturing medium for well-being. Family structure is noted as an important change in domestic organization of many developing countries with significant consequences. South Africa, in particular, has a unique share of these changes, which have been aggravated by a dramatic effects from the era of apartheid, coupled with high level of fertility decline, migration and unemployment, HIV and AIDS among other factors (Amoateng and Heato, 2018; Amoateng and Richter, 2003). They documented that the disruption of family life and functioning is a prominent legacy left by South Africa's colonial and apartheid history through deliberate plans, laws and urban and housing policy. This has significant enduring effects on family structure formation, family functioning, and domestic organization among others. Makiwane, Gumede, Makoae, and Vawda, (2017) documented historical review of South African families and underscored significant changes leading to diverse family structure formation with possible welfare implications.

There have been several empirical studies on the implications of family structure and consequently, some studies exist linking family structure and poverty level. Martin, Tina and Stephen (2014) reveal that divorced parents (families) have a greater risk of being in poverty compared to intact married families and that the possibility of married families prospering economically is greater than the cohabiting and single parents and households in UK. Other studies with similar findings include Whiteford and Adema (2007), Stafford and Roberts (2009) among others. Furthermore, in UK, literature focusing on family structure and poverty exists. According to DWP (2013) in UK, family structure has persistent significant relationship with income poverty and this relationship was reinforced by Households Below Average Income (HBAI) statistics. This report labeled lone parent families as most venerable and are at high risk of income poverty in Britain. Other studies exist on the spillover effect of poverty across one

generation to the other (Shildrick, 2013; Hirsch, 2008; MacDonald, and Garthwaite, 2012). In South Africa, Amoateng, and Marilyn (2015) documented that broken marriage households are in a higher risk of economic poverty than the intact married household. Other studies done in related area in South African context include Ebrahim, Woolard, and Leibbrandt (2013), Ntombifuthi (2009), Neves and Toit (2008), Amoateng, Heaton, and Kalule-Sabiti, (2007), Prokofieva, and Terskikh (1998) among others.

The foregoing studies however two major research deficiencies; Firstly, the welfare measures in the existing studies are mainly monetary in nature, focusing on income as a sole proxy for well-being with nearly no attention to subjective[1] well-being measures enshrined in the theory (Adam and Corey, 2007; World Bank, 2003; Grosh, and Baker, 1995). Secondly, nearly no studies have considered family type component of family structure, and the existing studies could not bring to light the family structure with more effects by bringing all the components into a single analysis

The issue of early motherhood and its implications have received some attention in recent years, primarily due to its pivotal link to mothers 'later life and child outcomes. In most societies, motherhood is a cardinal developmental stage in women's lives that defines their traditional gender roles and social inclination in the societal cultural system. (Ngum, Pranee, and Celia, 2015; Hobcraft and Kiernan, 2001; Ermisch, 2004). This critical stage of development is not only a key experience of women in the global planet but more importantly in Africa where motherhood is viewed as nucleonic precursor for family continuity with social life orientated toward childbearing. This, coupled with social recognition and privileges, creates a positive orientation toward motherhood (Bledsoe and Cohen, 1993). Over the last decade however, the prevalence iand trend of early motherhood have taken different dimensions in the global environment.

The prevalence of teenage motherhood has been well established to be astronomically high in countries such as USA and UK among other countries in the developed world (Renata and Maria, 2016; Goodmany, Kaplan, and Walker, 2004; Vinnerjung, Franzen, and Danielsson, 2007). In Africa, Niger is at the top of the list of the highest teenage pregnancy rates and child marriages in the world: about 75% of girls are married and 51% were born before they turn 18 (Stuart, 2013). This prevalence rate is very similar to that of Mozambique, Mali, Nigeria, Liberia and other

[1] Subjective well-being measures are usually non-monetary in nature which comprise of item(s) reflecting perceptions, feelings, and judgements and are subjective to units, entity, and individuals under observation. The following literature can be consulted for further reading Adam S., Corey L. M. 2007; World Bank, 2003

African countries. This trend is not an exception in South Africa, which in recent years has reached an alarming proportion of teenage pregnancies (Samantha, 2013; Sibeko, 2012; Karra and Lee, 2012; Makiwane et al., 2006). Statistics of South Africa (2011) reported that 40.8% of all mothers in South Africa had their first child while in teenage and this early timing of motherhood has been a recurrent experience over many decades. The high incidence of teen motherhood has raised a research concern for possible implications.

Very few studies exist on the implications of timing of motherhood on later socio-economic status of mothers and their life-course development with different methodologies. For instance, in the United States, Great Britain and other developed countries, some studies have confirmed that early motherhood has great potential to influence the outcomes of women's lives in the education and labor participation sectors (Goodmany, Kaplan and Walker, 2004; Hobcraft and Kiernan, 2001). Similar studies were also conducted in Australia and Asian (Watts, Liamputtong, and Mcmichael, 2015). Other studies reveal that early motherhood could affect mother's parenting behavior and attitude. In South Africa, only a few descriptive studies like Dlamini (2016) and Thandiwe (2011) have been done on causes and educational impact of early motherhood in some segments of the country. The available literature has established the high prevalence of teenage pregnancy, but to what degree does it affect the later life outcomes of teen mothers? This question remains to be studied in South African context. Almost all studies focus on educational impacts and some others on the economic effect of early motherhood. Other later life outcomes, such as life satisfaction, have not been investigated in any of the studies. The psychological and health effects (perceived health status and body weight) of early motherhood have also not been extensively investigated in the existing literature.

Furthermore, while early motherhood literature documented that very few studies exist on the implications of this subject, there is a scanty of work on the impacts of early motherhood on child outcomes. Hofferth and Reid (2003) and Bruce (2011) used multivariate analyses in the USA and Australia respectively to investigate early child bearing and its consequences for children's achievement and behavior. They found evidence that teen child bearing has a significant negative consequence for these outcomes. Kristin, Sharon and Fenaba (2016) also documented that the significant negative association of early child bearing with the relatively lower academic performance and problem with behavior of child is largely due to the family background

characteristics of the teenage mothers rather than her age. They however, did not take into consideration other outcomes of children such as economic well-being and health effects. In South Africa, there are limited studies that analyze the possible implications of adolescent motherhood on child outcomes.

It is evident from the empirical literature that many studies exist linking family structure and poverty (economic well-being); however, there are two essential gaps in the literature with respect to family structure impact on household well-being. Firstly, the existing studies have failed to investigate the subjective well-being effect of family structure. Furthermore, while very limited studies exist on the family type component of family structure, the literature has also failed to bring all the family structure components into a single analysis to determine the family structure with the greatest effect. Secondly, the extant literature has established the high incidence of teenage pregnancy, but to what degree does it affect the later life outcome of teen mothers? This question remains to be investigated in South African context. Nearly all the available work done focus on educational impacts with a few others on economic effects of early motherhood. Other life outcomes including life satisfaction have not been well investigated in any of the studies. The psychological and health effects (perceived health status, under weight, over weight and obesity) of early motherhood have also not been well investigated. Lastly, by comparison, there is a limited study on the intergenerational consequences of teenage motherhood in the areas of the economic well-being, education children's health outcomes, especially in South Africa. Based on the foregoing research gaps, this study is designed to investigate the following research problems in South African context:

a. How does family structure affect household well-being?
b. What are the effects of early motherhood on mothers' later life outcomes?
c. How does early motherhood affect children's outcomes?

1.2 Objective of the study

This study aims at investigating the statistical relationship between family structure and household well-being, and to further examine how early motherhood affects women's later life and child outcomes in the context of South Africa. Specifically, the study seeks the following:

1. To examine the impacts of family structure on household well-being.

2. To investigate the effects of early motherhood on mothers' later life outcomes.
3. To assess the impacts of early motherhood on child outcomes.

The historical experience of apartheid in South Africa has particularly shaped family living arrangement and structure into different forms as enshrined in the theory. This, coupled with changes in household living condition, makes South Africa, a good choice for the study area. In the same vein, the high record of teen pregnancy in South African raises a major concern on the potential implications on both the mothers and their children.

1.3 Data

The study is based on data from National Income Dynamics Survey (NIDS), which began from 2008 to 2014 in approximately 2 years intervals. The NIDS is conducted by the South African Research and Labor Research Unit (SALDRU), a peripheral of School of Economics, University of Cape Town, South Africa. The first wave, which occurred in 2008 is a sample that is nationally representative with about 28,000 people in about 7,300 families throughout the country. The same members were observed every two years in the survey in 2010, 2012 and 2014. NIDS survey covers data on household, adults and children. Consequently, NIDS disintegrates the entire data set into household, adult and child data, which is in a full alignment with this study, which seeks to investigate household well-being, mothers' life and child outcomes.

With regard to household data, relevant information on household reported well-being measured in five items (food consumption, housing needs, clothing, health and child education), household subjective well-being, income and expenditure was extracted. Data on household and demographic characteristics of members, family and household structure among others were also observed. The design of the NIDS survey was carried out through primary sampling units (PSU) and care was exercised to ensure national representativeness by estimating the probability of a participants being interviewed based on geographical location. Consequently, NIDS data set has panel weights to account for possibility of non-systematic response such as friction that could result in some population cohorts with incorrect characteristics. This was applied accordingly.

Concerning early motherhood, 14072 mothers who have given birth at least once form the sample with information on their childhood poverty and background precursors. The data also contain

information on life outcomes such as, education, economic well-being, psychological outcomes, life satisfaction and health related information. Furthermore, child variables in the data set include educational attainment, economic status, health, weight, and other anthropometric measures and demographical characteristics. Lastly, essential information on family structure environment including family types, household head composition, marital status, biological relation, family size, and background factors are also contained in the data set. The detailed description of data was provided under each section of the research.

1.4 Research significance

There are three-fold significances that makes this study very important; contribution to the field of study (research contribution), solving trending issues with policy relevance and ingredients for civil society organizations. Firstly, related to contribution in the research area, the goal throughout this study is to refine a set of critical questions on family structure and household well-being, early motherhood and women's later life and child outcomes to shape an agenda for the field and contribute significantly to the literature. For instance, it is very apparent that from the extensive empirical literature reviews (internationally and locally in South Africa), there is barely no studies linking all family structure (in a single analysis) with each of the household well-being measures and that nearly no studies attempted to look into subjective well-being of household. Additionally, research on the effects of early motherhood on women later life comes (such as life satisfaction, psychological well-being and health) and child outcomes is very scanty. Thus, the study will enrich literature on the field.

Secondly, based upon the findings emanating from this study, policy direction emerges in terms of when, how, and whom this intervention can be targeted. This includes policy on household well-being enhancement, economic empowerment and key strategic areas of intervention for disadvantaged families and household. The findings also show when the intervention can be triggered to achieve the desired results. For instance, the significant association of childhood poverty with teen motherhood in this study indicates that policy targeted at eradicating teen motherhood can be directed to child welfare enhancement. The study is also relevant for policy direction after the occurrence of early motherhood, and this helps to minimize the post-motherhood affects.

Finally, the findings from this study would also help other social empowerment actors and non-governmental organizations to tailor social protection framework geared at assisting disadvantaged households and those trapped in early motherhood and its consequences.

1.5 Structure of the Thesis

The rest of this thesis is structured based on the research questions and objectives mentioned previously consummating with the summary, conclusion, and recommendations on all the findings. Thus, chapter 2 analysis the impacts of family structure on household well-being. Chapter 3 is on teenage motherhood and women's later life outcomes, while chapter 4 is on the impacts of teenage motherhood on the outcomes of children. Each chapter encompasses items such as background information, literature review, methodology, results and discussions culminating in conclusions with recommendations. Then lastly, chapter 5 is on the summary, conclusion, and recommendations on all the findings with suggestions for further research.

CHAPTER TWO

Family Structure and Household Well-being: Evidence from South Africa

2.1 Introduction

Social organization has witnessed continuous changes in many parts of the world, most especially in Africa, due to the experience of colonialism in the 19th century. Some of these changes include family structure, which has witnessed series of metamorphosis in many African households. South Africa, in particular, has a unique share of these changes, which have been aggravated by dramatic effects from the era of apartheid, coupled with high level of fertility decline, high level of migration and unemployment, HIV and AIDS among other factors (Amoateng and Richter, 2003; Amoateng, 1997). They documented that the disruption of family life and functioning is a prominent legacies left by South Africa's colonial and apartheid history through deliberate plans, laws and urban and housing policy. This has significant enduring effects on family structure formation, family functioning, and domestic organization among others. Makiwane, Gumede, Makoae, and Vawda, (2017) documented historical review of South African families and underscored significant changes leading to diverse family structure formation with possible welfare implications.

Family structure formation evolves from the scope of family definition. Bruce and Yearly (2006) defined family in its simplified form as an intimate and close domestic group of people who share blood relation, and are in legal ties and other forms of social relations, in which the older, normally the adults, bears responsibility of looking after and raising children. Additionally, US Census defined family as involving couples with or without marriage and children but once the parties involved bear the same address; they are in the same family. Nam (2005) also defined family structure as a micro-social unit, which may involve ordered social structure, hierarchy or organization within a household and spells the position, responsibility and relationship of every member bearing similar residential address as one family unit.

Within the range of these family definitions and other theories, families have been categorized into four main components and household practices called family structure (Neves and Toit, 2008; Gelderblom and Kok, 1994). The first category of family structure is marital composition. This includes intact married households, divorced households, single parent households,

cohabiting households, widow and step households (Martin, Tina, and Stephen, 2014; Adam and Isabel, 2005; Cancian and Reed, 2008). The second category is based on household head composition, and this includes male-headed household, female-headed, grandparent-headed and sometimes child-headed household (Buvinić and Geeta, 1997; Ebrahim, Leibbrandt, and Woolard, 2015; Ebrahim, Woolard, and Leibbrandt, 2013). The third category of family structure is family types such as nuclear and extended family (Dibia, 2014; Kamo, 2000; Amoateng, 2007; Ziehl, 2012). The fourth is family structure based on household size (Meenakshi and Ray, 1999). The compartmentalization of family structure and its increasing development to the modern day era as indicated above has stimulated interest in researchers on its possible welfare implications especially on the households.

There have been several empirical studies on the implications of family structure and consequently, some studies exist linking family structure and poverty level. Martin, Tina and Stephen (2014) reveal that divorced parents (families) have a greater risk of being in poverty compared to intact married families and that the possibility of married families prospering economically is greater than the single parent households in UK. Other studies with similar findings include Whiteford and Adema (2007), Stafford and Roberts (2009). Furthermore, in UK, literature focusing on family structure and poverty exists. According to DWP (2013) in UK, family structure has persistent significant relationship with income poverty and this relationship was reinforced by Households Below Average Income (HBAI) statistics. This report labeled lone parent families as most venerable and are at high risk of income poverty in Britain. Other studies exist on the spillover effect of poverty across one generation to the other (Shildrick, 2013; Hirsch, 2008; MacDonald and Garthwaite, 2012). All the studies indicated above however, have two major research gaps; firstly, the household welfare measures used in the foregoing studies are mainly monetary, income poverty, without subjective well-being measures. Secondly, though some of the family structure components have been captured, no study attempted to bring all in a single estimation to examine which one has more effect on the household well-being.

In South Africa, there is a significant shortage of work done linking family structure to household well-being. Very few studies however, exist on family structure, which documented that broken marriage households are in a greater risk of being in economic difficulty than the intact

households (Amoateng, and Marilyn, 2015; Ebrahim, Woolard and Leibbrandt, 2013; Ntombifuthi, 2009; Neves and Toit, 2008; Amoateng, Heaton and Kalule-Sabiti, 2007; Prokofieva and Terskikh, 1998). Secondly Ebrahim, Woolard, and Leibbrandt (2013) reported that households headed by females are in greater risk of experiencing poverty than those headed by males. It is very apparent that all the foregoing studies failed to consider subjective aspects of household well-being and other family structure such as family type is less explored. Klasen, Tobias and Povel (2011) used cross-sectional OLS regression to investigate the impacts of family structure on the welfare of its members and found that households headed by female-heads are weaker economically than the male-headed households. His study however, lacks full scope of family structure and well-being measures and did not engage rigorous econometric analysis.

It is apparent from the empirical studies that a very limited studies exist focusing on the impacts of family structure on family poverty (economic well-being); however, there are two essential gaps in the literature as far as the implications of family structure on household well-being is concerned. Firstly, the subjective aspect of household well-being well has not been investigated in the existing study. Secondly, although there are studies on the association of family structure with household welfare, the existing studies could not bring to light the various components of wellbeing into a single analysis. This study is therefore very important to empirically see how family structure in its entirety in a given data set affects household well-being in both monetary and subjective well-being terms.

The purpose of this section is therefore to investigate how family structure affect household well-being in South Africa. In this study, various components of family structure as revealed in the literature (such as marital components, head composition, family type and size) are brought together in one study on a common data set for each household well-being outcome. The marital status mainly looks at the intact married, cohabiting, divorce/separate, and widow/widower and never-married households. With regard to household head composition, male-headed, female-headed and grandparent-headed are conceptualized. While the family type in this study considers the component of nuclear (parents with biological or adopted children) and extended households, the household size is denoted as number of members in a household. Lastly, this study adopts four

measures for measuring household well-being, which are household reported well-being, subjective well-being, and monetary[2] measures (income and expenditure).

2.2 Literature Review

This section provides relevant reviews of related literature, detailing the theoretical foundation, critiques of empirical documentations with econometric approaches, culminating in line of research gaps. The conceptual and empirical models in the current study draw on past and present research and theory highlighting family structure and mechanisms to household well-being.

2.2.1 Theoretical Framework

Structural-functional theory of family gives the first theoretical basis for the analysis in this study. Structure refers to the members of the family (parents, child, and kin), and function refers to how families satisfy physical, economic and psychological needs for survival and maintenance. Thus, structural-functional theory is a perspective in sociology that sees family as a system whose parts work together to promote well-being of its members. The theory underscores that the closeness of members in relation to others provides network of support system and that the productiveness of head of a unit (normally ascribed to men in most settings) maximizes the overall well-being of such family especially in the small family ties. Concerning this theory, Murdock (1949) posits that when a family is dysfunctional due to divorce or death it skews role structure in a household, cripple complementarity, which poses high risk to economic fortune of the members especially if the departing member is the main economic figure and this may affect the well-being of that household. The theory further points that while a poorer individual may benefit from other members beyond the nuclear ties or larger family, the overall well-being implication for household may be downward sloping than it was previously. In this context Stack (1974) and Ermisch and Di Salvo (1997) pointed that living arrangements in households may also respond to economic condition, that is fertility decisions, household management and marital decision may be affected by economic circumstances of the parties. Social stress theory on the other hand provides a useful theoretical framework to explain well-being disparities (Dressler, Oths, and Gravlee, 2005). Aneshensel, Rutter, and Lachenbruch (1991) described this framework as a

[2] The monetary measures included in this studies focus on household income and consumption (Montgomery et al. 2000; Falkingham and Namazie, 2002)

sociological paradigm that views social conditions as a cause of economic stress for members of disadvantaged social groups especially bigger group due to resource competition. Pearlin (1989) observed that the various family structural arrangements in which individuals are embedded determine the network of support system available, the outcome they encounter and their coping resources. These theories posit that family structure is life events that affect the functioning of family in the areas of economic resources and household well-being (Holmes and Rahe, 1967; Harry, 1971; George, 1993).

Bumpass, Martin and Sweet (1991) underscored family background precursors other than family structure that have significant impacts on the well-being of both individuals and the households at large. These include household income (Eggebeen, Lichter, 1991; Hanson, McLanahan, and Thomson, 1997), race (Eggebeen, Lichter, 1991). Irwin, Siddiqi, and Hertzman (2007) revealed that the geographical location is a key determinant of well-being as the availability of facilities and infrastructure create enabling environment and favorable opportunity that push one's economic fortune and overall well-being. Other factors that affect household well-being include religion (New, and Graham, 2018), infrastructure such as good source of water and toilet facility (Mahmud and Sawada, 2014).

2.2.2 Family Structure in South Africa; Past and Present

South Africa has a unique historical background as compared to other Sub-Sahara countries and this shaped its family structure in a particular direction. Firstly, the discovering of minerals such as diamond in the 20th century in area which has become the present day Johannesburg added distinguishing but significant factor despite the fact that it also experienced some period of colonialism (Pedzisai , 2013; Kanyenze, 2004). The presence of European settlers in the early 19th century was the beginning of family structure metamorphosis (Russell, 2002). The mutual effect of Europeans and local people significantly affect family structure organization in different ways (Amoateng, Heaton and Kalule-Sabiti, 2007).

Goode (1963) documented the development of family structure in terms of industrialization and urbanization, which weaken extended family structure, resulting in ascending figure of women taking part in the labour force, fertility decline among other coordinates. This consequently

causes more development of nuclear family system more prevailingly earlier in history. According to Pauw and Mayer (1973), about 58 percent of households in Duncan village were extended family households but this rate according to him dropped significantly in about twelve years later. Nuclear family structure was however, blossoming due to rapid urbanization and modernization of township close to Johannesburg. This was also reported by Marwick (1978) who revealed that 48 percent were nuclear households in the township. His finding is similar to Goode (1963) but only applicable to the community (Nguni) under consideration and could not be a representative sample of the entire family structure in South Africa. He, however, indicated that the extended family structure has taken the dominancy in South Africa especially among the black or African race in the present day.

Beittel's (1992) reported that family structure has taken a different dimension and significant departure from similarity across races in 1930. Owing to that, female-headed household is increasingly high in South Africa. This is partly because migration of their male counterpart to cities in search for job coupled with the historical effect of apartheid and high incidence of out-of-wedlock family. In most cases, females become victims of out-of-wedlock birth and this situation becomes more serious when the male counterpart refuses to accept the pregnancy. Human Sciences Research Council (HSRC) conducted empirical study on families and children in South Africa and found that 60 percent of children born in South Africa had absent fathers, which is above the average of 15 percent in the developed countries. In that situation, the female automatically becomes head of that household. In some circumstances in South Africa, some of these children born to out-of-wedlock mothers end up staying with other non-biological relatives such as grandparent making grandparent head of some households and more extended family as stated in the foregoing paragraph.

Furthermore, in their descriptive study of children in South Africa, Meintjes et al. (2010) reveal a sharp decline of children who live in intact household from 38 percent in the year 2002 to 33 percent after about 8 years 2010. This is attributed to factors such as divorce, low marriage rate, out-of-wedlock among others. He further stated that about 24 percent of these children live in a single parent household. Also, Hall, Lake, Woolard and Smith (2012) indicated that the higher proportion of children who live with intact married couples is recorded in Gauteng and Western Cape provinces, that is 54 percent and 50 percent respectively is above the average recorded

nationally. This is partly attributed to modernization, which fosters nuclear family system (Goode, 1963).

2.2.3 The Concept of Household Well-being

The terms 'family' and 'household' are used in many studies interchangeably especially in the field of sociology where both family and household are seen to be the same, although they do not intrinsically mean the same thing in different context at all times. For instance, household is a concept normally used in quantitative studies, which refers to people who live under the same residential address, share a physical space, food and other necessities as used in this study (Monde, Mzikazi, and Nene, 2016). Thus, those living together in the same address may share resources together, may share biological and non-biological relationship as well. In the current study, the concept of household is defined as a group of people who are confined under the same roof, who may or may not be related but share basic needs together and under a kind of authority or head of the household.

Household well-being generally involves both the monetary and non-monetary well-being, and physical and non-physical well-being. It thus includes the ability of a household to meet its needs for all the members and across all the spectrum of daily necessities such as food, income, health, education, housing, physical and psychological well-being. Household well-being includes both economic and non-economic variables, which in other word, is known as subjective well-being.

2.2.4 Measuring Household Well-being

Household well-being are measured in two main ways; the direct and indirect measures. The direct measure is normally monetary in nature and mostly uses income and consumption as proxy for welfare measurements. The indirect measure of well-being is however, constructed from item or a range of items, which together, measure the overall state of affairs. It is technically referred to as the subjective well-being measures. The application of particular measure depends on the context of the investigation, the availability of data, structure of the economy and the overall purpose of one's study. However, the application of both measures are of great important for holistic and broad–based analysis (World Bank, 2003).

The income measure of well-being is composed of a range of earnings from several sources. This includes earnings from productive activities and transfers. Income from productive activities

comprises wage earned from labor services, income from renting productive resources which include capita, land and other forms of productive asset (McKay, 2000; Grosh and Glewwe, 2000). It also includes income earned from self-employment. Income measure of household well-being also includes transfers from government and NGOs or other relatives. Furthermore, earnings from subsistence agriculture and any income that is received in-kind and home-made goods or services, which uses barter means for exchange or maybe used within the household directly, is also valued into the computation of household income (World Bank, 2003: Montgomery, Gragnaloti, Burke, and Paredes, 2000). The income data is also adjusted, household size by dividing household income by the number of household members giving rise to per household income (Deaton and Grosh 2000; Deaton and Zaidi, 2002).

Consumption measure of welfare on the other hand comprises both the home-made consumption and expenditure on goods and services. There are four main categories of items that constitute household consumption. This includes food items, consumer durables, non-food items, housing. These items are computed together to arrive at the aggregate consumption value with a particular reference point. Consumption includes house-produced goods and services, that is, when a household consume goods that it produces (Morris, Calogero, Hoddinot, and Christiaensen, 2000). All these are accounted for in the computation of consumption index. Monetary measure of consumption in the computation is adjusted to account for household size by dividing household consumption by the number of household members, thus giving rise to per capital household consumption. As noted in the forgoing reviews, most surveys employ household as a basic unit of observation when measuring consumption. According to World Bank (2003), there is a continuous debate on which monetary measures is more appropriates for consideration into the computation of household standard of living. It is recommended that, in developing countries, consumption measure maybe advocated due to the high concentration of informal sector, making income intermitted and jumps, whereas consumption is much smoother over time. However, in the more advanced and developed countries, income measure is more advisable (World Bank, 2003).

Household subjective well-being consists of items or a set of items, which are mostly non-monetary in nature that express person's cognitive and affective evaluations of his or her life (Diener, Lucas, and Oshi, 2002). It is often difficult and very expensive to collect data on income

and consumption and so many important data sources do not apply the direct measure of household standard of living but resort to alternative means (Filmer, and Pritchett, 1998; Sahn, and Stifel, 2000). Subjective well-being measures include the analysis of socioeconomic inequalities of household health needs, housing needs among others (Ahmed, and Bouis, 2001). This approach has a number of advantages in that data on household can easily be taken at any point in time. The approaches used to construct these indices, depending on how different the asset of the household and its feature, are measured in the composite index. The key approaches include (1) Arbitrary approach (2) Principal components analysis and factor analysis (3) Predicting consumption and linear summation techniques. It sometimes uses life satisfaction of household head as a proxy for the overall household well-being (Grosh, and Baker, 1995; Ahmed and Bouis, 2001; Montgomery, Gragnaloti, Burke, and Paredes, 2000; Falkingham and Namazie, 2002).

2.2.5 Empirical Literature on Family Structure and Household Standard of Living

Voluminous studies exist on the possible impacts of marital status on the physical and health well-being (Shapiro, 1996; Kessler and Essex, 1982). They found that those who are married have better physical well-being and health as compared to those who are single. They attributed this wellness partly to complementarity of economic resources, emotional and other form of social supports that married people enjoy, which enhances their overall well-being. Hurlbert and Acock (1990) argued that because marriage represents a kind of contract with legal tied in some cases, there is a high sense of belongingness and support in every possible way. This enhances their economic fortune. They also pointed out that, married persons are able to release stress more easily than the non-married persons. These studies are however, limited to only the marital component of the overall family structure. Secondly, they only focused on the individual, rather than household and their well-being measure is only limited to their physical well-being and does not include other areas of subjective well-being and monetary aspect.

Buijs and Atherfold (1995) classified a household head as a member of household who earns to support the functioning of the household members, own accommodation and provide most of the daily needs to its members. They reported that, it is possible for more than one person to head a household and that in most cases, it is the males who head the affairs of the household. However, the modern day experience of household structure varies from norms, where female and grandparent headships are taking ascending record especially in some countries in African, of

which South Africa is among the leading countries in female and grandparent-headed households. They documented that female-headed household is of a great concerned worldwide due to its poverty and vulnerability as compared to the male headed household. Laughlin (1995) also made similar statement but added that, not only female but aged or grandparent-headed households are often weaker and be considered for assistance under social intervention programme (Buvinic and Gupta,1997; World Bank, 2007; Deere and Leon, 2003; Storey, 2004; King et al., 2007; Ratusi and Swamy, 1999). Their studies are, however, a mere historical account without any statistical effects of how household head composition can affect the welfare of its members.

Research on family types focusing on family living environment in relation to other members and how it affects members' well- being also exist (Brown, 2010; McLanahan and Sandefur, 1994). They concluded that members living with non-biological families (that is, extended family) are often poorer than those in the purely nuclear households. Additionally, they also documented that, children in non-biological households suffer from poor child-parent relationship and do not often do well. This, according to them, culminates from the fact that often parents are the key features of the immediate family environment of the children and that most family resources are well channeled and distributed from parents to children in a better manner than non-biological parents. This is however, not the case at all times with non-biological parents and relatives in the extended family, which is often associated with poorer resource distribution and eventual welfare decline (McLanahan, 2000; Hofferth and Anderson, 2003). Other studies with similar findings include Ginther and Pollak, (2004), Tach (2008), Halpern-Meekin and Yuan (2009). Their studies however, lack substantial ingredients in terms of family structure compartmentalization and comprehensive household welfare measures.

Hawaii (1999) conducted some studies on resource endowment between small and large families in Thailand. After controlling for background characteristics, he found that small families are wealthier than the large family. In particular, small families save a lot of money owned or have more consumer goods than the large family. He argued that, there is more pressure on family resources and higher level of resource competition in large family and this ultimately affects the overall well-being of the household. He argued that happiness in the family is maximized when there are fewer members as each one receives the needed attention and supply to meet the need. He concluded that those who enter into motherhood early, which is usually linked with having a

larger or bigger family, recorded downward happiness trajectories, whereas happiness levels for older parent with good education and financial resource were maximized. His studies are however, narrowed to family size while ignoring other components of family structure. His study does not take into account the other components of welfare measures and rigorous econometric analysis.

In South Africa, there is a very limited studies linking family structure to household well-being. A few studies however, exist on family structure and poverty. Acheampong, and Marily, (2015) documented that broken marriage household have higher risks of being in economic poverty than intact families. Other studies done in related area include Ebrahim, Woolard, and Leibbrandt, (2013), Ntombifuthi, (2009), Neves and Toit (2008), Amoateng, Heaton, and Kalule-Sabiti (2007), Pedzisai (2013) among others. Secondly, Ebrahim, Woolard, and Leibbrandt (2013) reported that, household which headed by women are often more vulnerable to economic agony than those headed by male. It is very apparent that all the foregoing studies focus on marital component of family structure with a very few on head composition. Other vital components including biological relation and family types, and size have not been well investigated. Furthermore, the household welfare implication considered in the literature is heavily skewed to income, while non-monetary measures have not been accounted for. Buviand Geeta (1997) found that household headed by females are weaker economically than those headed by males. His study is however, descriptive in nature without rigorous quantitative and econometric analysis.

In the view of the above gaps in the literature, this study consolidates the existing study by widening the scope of family structure composition in the context of South Africa and bringing all of them under one study with a common data set for each well-being outcome. It also considered non-monetary aspect of household well-being, also known as subjective well-being that has not been well investigated in existing literature.

2.3 Methodology

This section embodies the study data according to the objectives sought to achieve, summary statistics of pertinent variables, econometric strategies with model specifications and variable descriptions.

2.3.1 Data

The analysis conducted in this study used data from National Income Dynamics Survey (NIDS) collected from 2008 to 2014 in approximately 2 years intervals. The NIDS is conducted by the South African Research and Labor Research Unit (SALDRU), a peripheral of School of Economics, University of Cape Town, South Africa. The first study was conducted in 2008 with a nationally representative sample of over 28,000 people in about 7,300 households throughout the country. The survey was repeated every two years in 2010, 2012 and 2014. These data contain information on many variables including household variables such as household head composition, marital status, family type, family size, and background factors. The data also includes information on household reported well-being, subjective well-being, household income and consumption expenditure, employment status of household head, geographical location, provinces and availability of social amenity and sanitation facility. With the help of unique identifier, for each household and member, including parents, children, and other members, it was possible to merge all family structure components as mentioned in the literature, the relevant well-being measures and other covariates into one complete data set for each wave (cross-sectional data) and further append for paneling as done in this study. With the exception of household reported well-being, which was examined using cross-sectional data (since it was only measured in wave one), panel data sets are used to investigate the other three well-being outcomes.

In rounds two to four of interviews the NIDS suffers from attrition. Attrition at the household level was largely due to non-response and at the individual level due to refusal (De Villiers et al., 2013). Problems with attrition arise when it is systematic so Table 2.1B and 2.1 C compares the statistics for full sample across the four waves and the balanced sample to see if attrition affects the variables of interest as explained in the following tables (Ebrahim, Woolard, and Leibbrandt, 2013).

In dealing with the missing observations, the data were studied and analyzed (such as mcartest command in stata version 14) to identify the causes of the missing observations and if the data points are missing completely at random, missing at random and not missing at random(Graham, 2009; Kim, and Curry, 1977; Rubin, 1976). In dealing with missing completely at random they recommended that one should to ignore the missingness if it constitutes less than 5% of the observation in large data and drop the entire variable if the missingness amounts to over 60% of the observations. The former rule was applied with caution as most of the variables with missing values have related questions which help in supplying data points for missing observations leaving no or missing values of less than 1 % for outcome and explanatory variables. With regard to financial data such as household income and expenditure data, the study used their imputed values (computed by NID from a set of productive items) which were already in the data set. Concerning missing values that are not randomly distributed across observations but are distributed within one or more sub-samples, the data points were derive from the primary indicators. For instance, where missing values exist in the "highest education attained" variable, it was derived from the separate response to questions of "highest school grade completed" or "highest level of tertiary education completed" variables. To account for the household and individual level attrition post-stratification calibrated weights was used when reporting cross-sectional analysis and panel weights when reporting on the panel. Statistics for the variables are presented in the following paragraphs.

2.3.1.1 Summary Statistics

Table 2.1A, on cross-sectional data, documents descriptive statistics of relevant variables on household characteristics. First, concerning household reported well-being, four items were recorded. These items comprise food consumption, housing, healthcare, and clothing, all of which are expressed in relation to the household needs. These items were dropped in the subsequent interviews, hence the need for the cross-sectional report and estimation for this variable of interest. The records show that, most households have either less than adequate for the household need or just adequate for the household need for each of the above items. With regard to food consumption need of the household, the table documents that 38.2% households were in shortage, while 48.1% and 13.7% had just enough for the household need and more than adequate for the

household needs respectively. This statistics is not surprising as similar report on right to food made by South African Human Rights Commission (2009) documented lack of adequate food and nutritious to meet households' daily needs. This is closely similar to the housing need, where 38.6% and 48.7 % and 12.7% of households have less than household need, just adequate and more than adequate for the household need respectively. Concerning housing needs, Moroke (2009) reported that In South Africa the most severe element-affecting people's welfare is the housing need and this is confirmed the large proportion of households that have less that adequate to meet their housing needs. The persistence and enormity of the housing backlog facing low-income earners is an indication of the depth of the housing crisis in South Africa. This challenge exists despite major policy and legislation changes ushered in with the new post-1994 democracy. While 42.0% of households do not have adequate healthcare cover, 46.4% have healthcare cover just adequate for the household with about 11.7% having more than their households' need. The table also shows that 39.5% of households do not have adequate clothing to meet the household need, 48.0% have just adequate clothing, 11.9% households have more than what they need.

Concerning the marital composition, 38.8% were in intact married households, 10%, 18.8 %, 5.0% and 27.4% were in cohabiting, widow/widower, divorced and never married households respectively. The proportion of marital composition indicated in the above statistics is in line with the publication by the Statistics of South Africa(2011). The table also reveals that 51.3% comprise households with nuclear family members. This means that such households share biological relations (parents with their own children, biologically or adopted). The extended household (parents with or without biological or adopted children in addition to other relatives or non-relatives members) constitutes 48.7% of the household. The relatively high number of nuclear household could be attributed to the large number of never-married and widowed households (Hall and Mokomane, 2018). The results show that male headed most households in South Africa, representing 50.6%, followed by female-headed household that accounts for 37.2% and then grandparent-headed households, which constitute 12.1%. On average, there are four members in a household. The table shows the average per capital per household income and consumption recorded were R1624.3 and R1434.0 respectively. The table also shows that majority of households are African, accounting for 77.5%, which is in line with the expectation according to Statistics of SA (2018) where majority are black Africans. While the statistics for rural/traditional area is 47.1%, , most households live in the provinces of KZN, Eastern Cape,

Western Cape, Gauteng, and Limpopo representing 24.2%, 13.8%, 13.7%, 12.8%, 12.8% and 8.2% respectively.

Furthermore, each of the cross-sectional household data set from wave one to four (with all the relevant variables of interest merged using identifiers) were appended to create the panel data set. Statistics of relevant variables in the full sample of waves one to four and balanced panel data set are presented in Table 2.1B to allow for comparative analysis of the statistics and estimates of all the panel analysis (reported later in this section) to check if attrition affects the statistics and results significantly. Household subjective well-being (proxied by life satisfaction) was measured on 1-10 level scale at household head level and at average of adults members of the household to check if there is any intra-household inequality of this well-being measure. The table shows that within and across sample categorizations (full sample and balanced sample), the subjective well-being at head level is recorded at 5.1 which is also the same for the average of adult members of the household. This may imply that there is no intra-household inequality with respect to household subjective well-being. Furthermore, it also suggests that we do not lose meaningful information due to attrition since the statistics for full sample is the same as that of the balanced sample. The mean per capital income for the full sample and balanced data are R2023 and R2185.7 respectively, while that for household consumptions are recorded as R1506.7 and R1579.5 for the full sample and balanced data sets, which are all very close. This statistics shows that on average, household consumed less than the income, which is not surprising as some income might be channeled to saving, gift, payment of debts among others. Concerning marital status, intact married households record 33.0% cohabiting (9.0%), divorced (4.0%), widow (18%) and single or unmarried household (35%) in the full sample data set while the balanced data accounts for the following statistics for marital status: intact married (28%), cohabiting (5%), divorce (7%), widow (28%) and never married (31%). The table also documents extended household composition of 44% and 38% for the full sample and balanced data sets respectively. Head composition of the household show that male-headed household constitute 41%, female-headed (46%) and grandparent headed (12%) for the full sample data while 38% constitute male-headed, 45% represent female-headed and 15% accounts for grandparent headed for the balanced panel data. The average household size was 4.1 for the full sample data and 3.9 for the balanced data. Additionally, most households were African (81%) followed by Coloured (13%), then white (4%) and Asian (0.1%). The same trend is observed in

the balanced panel data as follows; Africa (83%) followed by coloured (12%), then white (4%) and Asian (0.1%). The average education in terms of years of schooling for household heads was 8.25years and 7.5years for the full sample and balanced data respectively. Furthermore, most of the household (representing 97% and 96% for full sample and balanced panel) have religious belief and about 87% have good source of water for both data sets, good toilet facility (94 % and 95% for full sample data and balanced panel) and 46%% and 48% for full sample and balanced respectively live in area that is rural or traditional. This further shows that attrition does not significantly affect the statistics of both data sets (full sample and balanced sample). The provincial distribution for the full sample and balanced data sets are respectively documented as follows; Western Cape constitute, 12%, Eastern Cape, 13%, Northern Cape (7.0%), KwaZulu-Natal (25%), Mpumalanga (7%) and Limpopo (8%), which are all the same for full sample and balanced sample, Free State (6.0%% and 7%), North West (6% and 7%) and Gauteng (13% and 12%). Thus, the statistics for both data sets (full sample data set and balanced panel data are approximately the same in nearly all the cases.

Table 2.1A Summary Statistics: Cross-sectional Data for Wave One

Items and Variables	**Frequency**	**Percentage**
A. Items for Household Basic Needs		
1. Food consumption in relation to household needs		
a. It was less than adequate for the household	2775	38.2
b. It was just adequate for the household	3497	48.1
c. It was more than adequate for the household	993	13.7
2. Housing in relation to household needs		
a. It was less than adequate for the household	2803	38.6
b. It was just adequate for the household	3539	48.7
c. It was more than adequate for the household	921	12.7
3. Healthcare cover in relation to household needs		
a. It was less than adequate for the household	3043	42.0
b. It was just adequate for the household	3361	46.4
c. It was more than adequate for the household	848	11.7
4. Clothing in relation to household needs		

a. It was less than adequate for the household	2883	39.8
b. It was just adequate for the household	3505	48.3
c. It was more than adequate for the household	863	11.9
Household reported well-being*	6.10 (1.27)	
Marital Composition of household		
Intact married	2822	38.8
Cohabiting	727	10.0
Widow/Widower	1364	18.8
Divorced	364	5.0
Never Married	1995	27.4
Family Type		
Nuclear family	3743	51.3
Extended family	3550	48.7
Head composition		
Male-headed	3693	50.6
Female-headed	2714	37.2
Grandparents- headed	886	12.1
Family size*	4(2.6))	
Other characteristics		
Household Income*	4437.9 (8053.3)	
Per Household Income*	1624.3 (3488.9)	
Household Consumption Expenditure*	3868.5 (7181.6)	
Per Household Consumption Expenditure*	1434.0 (3058.9)	
Race		
Africa	5619	77.0
Coloured	1010	13.8
Asians/Indians	105	1.4
White	559	7.6

Education		
Geography:		
Rural/traditional	3433	47.1%
Good toilet facility	6582	90.9%
Good source of water	6260	86.2%
Western Cape	1,004	13.8
Eastern Cape	933	12.8
Northern Cape	569	7.8
Free State	455	6.2
KwaZulu-Natal	1,763	24.2
North West	483	6.6
Gauteng	933	12.8
Mpumalanga	552	7.6
Limpopo	601	8.2
Observation	**7293**	**100**

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

Table 2.1B Summary Statistics: Panel Data for Wave One to Four

			Full Sample (N=32988)				**Balanced Panel (N=8612)**			
	Variables	**Definitions**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Household well-being	Subjective well-being (head)*	measured from 1 to 10 scale	5.1	2.4	1	10	5.1	2.3	1	10
	Subjective well-being (Adults)*	1-10 scale	5.1	2.3	1	10	5.1	2.3	1	10
	Household* income	Measured as per capital income (in Rand)	2023	6250.2	0	617327.1	2185.9	8070.4	0	617327.9
	Household consumption*	Measured as per capital consumption (in Rand)	1506.7	3012.4	20	92225.8	1579.5	3273.2	26.7	79246.0
Marital	Intact married	=1 intact married, otherwise 0	0.33	0.47	0	1	0.28	0.44	0	1
	Cohabiting	=1 cohabiting, otherwise 0	0.09	0.28	0	1	0.05	0.22	0	1

	Divorced	=1 divorced, otherwise 0	0.04	0.21	0	1	0.07	0.25	0	1
	Widow	=1 widow, otherwise 0	0.18	0.38	0	1	0.28	0.45	0	1
	Never married	=1 single, otherwise 0	0.35	0.48	0	1	0.31	0.46	0 0	1 1
Family type	Extended household family	=1 extended family, otherwise 0	0.44	0.49	0	1	0.38	0.48	0	1
Headship	Male head	=1 male head Otherwise 0	0.41	0.49	0	1	0.38	0.48	0	1
	Female head	=1 female head Otherwise 0	0.46	0.49	0	1	0.45	0.49	0	1
	Grandparent head	=1 grandparent head Otherwise 0	0.12	0.29	0	1	0.15	0.36	0	1
Family size	Family size*	Family size is measured as the number of members per household	4.12	2.72	0		3.9	2.70	1	27
Household characteristics	Race									
	African	=1 African , otherwise 0	0.81	0.39	0	1	0.83	0.37	0	1
	Asians	=1 Asians , otherwise 0	0.01	0.10	0	1	0.01	0.08	0	1
	Coloured	=1 Coloured , otherwise 0	0.13	0.34	0	1	0.12	0.32	0	1
	White	=1 White , otherwise 0	0.04	0.21	0	1	0.04	0.19	0	1
	Head's education*	Years of formal school completed	8.25	5.77	0	23	7.5	5.86	0	23
	Religious belief	=1 has belief ,otherwise 0	0.97	0.15	0	1	0.96	0.19	0	1
	Source of water	=1 has good water source, otherwise 0	0.87	0.33	0	1	0.87	0.33	0	1
	Source of toilet	=1 has good toilet facility, otherwise 0	0.94	0.22	0	1	0.95	0.23	0	1

	Rural/traditional	=1 Rural/trad. , otherwise 0	0.46	0.49	0	1	0.48	0.49	0	1
	Provinces				0	1				
	Western cape	=1 Western cape , otherwise 0	0.12	0.33	0	1	0.12	0.32	0	1
	Eastern Cape	=1 Eastern Cape , otherwise 0	0.13	0.33	0	1	0.13	0.34	0	1
	Northern Cape	=1 Northern Cape , otherwise 0	0.07	0.26	0	1	0.07	0.26	0	1
	Free state	=1 Free state , otherwise 0	0.06	0.24	0	1	0.07	0.25	0	1
	KwaZulu-Natal	=1 KwaZulu-Natal , otherwise 0	0.25	0.43	0	1	0.25	0.43	0	1
	North West	=1 North West, otherwise 0	0.06	0.06	0	1	0.07	0.26	0	1
	Gauteng	=1 Gauteng , otherwise 0	0.13	0.33	0	1	0.12	0.32	0	1
	Mpumalanga	=1 Mpumalanga , otherwise 0	0.07		0	1	0.07	0.25	0	1
	Limpopo	=1 Limpopo, otherwise 0	0.08	0.28	0	1	0.08	0.28	0	1

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

2.3.1.2 Family Structure by Household Well-being

Table 2.1C documents family structure by the household well-being variables for cross-sectional, full sample and balanced data. Under cross-sectional data, two indexes from the same items were used; equal weighted index and unequal weighted index from polychoric principal component analysis. Statistics from Table 2.1C shows that married households record the highest household reported well-being for both the equal weighted and unequal weighted indexes with an average of 7.2 and 0.21 respectively. This means that married households' ability to meet its household need is higher compared to other family structure measures. This is followed by household headed by male and divorced household recording an average of 7.1, then extended (6.9), and cohabiting (6.7). Additionally, statistics for cohabiting, divorce, widow, and never married

households recorded -0.17, 0.11, -0.16, and -0.23 respectively for household reported well-being index. Extended family recorded 0.01, male-headed household recorded 0.11, female-headed -0.13 and grandparents has -0.23. It is also good to note that the statistical trend for both indexes (equal weighted index and unequal weighted index) are parallel. Furthermore, the table shows the statistics of dependent variables by key explanatory variables for both the full sample data and balanced data set. Intact married household record the highest level of household subjective well-being at household head level (5.4) and (5.5) for full sample and balanced data respectively, which also shows that we did not lose meaningful information due to attrition. The same trend is documented for household subjective well-being at adults level for the full sample (5.5) and balanced sample (5.6) showing nearly no intra-household inequality. The intact married household repeats similar trend for logarithmic household income on average of 7.0 and 7.2 for full sample and balanced data respectively while that for the expenditure is recorded at 6.7 and 6.8 for the full sample and balanced data set respectively. The higher per capital household income over the per capital household consumption is not surprising since not all household income that is often consumed as some go into savings, donation among others. The table also shows that extended household record household subjective well-being of 5.2 in both data sets. While male-headed household records household reported well-being of 0.11, its statistics for subjective well-being, household income and consumption are 5.3, 7.2 and 6.9 respectively for full sample data and 5.45, 7.4 and 7.0 respectively for balanced data, which are also approximately the same as the full sample data. Female and grandparent headed household record household reported well-being of -0.13 and -0.23 respectively. The statistics of household subjective well-being, logarithmic income and expenditure for female headed households are 4.9, 6.7 and 6.5 respectively for full sample data and 4.9, 6.6 and 6.4 respectively for balanced panel while the grandparents headed household records 4.9, 6.4 and 5.9 for household subjective well-being, logarithmic income and expenditure respectively for full sample panel and 5.9, 6.4 and 5.9 respectively for balanced pabel (Table 2.1C). Thus, the statistics for both data sets (full sample data set and balanced panel data are approximately the same in nearly all the cases.

Table 2.1C Household Well-being by Family Structure

		Cross-sectional data		Full Sample data (N=32988) Mean and std deviation				Balanced data (N=8612) Mean and std deviation			
	Family Structure	**HRWE***	**HRWU***	**HSWH***	**HSWA***	**HI (log)***	**HC (log)***	**HSWH***	**HSWA***	**HI (log)***	**HC (log)***
Marital status	Intact married	7.2 (2.3)	0.21 (1.49)	5.4 (2.2)	5.5 (2.1)	7.0 (1.2)	6.7 (1.2)	5.5 (2.3)	5.6 (2.2)	7.2 (1.3)	6.8 (1.2)
	Cohabiting	6.7 (2.2)	-0.17 (1.43)	4.9 (2.2)	5.0 (2.2)	6.6 (1.0)	6.3 (0.9)	5.1 (2.3)	5.1 (2.3)	6.7 (1.0)	6.3 (0.9)
	Divorced	7.1 (2.3)	0.11 (1.47)	5.3	5.4 (2.2)	7.2 (1.3)	7.0 (1.2)	5.3 (2.4)	5.3 (2.3)	7.2 (1.3)	6.9 (1.2)
	Widow	6.6 (2.3)	-0.16 (0.47	4.9 (2.3)	5.0 (2.1)	6.6 (0.9)	6.3 (1.0)	4.9 (2.2)	5.0 (2.2)	6.6 (1.0)	6.3 (1.0)
	Never married	6.6 (2.2)	-0.23 (1.4)	4.9 (2.2)	4.9 (2.2)	6.9 (1.1)	6.6 (1.0)	4.8 (2.3)	4.8 (2.2)	6.8 (1.1)	6.5 (1.1)
Fami	Extended family	6.9 (2.3)	0.01 (1.47)	5.2 (2.1)	5.3 (2.1)	6.7 (1.1)	6.4 (1.0)	5.2 (2.3)	5.3 (2.2)	6.7 (1.1)	6.5 (1.1)
Head composition	Male head	7.1 (2.3)	0.11 (1.49)	5.3 (2.2)	5.4 (2.2)	7.2 (1.2)	6.9 (1.1)	5.4 (2.3)	5.4 (2.3)	7.4 (1.2)	7.0 (1.2)
	Female head	6.7 (2.3)	-0.13 (1.47)	4.9 (2.3)	5.0 (2.1)	6.7 (1.1)	6.5 (1.0)	4.9 (2.3)	4.9 (2.2)	6.6 (1.1)	6.4 (1.0)
	Grandparent head	6.6 (2.2)	-0.23 (1.45)	4.9 (2.3)	5.1 (2.1)	6.4 (0.9)	5.9 (0.9)	5.0 (2.4)	5.1 (2.2)	6.4 (0.9)	5.9 (0.9)
Household size	Household size										

HRWE*= Household reported well-being (equal weighted index), HRWU*=Household reported well-being (Unequal weighted index), HSWH* = Household subjective well-being at head of household level, HSWA*=Household subjective well-being at adults level, Household HI (log)*= log of household income, HC (log)*= log of household consumption.

Table 2.1D displays family structure transition across all waves (that is, from wave 1 to 4), where 1 was assigned to each family structure, and 0 otherwise. The rows reflect the initial values, and the columns reflect the final values. The table shows that from wave 1 to 4 , in average, 84.8% of married household remained in the same status in each wave while about 15.2 % has the chance to transit to other family structure. The results also show that 94.4% of the married 0 persons in the data remained married 0 in the next wave; the remaining 5.6% became married 1. Concerning cohabiting, 54.3 % remained the same while 45.8% transit to other family structure. Furthermore, about 64.5%, 85.9% and 81.3% of divorced, widow and never married respectively remained the same in each wave while 35.5%, 14.1% and 18.7% respective are likely to transit to other family structure. The proportion of nuclear family type that remained in each wave was recorded as 88.2% with about 11.9% chances of transiting to extended family type, while about 80% and 20% of the extended family remained the same in the next next wave. The trend is the same for household head composition; 96.2% of male-headed household remain in each wave, 90.4% of female-headed household remained the same while 69.1% of female-headed household remained the same in each wave. While some form of transition occurs in all the family structure variables in all the waves, cohabiting households record the highest level of transition across waves and between waves (except for wave 1 to 2) as compared to other family structure measures. This is not surprising, as cohabiting couples are not legally bound as compared to married household as therefore it is likely to transit into married or stay single. From wave 1 to 2 however, transition of grandparent headed household was highest (84.4%) but second to cohabiting households for between waves transition. This is also within expectation due to old age, which paves way for economically younger members to assume headship role. Divorced household records the second highest for across wave transition from wave 1 to 4 (35.5%).

Table 2.1D Family Structure Transition Across and Between All Waves

Family Structure		Across all the waves		Between waves					
		From wave 1 to 4		Wave 1 to 2 %		Wave 2 to 3 %		Wave 3 to 4 %	
		0	1	0	1	0	1	0	1
Married	0	94.4	5.60	96.7	3.2	92.1	7.9	94.4	5.6
	1	15.2	84.8	12.7	87.3	14.1	85.9	18.7	81.3
Cohabiting	0	98.0	1.95	98.6	1.4	97.3	2.7	98.3	1.7
	1	45.8	54.3	35.6	64.4	42.5	57.5	60	40
Divorce	0	97.4	2.64	98.0	2.00	97.0	2.9	97.1	2.9
	1	35.5	64.5	21.3	78.72	44.4	55.6	40.28	59.7
Widow	0	91.0	8.9	95.2	4.8	93.7	6.3	84.3	15.7
	1	14.1	85.9	8.4	91.6	25.9	74.1	6.9	93.1
Never married	0	93.7	6.3	95.6	4.5	90.5	9.5	95.1	4.9
	1	18.7	81.3	8.1	91.9	17.1	82.9	30.6	69.4
Nuclear	0	80.0	19.9	79.5	20.5	82.6	17.4	77.9	22.0
	1	11.9	88.21	11.4	88.6	10.4	89.6	13.6	86.4
Extended	0	88.2	11.7	88.6	11.4	89.6	10.4	86.4	13.6
	1	19.9	80.0	20.5	79.6	17.42	82.6	22.0	78.0
Male head	0	98.0	1.9	98.3	1.7	97.9	2.1	98.0	2.0
	1	3.8	96.2	3.3	96.7	3.7	96.3	4.3	95.7
Female-headed	0	93.8	6.2	94.2	5.7	92.9	7.1	94.3	5.7
	1	9.6	90.4	10.5	89.5	7.0	93.0	11.1	88.9
Grandparent-headed	0	89.9	10.1	84.4	15.6	94.5	5.5	92.0	8.0
	1	30.8	69.1	84.4	15.6	33.0	67.0	28.6	71.4

2.3.2 Variable definitions

Dependent variables

Household well-being: This study uses four measures for evaluating household well-being; household reported well-being, subjective well-being (Life satisfaction), household income and household consumption expenditure.

Household reported well-being: Two indexes from the same items were used; equal weighted index and unequal weighted index from polychoric principal component analysis. This was computed from a set of items, which indicate if household was able to meet its basic needs as follows: "Concerning household meeting its food consumption need over the past month," "Concerning household meeting its housing need," "Concerning household meeting its clothing need," and "Concerning household meeting its healthcare cover need".

Household Subjective Well-being: Life satisfaction level was used as proxy for household subjective well-being at household level and average of adult members for each household (Andrews and Withey, 1976; Gamage, Kuruppuge and Nedelea, 2016; Dong, 2006). This was measured on a scale which ranges from 1 to 10; where 1 means "Very dissatisfied" and 10 denotes "Very satisfied" This numeric scale was used as an interval-level variable for the analysis.

Household income: The income used for the computation includes earnings from productive activities and transfers. Income from productive activities comprises wage earned from labor services, income from renting productive resources such as capita, land and other forms of productive asset and earnings from self-employment. The income data, which was measured in South African Rand, was adjusted for household size by dividing household income by the number of household members to have household per capital income.

Household consumption: Consumption measure of welfare was computed from four main categories of items. This includes food items, consumer durables, non-food items, housing. These items were computed together to arrive at the aggregate consumption value in South African Rand. Household consumption was adjusted for size, by dividing household consumption by the number of household members to have household per capital consumptions

Explanatory variables

Family structure: In this study, family structure is compartmentalized into four major categories; marital status, head composition, family types and family size. The marital status category indicates whether, at the time of the NIDS, the respondent was reported to live in married families, cohabiting with a partner, widow/widower, and divorced families/separate or in single household (benchmark). Each category is treated as dummy variable for 1 if yes, 0 otherwise. Regarding the family structure based on household head, three categories are identified based on the NIDS dataset; 1 is assigned to female headed, male headed (which is the bench mark), and grandparents headed households or0 otherwise. The family structure is also measured based on the biological relations and family type; derivatively, two categories are identified; extended families (family with other relatives), 0 for nuclear families (parents with biological or adopted children). Lastly, family structure based on the household size is measured in numbers of household members.

Control variables

Educational outcome of heads of households was measured in years; geographical location was measures as 1 for rural or traditional household and 0 otherwise. Religion was measured in dummy, 1 for having religious belief for household head, 0 for otherwise. Unemployment and grant were each measured as 1 for unemployment. In terms of race, 1 was assigned if a household is African, Colored, Indian household or white (benchmark) race for household head, 0 otherwise. For sanitation and water, 1 was assigned each if a household has toilet facility and good source of water were available for the households, 0 otherwise. Each time variable is dummy, and is aligned to the year of data collection, labelled as time (benchmark) 1, time2, time3 and time4 for 2008, 2010, 2012 and 2014 respectively.

2.3.3 Econometric Strategies

The study employs OLS regression model, with robust standard error, for estimating the impacts of family structure on household reported well-being in wave one. Additionally, two types of panel analytic models were used to analyze wave one to four in attempt to investigate the impacts of family structure on household subjective well-being (measured as life satisfaction of household heads), household income and consumption. These are fixed effect model and system generalized method of moment (system GMM).

Household Reported Well-being.

Household reported well-being was computed as indexes based on a set of items that measured how household meets its basic needs. Thus, the respondents, normally the household heads, were required to indicate their well-being, by means of rating, from the following household related items: "Concerning household meeting its food consumption need over the past month," "Concerning household meeting its housing need," "Concerning household meeting its clothing need," and "Concerning household meeting its healthcare cover need,". The three response categories are on a scale that ranges from 1 (less than adequate) to 3 (more than adequate). Firstly, preliminary analysis (reliability test) was conducted to measure the internal consistency of this group of items for the household reported well-being to infer the homogeneity and degree of

complementarity of the items. The Cronbach's alpha (=.887) shows high level of internal consistency and complementarity of the items for measuring household's well-being. To create equal weighted index, responses to the questions as indicated above were summed and scores form a linear scale that ranges from 3 (less than adequate) to 12 (more than adequate) which is now an interval-level variable (Walton and Takeuchi, 2010). The study applies polychoric principal component analysis (Karen, 2018; Stanislav and Gustavo, 2005) for the unqual weighted index, which takes into account the contribution of each item that constitutes the index (-1.956 to 3.239). Ordinary Least Square regression was used for this analysis. The OLS was used due to the continuous nature of the data , the low mean of variance inflation factors (VIF) which measures the severity of multicollinearity in and OLS regression analysis (see Table 2.2), the robust estimation and the principles of Central Limit Theorem and Law of Large Numbers (Orloff and Bloom, 2014). The items that were used to compute this index (household reported well-being) were only recorded in wave one but were dropped in the subsequent waves in the NIDS data. The OLS model is specified as follows

$$HRW_i = \beta_O + \beta_{1j}\sum_{j=1}^{4} MS_{ji} + \beta_{2j}\sum_{j=1}^{2} HH_{ji} + \beta_3 FT_i + \beta_4 FZ_i + \gamma X + \varepsilon \qquad [2.1]$$

HRW denotes household reported well-being, i denotes household (i=1,2,3…..N), j indicates the number within each family categorization. MS denotes marital status which is 1 if one falls in the following categories; intact married, divorce (separated), cohabiting, divorce (separated), widow, and never married (benchmark), and 0 otherwise. HH is the family category based on household head measured as 1 if male head, female head, grandparent head and 0 otherwise. FT is the family type which is 1 if extended family; 0 otherwise (nuclear family). FZ is Family size measured as total number of members in the households. $\beta_{1,}\beta_{2,}\beta_{3,}$ and $\beta_{4,}$ are the interested parameters , which measure the impacts of family structure components as defined above. X is a vector of control variables, which includes educational attainment of household head, employment status, geographical location, grant, religion, water source, sanitation, provinces and race. Robust OLS estimator was used for the estimation of the parameters of interest.

Household Subjective Well-being

Household's subjective well-being (proxied by life satisfaction) was measured in two levels; First at household head level (Gamage, Kuruppuge and Nedelea, 2016; Dong, 2006). It is expected that the general life satisfaction of household's head is an epitome of household subjective well-being and satisfaction. Additionally, Piccoli (2017) and Chiappori (2014) documented that intra-household inequality could exist with cerain households. For instance, a husband and wife or any other adult member in the household may have different level of satisfaction due to personal goal and experience which could affect the overall level of satisfaction. Therefore, this study has also captured subjective well-being, which includes average of adult members for each household. Both were measured on a scale which ranges from 1 to 10; where 1 means "Very dissatisfied" and 10 denotes "Very satisfied" This numeric scale was used as an interval-level variable for the analysis (Krishnaswamy, Sivakumar and Mathirajan, 2009; Walton and Takeuchi, 2010).

Due to the nature of data for household subjective well-being which relied on experiences and not an objective indicator with wider variation, most existing literature use static panel analytic models such as random or fixed effect model (depending of the covariates) to investigate subjective well-being (Dockery, 2010; Powdthavee, Lekfuangfu and Wooden, 2013; Ada, 2004). Thus, this study similarly step beginning with model selection procedure.

The selection of appropriate model was based on series of model selection tests. First, Breusch and Pagan Lagrangian multiplier test for random effect was conducted to choose between random effect and pooled OLS under the null hypothesis of constant variances. In this diagnostic analysis, pooled OLS is appropriate if the null hypothesis is not rejected; otherwise, random effect is a better fit. Tables 2.3 shows that the null hypothesis of no variance is rejected at p-value of 0.0002, thus random effect model was selected. The next step was to choose between random effect and and fixed effect models. To this effect, hausman test was conducted to compare fixed effect estimator (b) that is known to be consistent with random effect estimator (B) that is efficient. The null hypothesis is that the random effect estimator (B) is indeed an efficient (and consistent) estimator of the true parameters. The p-value of 0.0001 (see Table 2.3) rejects the null hypothesis of random effect estimator. Thus, this section fits fixed effect model to

investigate the effect of family structure on household subjective well-being. The fixed effect model is therefore specified below:

Fixed Effect Model

$$HSW_{it} = \beta_{1j} \sum_{j=0}^{4} MS_{jit} + \beta_{2j} \sum_{j=0}^{2} HH_{jit} + \beta_3 FT_{it} + \beta_4 FZ_{it} + \gamma X + \eta_i + \varepsilon_{it} \qquad [2.2]$$

HSW is the household subjective well-being, which uses life satisfaction level of the household head and average of all adults members per household as proxies (Gamage, Kuruppuge and Nedelea, 2016; Dong, 2006). Thus, two estimations were done for each proxy using all the three model specifications above. i denotes household (i=1,2,3…..N), j indicates the number within each family categorization. MS denotes marital status which is 1 if one is within the following categories; intact married, divorce (separated), cohabiting, widow, and never married (bench mark), and 0 otherwise. HH is the family category based on household head (gender; 1 for female head, 0 for male), and 1 for grandparent head. FT is the family type which is 1 if extended family; 0 otherwise (nuclear family). FZ is Family size measured as total number of members in the households. $\beta_{1,}\beta_{2,}\beta_{3,}$ and $\beta_{4,}$ are the key interested parameters, which measure the impacts of family structure components as defined above. X is a vector of control variables, which includes educational attainment of household head, employment status, geographical location, income-step, religion, water source, sanitation, provinces and race. In this analysis, within fixed effect estimator was used.

Household Income and Consumption As Proxies for Household Economic Wellbeing

According to Ashok, etal (2002), household income and consumption are key ingredients for measuring household well-being. The household income used for this analysis is computed from earnings from productive activities and transfers. Income from productive activities comprises wage earned from labor services, income from renting productive resources including capita, land and other productive asset and earnings from self-employment. The income data, which was measured in South African Rand, was adjusted for household size, that is was divided by the number of household members to get household per capital income. Concerning household consumption, four main categories of items that constitute consumptions were accounted for in

the analysis. This includes food items, consumer durables, non-food items, housing. These items were computed together to arrive at the aggregate consumption value measured in South African Rands. Household consumption was adjusted to account for household size, by dividing household consumption by the number of household members to get household per capital consumption.

The choice of dynamic panel model for income and consumption, was preceded by pre-corrected results of static panel analytic models such as fixed effect, random effect and pooled regression analysis (Wooldridge, 2012) which included lags values and their residuals of the outcome variables (see Tables 2.4 and 2.6). In the context of family structure theory as pointed out earlier that not only family structure affects household's economic outcomes but also, living arrangements in households may also respond to economic condition, such that fertility decisions, household management and marital decision may be affected by economic circumstances of the parties (Stack, 1974; Ermisch and Di Salvo, 1997). For instance, it is likely that (a) higher-status men are more likely to marry, and if there is assortative matching, then higher-status men will marry higher status women. (b) richer families typically have fewer children; (c) people with more economic power head household among others. Thus, marital status, headship in the household, family type and size are likely to be endogenous to economic status, which in itself is dynamic. Therefore, to model this dynamic relationship and solve the potential problem of endogeneity, system GMM methodology as applied in this context uses lags of the dependent variables as explanatory variables among other internal instruments, to address different sources of endogeneity, namely "unobserved heterogeneity, simultaneity and dynamic endogeneity" (Wintoki, Linck, and Netter, 2012, p. 588), unlike traditional fixed-effects, Pooled OLS and random-effects panel data static models which provide inconsistent and biased results (Wooldridge, 2012), since they are not essentially designed to model this dynamic relationships and are not robust to endogeneity as shown in the pre-estimated results in tables 2.4 and 2.6.

This study therefore employed this technique following series of diagnostics tests, which are displayed and discussed in the later part of this chapter. The dynamic model (autoregressive models) is therefore specified below:

Household Income

$$logHINCOME_{it} = \alpha logHINCOME_{t-1} + \beta_{1j}\sum_{j=1}^{4} MS_{jit} + \beta_{2j}\sum_{j=1}^{2} HH_{jit} + \beta_3 FT_{it} + \beta_4 FZ_{it} + \gamma X + \eta_i + \varepsilon_{it} \quad [2.3]$$

Household Consumption Expenditure

$$logHCOMSU_{it} = \alpha logHCONSU_{t-1} + \beta_{1j}\sum_{j=1}^{4} MS_{jit} + \beta_{2j}\sum_{j=1}^{2} HH_{jit} + \beta_3 FT_{it} + \beta_4 FZ_{it} + \gamma X + \eta_i + \varepsilon_{it} \quad [2.4]$$

HINCOME denotes household income while HCONSU is the household consumption expenditure, i denotes household (i=1,2,3…..N), j indicates the number within each family categorization. MS denotes marital status which is 1 if one falls in the following categories; intact married, divorce (separated), cohabiting, widow, and never married (benchmark), and 0 otherwise. HH is the family category based on household head measured as 1 if male headed, female headed and grandparent headed household or 0 otherwise. FT is the family type which is 1 if extended family; 0 otherwise (nuclear family). FZ is Family size measured as total number of members in the households. $\beta_1, \beta_2, \beta_3,$ and $\beta_4,$ are the interested parameters, which measure the impacts of family structure components as defined above. α is the coefficient of the lagged variables (household income and consumption) X is a vector of control variables, which are educational attainment of household head, employment status, geographical location, grant, religion, water source, sanitation, life satisfaction and race, δ_t is time effect, η_i denotes household specific effect and ε_{ti} denotes the error term.

Following the series of diagnostic tests (including Arellano-Bond test for autoregression, Hansen test among others as reported later in this chapter), this analysis used System GMM as the estimator. Unlike GMM, the system GMM estimator utilizes additional set of level moment conditions as well as the difference moment conditions to estimate dynamic panel data and allows

persistent variables. To this purpose, it uses the combination of difference equations and the level equations into one greater system of equations. This involves "building a stacked data set with twice the observations" where the difference equations are followed by the level equations (Roodman, 2006; Elitza, 2007). Since both assume the same linear functional form and specification of the data generating process, the whole system can be estimated by one single operation that applies to both systems of equations. It also produces a strong instrument for the problem of endogeneity and a good estimator for panel with fewer iperiods (Arellano and Bond, 1991; Holtz-Eakin, Newey and Rosen,1988; Roodman, 2006). It has often been found that the estimated asymptotic standard errors of the efficient two-step system generalised method of moments (system GMM) estimator, though robust to panel-specific autocorrelation and heteroskedasticity, it is severely downward biased especially in small samples (Arellano and Bond, 1991) whereas asymptotic standard errors of one-step system GMM estimators are virtually unbiased. This study uses robust standard error with one-step system GMM estimator, which is robust to panel-specific autocorrelation and heteroskedasticity and unbiased.

2.4 Results and Discussion

2.4.1 Effects of Family Structure on Household Reported Well-being

Table 2.2 reports cross-sectional results of OLS regression of the effects of family structure on household reported well-being (for equal weighted and unequal weighted indexes). The estimates across all family structure measures and covariates bear the same level of significance and the direction of the relationships.

The table unveils that married and cohabiting households have significant positive relationship with household reported well-being. Thus, the household reported well-being for married households increase significantly by 0.25 and 0.168 points for the equal weighted and unequal weighted indexes respectively as compared to the never married household. Similarly, cohabiting family households recorded an increase of household reported well-being score significantly by 0.28 and 0.1815 respectively as compared to never married household. These findings are in line with the expectation as Tank (2011) and Jane (2014) reported that, in married household, there is a high degree of complementarity of married partners in providing economic support that could equally benefit the whole family. Married family also enjoys certain privileges, which positively

enhance the economic fortune of the overall well-being of the household (Shapiro 1996; Kessler and Esse 1982). They also argued that, intact married families provide opportunities for specialization of responsibilities and role assignment of members, which is a precursor for efficient capital accumulation and wealth creation that help in the betterment of household well-being. This may be contrary to divorced family, where responsibilities for household well-being maybe left in the hand of a single parent, and this situation may be adversely consequential especially when the non-productive parents ends up bearing the responsibilities of providing for the family as in the case of African race. Hurlbert and Acock (1990) argued that, because marriage represent a kind of contract with legal tied in some cases, there is a high sense of belongingness and support in every possible way. This result reinforces Hodges and Budig (2010) and Killewald (2012) that marriage, as an institution is a catalyst for healthy life in adulthood, and a good precursor for healthy family and community. They added that married couples do better and that children raised by them do better academically and at work, and have a good foundation for personal development and healthy interpersonal relationship.

Furthermore, grandparent headed household is significantly positively related to the household reported well-being. Results show that grandparents predict a significant decrease in household reported well-being score by and 0.222 for the equal weighted and unequal weighted indexes respectively. Hamilton and Jenkins (2015) argued that, even though grandparents are key source of moral and physical support to nuclear household and other social support network, majority are economically unproductive and thus, children under their shepherding could suffer economic hardship. Due to the high incidence of out-of-wedlock parents in South Africa, some of these children end up with their grandparents and other relatives. In a situation where the receiving grandparent is economically impotent, the welfare implication remains bad. They also argued that some grandparents in productive age could contribute significantly for the household well-being.

Additionally, household size is significantly negatively related to household reported well-being. Thus, having an additional member reduces household reported well-being by 0.135 and 0.088 points for the equal weighted and unequal weighted index respectively. In that case, Kalil and DeLeire (2004) documented that the distribution of household's wealth and other economic and resources to members in the household is partly affected by larger household size due to resource competition, where resources have to be shared among members. This situation becomes

adversely serious especially when such household has one productive member (King et al., 2007). Furthermore, they documented that the presence of other person in the bigger household might induce a situation called resource competition, where resources have to be shared among members. This situation becomes adversely serious especially when such household has one productive member with more dependents. Furthermore, parents often tend to do lower investment in non-biological members of the household than their own children (Case, Lin, and McLanahan, 2000; Hofferth and Anderson, 2003).

The Table also documents the effects of crucial background characteristics on household reported well-being. Results show that high educated head, household income, good sanitation facility, record significant positive relationship with the household reported well-being by 0.041, 0.497 and 0.412 points for equal weighted index and 0.0268, 0.3262, and 0.2708 points for unequal weighted index respectively. This finding confirm Garvais and Millear (2016) who reported that education and income provide economic empowerment to an individual or a group of people which enable them to meet their needs. WHO (2008) also documented that "Improved sanitation contributes enormously to human health and well-being"

However, African and coloured household and those with unemployed heads, Gauteng and KZN provinces have significant negative relationship with household reported well-being by 0.654, 0.418, 0.183 0.696 and 0.566 point for equal weighted index and 0.427, 0.265, 0.120, 0.447 and 0.362 points for unequal weighted index respectively. These relationships are not surprising because Statistics of South Africa (2011) reported that 76.4% of the population in South Africa are Africans and that about 49.2 % of this population group experience some form of poverty, unable to afford basis needs especially those in provinces where cost of living is relatively high such as Gauteng. Concerning the effect of location on well-being, Gallies (2014) reported that location bears significant meaning to well-being. He pointed that the well-being of one living in area with higher cost of living or poorer area with deprived economic opportunity is less likely to be better especially for the unemployed. This is not expecting as Statistics of South Africa (2011) reported Gauteng and KZN as province with higher cost of living and poorer provinces respectively.

Table 2.2 OLS Results: Effects of Family Structure on Household Reported Well-being

Variables	OLS EQUAL WEIGHTED	OLS UNEQUAL WEIGHTED
Married	0.2571***	0.1683***
	(0.1032)	(0.0676)
Cohabiting	0.2811**	0.1815**
	(0.1355)	(0.088)
Divorce/separate	-0.1264	-0.0789
	(0.1682)	(0.1098)
Widow	0.1432*	0.0959
	(0.1096)	(0.0719)
Extended household	0.0419	0.0271
	(0.0852)	(0.0558)
Female-headed	0.1694*	0.1092*
	(0.0952)	(0.0623)
Grandparent-headed	0.3415*	0.2223*
	(0.1330)	(0.0874)
Household size	-0.1359***	-0.0884***
	(0.0419)	(0.0275)
Household size square	0.0028	0.0018
	(0.0030)	(0.0019)
Education (head)	0.0409***	0.0268***
	(0.0078)	(0.0051)
African	-0.6553***	-0.4271***
	(0.1737)	(0.1122)
Asian/Indian	0.0041	-0.0027
	(0.3216)	(0.2078)
Coloured	-0.4176**	-0.2654**
	(0.1896)	(0.1228)
logHousehold income	0.4971***	0.3262***
	(0.0463)	(0.0301)
Unemployment	-0.1827**	-0.1203**
	(0.0816)	(0.0534)
Rural household	0.1149	0.0752
	(0.0929)	(0.0605)
Good Water source	0.0122	0.0115
	(0.1314)	(0.0860)
Good toilet	0.4124**	0.2708**
	(0.1328)	(0.0875)
Eastern Cape	-0.0421	-0.0248
	(0.1765)	(0.1146)
Western Cape	-0.1438	-0.0954
	(0.2174)	(0.1407)
North-west	-0.2637	-0.1683
	(0.2035)	(0.1321)
Gauteng	-0.6964***	-0.4469***
	(0.1873)	(0.1212)
Mpumalanga	0.3352*	0.2258*

	(0.1883)	(0.1220)
KZN	-0.5658*** (0.1692)	-0.3628*** (0.1098)
Northern-Cape	-0.0132 (0.2012)	-0.0056 (0.1304)
Free-state	-0.1777 (0.1983)	-0.1071 (0.1286)
Constant	3.4367*** (0.4584)	-2.3202*** (0.2990)
R-squared	0.185	0.1861
Prob>F	0.0000	0.0000
Mean of VIF	2.32	2.31
Observation	7039	7039

Robust standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

2.4.2 Effects of Family Structure on Household Subjective Well-being

Tables 2.3 (see the bottom of the table) reports the results of Lagrangian multiplier and hausman model selection tests. Breusch and Pagan Lagrangian multipler test for random effects for the full and balanced samples was conducted to ascerain if random effect is a preferred model to pooled OLS by testing the null hypothesis of constant variance. The p-values of 0.0002 and 0.0001 for the full and balanced samples respectively show that the null hypothesis of no variance is rejected. This allowed a random effect a better fit as compared to the pooled OLS. Next to this was to compare random and fixed effect estimators through hausman test for model selection. The analsysi tests the null hypothesis that random effect is better fit than fixed effect. In both analyses for full sample and balanced sample, the p-values were estimated as 0.0000 and 0.0001 respectively. This implied that, the null hypothesis of random effect model is rejected. Consequently, fixed effet model was fitted to estimate the effect of family structure on household subjective well-being (see Table 2.4). The test was repeated and reported in Table 2.3B for household subjective well-being for average of adult members. The p-value of 0.0000 rejected pooled OLS, and further rejection of random effect model at p-value of 0.000. Consequently, fixed effect model was fitted and the results displayed in Table 2.4)

Table 2.3 documents fixed effect results for subjective well-being at household head level and average of adult members for both the full sample and balanced panel. By comparison, it is worth noting that the coefficients of nearly all the variables are the same in terms of significance level and the direction of the relationship for the household head level and the average of adult members within each sample categorization (full sample or balanced sample). This further confirms that there is no intra-household inequality of household subjective well-being. Futhermore the general outlook of the estimates for full sample data and balanced panel data are the same in most cases in terms of the significance level and the direction of the relationship. This again confirms that the attrition does not significantly affect the estimates.

The Table 2.3 shows that cohabiting households have significant positive relationship with household subjective well-being. Thus, results from fixed effect model, cohabiting households significantly increase household subject well-being by 0.2535 and 0.5428 for full sample and balanced data at head level as compared to the never-married household while the adult level recorded the same for the full sample and 0.444 for the balanced sample. This result is not surprising because couples will not be cohabiting together unless they have high subjective well-being as dissolving the arrangement is easier rather than dissolving a marriage perhaps. This finding is not surprising as households with couple often enjoy emotional support and encouragement which are catalysts for joy, happiness, and adverse stress management. Furthermore, Tank (2011) and Jane (2014) reported, there is a high degree of complementarity of married partners or couple living together in providing economic support that could equally benefit the whole family. Married family also enjoys certain privileges, which positively enhances the economic fortune of the overall well-being of the household. He also argued that, intact married families provide opportunities for specialization of responsibilities and role assignment of members, which is a precursor for efficient capital accumulation and wealth creation that help in the betterment of household well-being. This may be contrary to divorced family, where responsibilities for household well-being maybe left in the hand of a single parent, and this situation may have adverse effect especially when the non-productive parents ends up bearing the responsibilities of providing for the family.

Much research (Mastekaasa, 1994; Glenn, 1996; Myers, 2000) has also found that couples are generally happier than those who are unmarried, whether they are separated, divorced or widow as shown by the significant positive relationships with subjective well-being (Myers, 2000). Thus the He also found that the unhappiest people are those stuck in unhappy marriages. One explanation of the link between marriage and happiness is the range of benefits that marriage brings in terms of intimacy, companionship, sharing etc. Hendrick and Hendrick (1997) believe that friendship and commitment are quite important in a marriage. Their findings also implied that marriage can help loneliness and offer a faithful companion. One would think that co-habiting couples who seem to experience the same benefits as married couples, would therefore have similar correlations with SWB as the married couples. However, Diener, Gohm, Suh, and Oishi (1998) found that this was not the case, finding instead that married couples were happier than non-married couples, especially in collectivist cultures such as India.

The table also shows that unemployment is significantly negatively related to household subjective well-being by 0.1666 and 0.1388 at head level and adult level respectively for full sample data as compared to employed households. Research suggests that people who have jobs tend to be happier than those who are unemployed, and what's more, skilled workers seem to be happier than their unskilled counterparts (Argyle, 2001). Warr (1999) suggested that subjective well-being can be attributed to work which effectively matches one's skills, talents and preferences, allows for some amount of autonomy or 'decisional discretion', provides variety in the tasks, provides supportive supervision, as well as opportunities for interpersonal contact with colleagues.

Furthermore, results show that, income, religion and education have significant positive relationship with subjective well-being of the households for the full sample and balanced. Lewis et al. (2011) found that background and socioeconomic status such as high income, education and health (which is also significance) play a significant role in life satisfaction especially for elderly people (and for all people). In addition, those with some level of religious belief turn to live by some religious doctrines which fuel them some level of satisfaction.

Time2 and Time3 significantly reduce life satisfaction by 0.610 and 0.5776; 0.3556 and 0.4086 respectively at head level as compared to the based year of time 1(2008) and similar trend with significance level was also observed at adult level. The relationship is however, positive for time

4. This relationship is expected because, with the passage of time, individuals who were previously unsatisfied have opportunity to improve him or herself (for instance through higher education) and maybe expose to better economic opportunity. For instance, in his extensive research on subjective well-being, Veenhoven (2008 and 1996), concluded that education is an interesting point when studying life satisfaction; based on the variance between nations, it seems that more highly educated countries generally experience higher levels of satisfaction. However, it is interesting to note that for individuals, the effect of education on life satisfaction is stronger when few people within that individual's country have gained the individual's level of education".

With satisfaction level, Jiang, Klein, and Saunders (2015), Festinger (1942) and Festinger (1954) under discrepancy theory provide a broad spectrum to explain life satisfaction. According to them, essentially, satisfaction is derived from a process that compares one outcome of experience with the other and establish judgement based on the emerging wellness outcome of the comparison. Thus, the conclusion is arrived at by cognitively processing the relationship between what one anticipated and the reality that occurs to establish one's life satisfaction level. This conclusively implies that an individual or corporate body like household may be well satisfied when the reference points are peers or a group of people of the same level and may feel less satisfy in the mist of well-off people and vice versa.

Table 2.3 Fixed Effect Results: Effects of Family Structure on Household Subjective Well-being

Variables	Full Sample (Head)	Full Sample (Adults)	Balanced Panel (Head)	Balanced Panel (Adults)
	Coefficients	Coefficients	Coefficients	Coefficients
Married	-0.0075	0.0123	0.1550	0.0683
	(0.0985)	(0.0922)	(0.15349)	(0.1440)
Cohabiting	0.2535**	0.2581**	0.5428**	0.4446**
	(0.1055)	(0.0987)	(0.1865)	(0.1750)
Divorce/separate	0.0980	0.1110	0.1605	0.0406
	(0.1294)	(0.1211)	(0.1822)	(0.1710)
Widow	0.1130	0.1253	0.1996	0.1339
	(0.0980)	(0.0917)	(0.1360)	(0.1277)
Extended household	-0.0288	0.0136	-0.1578	-0.1345
	(0.0694)	(0.0650)	(0.1052)	(0.0987)
Female-headed	0.1658	0.1427	0.2122	0.0890
	(0.1282)	(0.1199)	(0.1795)	(0.1685)
Grandparent-headed	0.1969*	0.2214**	0.2265	0.1534
	(0.1033)	(0.0967)	(0.1518)	(0.1425)
Household size	0.0272	0.0197	-0.0391	-0.0359
	(0.0321)	(0.0300)	(0.0495)	(0.0465)
Household size square	-0.002	-0.0016	0.0011	0.0017
	(0.0022)	(0.0020)	(0.0032)	(0.0030)
Education (head)	0.0160**	0.0140**	0.0189**	0.0122**
	(0.013)	(0.0123)	(0.0208)	(0.0195)
Religious	0.5990***	0.4589***	0.6561**	0.6216***
	(0.1284)	(0.1202)	(0.2003)	(0.1880)
Income_step	0.5105***	0.4495***	0.5018***	0.4575***
	(0.0222)	(0.0207)	(0.0333)	(0.0312)
Unemployed	-0.1666***	-0.1388***	-0.0079	-0.0137
	(0.0522)	(0.0488)	(0.0803)	(0.0754)
Rural Household	0.3929**	0.3636***	0.2187	0.1849
	(0.1448)	(0.1355)	(0.2781)	(0.2611)
Good water source	-0.0598	-0.0540	-0.0426	-0.02705
	(0.0778)	(0.0728)	(0.1150)	(0.1079)
Good Toilet facility	0.1362	0.1918**	0.1578	0.1894
	0.0959	(0.0898)	(0.1467)	(0.1377)
Good health	0.1568**	0.1306**	0.0993	0.0732
	(0.0508)	(0.0476)	(0.0724)	(0.0679)
Eastern Cape	-0.3581	-0.3119	-0.8736	-0.7689
	(0.4646)	(0.4348)	(0.9077)	(0.8521)
Western Cape	-0.3494	-0.3963	-0.9392	-0.9088
	(0.5562)	(0.5205)	(1.1074)	(1.0396)
North-west	0.2969	0.5286	-1.4735	-1.0574
	(0.4644)	(0.4346)	(0.9290)	(0.8721)

Gauteng	0.0253 (0.3367)	0.0646 (0.3151)	-1.0968 (0.6756)	(-0.9670) (0.6342)
Mpumalanga	0.4111 (0.4318)	0.5489 (0.4041)	0.1092 (1.1349)	0.9072 (1.0654)
KZN	-0.5271 (0.4697)	-0.4782 (0.4395)	-0.8903 (0.9160)	-0.6896 (0.8599)
Northern-Cape	0.1375 (0.5744)	0.3388 (0.5375)	0.2997 (1.3007)	0.6583 (1.2210)
Free-state	0.4726 (0.5278)	0.5327 (0.4939)	-0.0626 (0.9056)	0.2966 (0.8502)
time2	-0.610*** (0.0493)	-0.6517*** (0.0461)	-0.5776*** (0.0731)	-0.6320*** (0.0686)
time3	-0.3556*** (0.0491)	-0.3992*** (0.0459)	-0.4086*** (0.0715)	-0.4656*** (0.0671)
time4	0.1149*** (0.0508)	0.0907 (0.0476)	0.1545** (0.0740)	0.1458** (0.0695)
_cons	2.9691*** (0.4139)	3.2499*** (0.3873)	3.5777*** (0.7535)	3.6944*** (0.7073)
rho	0.4557	0.454	0.3345	0.359
No of groups	15,159	15,159	2,049	2,049
No of observation	28,529	28,529	8,049	8,049
Breusch and Pagan Lagrangian multipler				
Chibar2(01)	12.79	12.79	14.80	15.15
Prob>chibar2	0.002	0.000	0.0001	0.000
Hausman test				
chi2(28)	66.27	66.27	66.27	66.27
Prob>chi2	0.000	0.000	0.000	0.000

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

2.4.3 Effects of family structure on Household Income.

Table 2.4 reports pre-corrected results on the effects of family income on household per capital income using three static panel analytic models (fixed effect, random effects and pooled regression models). The results show that both the lag household per capital income and its residual are significant. This violates the assumption of constant variance. Nickell (1981) documented that estimating fixed effect in autoregressive model leads to downward bias, which becomes massive in the small time dimension where random effect is not applicable. Furthermore, in the context of family structure theory, Stack (1974) and Ermisch and Di Salvo (1997) reported that reversal causal effect is possible, where economic condition rather drives family structure arrangement and this reversal effect could be a potential source of endogeinity. Bell, Fairbrother, and Jones (2019) documented that the presence of endogeneity makes the estimates of random and pooled effect bias, inefficient and inconsistent. Thus, a more robust estimation technique such as sytem GMM is required to address this problem and any reversal effect (see Table 2.5)

Table 2.4: Pre-corrected Results: Effects of Family Structure on Household income

	Full Sample			**Balance Panel**		
Variables	**Fixed coefficients**	**Random Coefficients**	**Pooled Coefficients**	**Fixed coefficients**	**Random Coefficients**	**Pooled Coefficients**
Lag Household per Capital Income	1.5381*** (0.070)	1.1847*** (0.0676)	0.9301*** (0.0303)	1.2124*** (0.0737)	1.0421*** (0.0910)	0.9183*** (0.0443)
Residual of Lag Lag Household per Capital Income	-1.812*** (0.0719)	-0.8718*** (0.0681)	-0.4604**** (0.0312)	-1.442*** (0.0754)	-0.5472*** (0.0916)	-0.4234*** (0.0455)
Married	-0.2643*** (0.0414)	0.0059 (0.0215)	0.0386** (0.0190)	-0.2590*** (0.0481)	0.0199 (0.0280)	0.0327 (0.0266)
Cohabiting	0.1779*** (0.0485)	-0.0194 0.0320	-0.0800*** (0.0296)	0.0363 (0.0582)	-0.1226*** (0.0474)	-0.1433*** (0.0475)
Divorce/separate	-0.416*** (0.0527)	-0.0373 (0.0371)	0.0496 (0.0318)	-0.3552*** (0.0586)	-0.0139 (0.0439)	0.0157 (0.0429)
Widow	-0.5353*** (0.0449)	-0.0681** (0.0297)	0.035* (0.0210)	-0.3720*** (0.0487)	0.0197 (0.0359)	0.0521* (0.0276)
Extended household	-0.1373*** (0.0284)	-0.1519*** (0.0181)	-0.1521*** (0.0151)	-0.1991*** (0.0320)	-0.1284*** (0.0231)	-0.1441*** (0.0205)
Female-headed	0.9097*** (0.0777)	0.1208** (0.0383)	-0.0208 (0.0229)	0.7536*** (0.0899)	0.0104 (0.0533)	-0.0536 (0.0341)
Grandparent-headed	1.0242*** (0.0742)	0.10733** (0.0494)	-0.0946*** (0.0293)	0.8489*** (0.0872)	-0.0510 (0.0718)	-0.1401*** (0.0447)

Education_year	-0.0876*** (0.0073)	-0.0184*** (0.0044)	-0.0015 (0.0025)	-0.0692*** (0.0081)	-0.0062 (0.0059)	0.0012 (0.0035)
African		0.3568*** (0.1029)	0.0144 (0.0288)		0.2133 (0.1409)	0.0340 (0.0422)
Asian/Indian		0.0808 (0.0950)	-0.0208 (0.0637)		0.1630 (0.1273)	0.1060 (0.1059)
Coloured		0.3027*** (0.0926)			0.1517 (0.1233)	
Unemployed_h	-0.0230 (0.0266)	-0.2229*** (0.0208)	-0.2562*** (0.0157)	-0.0606** (0.0305)	-0.1813*** (0.0281)	-0.2080** (0.0225)
Rural	0.1883*** (0.0747)	0.0645*** (0.0248)	-0.0002 (0.0174)	0.1970** (0.0919)	0.0224 (0.0330)	-0.0104 (0.0247)
Eastern Cape	-0.164 (0.2413)	0.0057 (0.0354)	-0.0103 (0.0288)	-0.0516 (0.30758)	0.0317 (0.0413)	0.0144 (0.0404)
Western Cape	-0.547** (0.2808)	-0.0422 (0.0423)	-0.0234 (0.0350)	-0.3255 (0.3658)	0.0062 (0.0494)	0.0026 (0.0494)
North-west	-0.3109 (0.2647)	-0.0561 (0.0416)	-0.0095 (0.0349)	0.1565 (0.3476)	-0.0223 (0.0464)	-0.0064 (0.0466)
Gauteng	-0.4239** (0.1936)	-0.1160** (0.0403)	-0.0560* (0.0327)	0.1198 (0.2573)	-0.0489 (0.0464)	-0.0270 (0.0456)
Mpumalanga	-0.3630 (0.24710_	-0.1211** (0.0416)	-0.0496 (0.0335)	-0.884** (0.4286)	-0.0268 (0.0495)	-0.0007 (0.0466)
KZN	-0.2253 (0.24360)	-0.0609** (0.0312)	-0.0384 (0.0257)	0.1059 (0.3159)	-0.0163 (0.0357)	-0.0119 (0.0358)
Northern-Cape	0.1807 (0.3298)	-0.0092 (0.0433)	0.005317 (0.0354)	0.5550 (0.4291)	0.0254 0.0482)	0.0264 (0.0485)
Free-state	0.0876 0.2537	0.0117 (0.0426)	0.0028 (0.0368)	0.3666 (0.3149)	-0.0081 (0.0484)	-0.0127 (0.0514)
time2	-0.0198 (0.02118)	-0.0193 (0.0216)	0.0530*** (0.0169)	-0.0217 (0.0275)	-0.0491 (0.0346)	-0.1035*** (0.0292)
time3			0.0975*** (0.0185)			-0.0294 (0.0232)
time4			0.8958*** (0.2127)			1.0128*** (0.3348)
Constant	-2.8091 (0.5074)			-0.9187 (0.5659)	-0.02162 0.751788	
R-Squared			0.5967			0.6302
Prob>F			0.0000			0.000
rho	.783269	0.345189		.775355	0	
No of groups	7356	7356		2, 153	2, 153	
No. of observation	12994	12994	12994	6419	6419	6419

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

In Table 2.5, dynamic panel analysis was employed to examine the effect of family structure on household income. In the context of family structure theory, Stack (1974) and Ermisch and Di Salvo (1997) pointed that living arrangements in households may also respond to economic condition, such that fertility decisions, household management and marital decision may be affected by economic circumstances of the parties. Specifically, it is likely that (a) higher-status men are more likely to marry, and if there is assortative matching, then higher-status men will marry higher-status women. (b) richer families typically have fewer children; (c) people with more economic power head household among others. Thus, marital status, headship in the household, family type and size are likely to be endogenous to economic status. To counter this possible issue of endogeneity, system GMM was used as estimator, following series of diagnostic tests (Arellano and Bond, 1991; Holtz-Eakin, Newey and Rosen, 1988; Roodman, 2006). These include Arellano-Bond test for auto regression, Hansen test of over identification, Difference-in-Hansen tests of exogeneity of instrument subsets (Hansen test excluding group and difference). This simply implies that the previous household income does not affect the current after the first differencing, thus the association of lag dependent variable, which in this context is the household income, is removed, at first order with its potential hiden endogeneity in the error term of the lag values. The Hansen test is insignificant showing that the null hypothesis that the over-identifying restrictions are valid is not rejected. Difference-in-Hansen tests of exogeneity of instrument subsets (Hansen test excluding group and difference) which are insignificant showing that the instrument used are exogenous (Table 2.5). The number of instruments used at first difference and level equation are also displayed in the table.

It is important to note that the estimates for all the variables are the same for the full sample and balanced panel, indicating that the attrition does not significantly affect the results. Furthermore, a percentage increase in previous per capital income significantly increase the presence income by 0.15% and 0.073% for the full sample and balanced sample respectively.

Table 2.5 shows that as compared to the nuclear household, extended household income is significantly less by 22.2% and 54.7% for full sample and balanced sample respectively. This is more likely as households with extended members often tend to be relatively more as compared to purely biological households and quite often, have fewer productive members. Halpern-Meekin and Tach (2008) documented that the ratio of productive to non-productive members in

the extended housed is often lower than that of the nuclear household. Because of that, the per capital household income tend to be less. He reported that nuclear family comprising the biological parents with children prove to be economically and sociologically viable than the extended ones. They further pointed out that, extended family structure is more stressful and could affect welfare of which children are the most vulnerable.

Results also show that household headed by female and grandparents have significant negative relationship with the household income. Buvinic and Gupta, 1997; World Bank, 2007; Deere and Leon (2003) documented that females are most disadvantaged especially in most developing countries and are more vulnerable and poorer than male and consequently, households headed by females tend to suffer from economic agony. They reported that most females, unlike their male counterparts, have limited access to productive resources, market and credit facilities (King et al., 2007; Storey 2004; Ratusi and Swamy, 1999). In addition to the economic disadvantages associated with the female-headed households it is evidently documented that women generally have double obligation of providing domestic needs and participating in the labor market to earn income to support the family. These constraints imposed on time and mobility could lead to other adverse consequence for the household. This finding is also consistent with finding by Greathead, Devenish and Funnel (1998) ithat women experiences series of life interruption events, which encompass maternity, motherhood, among others that could affect their education and labor participation. Furthermore, Hamilton and Jenkins (2015) argued that, even though grandparents are key source of moral and physical support to nuclear household and other social support network, majority are economically unproductive and thus children under their shepherding could suffer economic hardship.

The significant negative relationship between race and household per capital income shows a wide spread of income poverty across most races in South Africa. The UCT Graduate School of Development Policy and Practice [UCT-GSDPP] (2018) reported that a widespread poverty remains a concerning feature of South African society: according to a recently released report by Statistics South Africa, over 30.4 million people were still living in poverty in 2015, and approximately 13.8 million of these were living below the Food Poverty Line. The negative relationship between rural household and unemployment with household income confirm similar report by UCT-GSDPP (2018) that most people in the rural areas lack basic infrastructure and

favorable opportunities that will turn their economic fortune for better life outcomes. The significant positive relationship between education and household income confirms the finding by Garvais and Millear (2016) who reported that education provides opprtunity for one to get employment and earn income.

The finding on the significance negative relationship between provinces such as, Eastern Cape, Western Cape and Northern cape with household income is parallel with a publication by Statistics of South Africa (2019) that " The provinces with the highest headcount of adult poverty are Limpopo (67,5%), Eastern Cape (67,3%), KwaZulu-Natal (60,7%) and North West (59,6%). For these four provinces, significantly more than half of their population were living in poverty. Gauteng and Western Cape had the lowest proportion of adults living in poverty at 29,3% and 33,2%, respectively". Time factor in the model (time2, time 3) are significantly negative using the based line of Time. Thus as time passes by, more opportunities are likely to unfold for individual to prepare and seize economic chance to earn income.

Table 2.5: Results of Dynamic Panel with System GMM. Effects of Family Structure on Household Income

Results of Dynamic Panel with System GMM

Variables	Full Sample Coefficients	Balance Panel Coefficients
L1.	0.1505***	0.0728**
	(0.0394)	(0.0453)
Married	0.4403*	-0.1181
	(0.2432)	(0.2793)
Cohabiting	-0.0207	-0.3763
	(0.3115)	(0.2907)
Divorce/separate	0.5475*	-0.1998
	(0.2923)	(0.3308)
Widow	0.4039*	0.0285
	(0.2225)	(0.2493)
Extended household	-0.2248**	-0.5471**
	(0.2235)	(0.25816)
Female-headed	-0.7066**	-0.6769**
	(0.2353)	(0.2903)
Grandparent-headed	-0.7680**	-0.8892***
	(0.1790)	(0.1918)
	0.0497***	0.0506***
Head's Education_	(0.0044)	(0.0058)

African	-1.0309***	-1.5207***
	(0.1337)	(0.1770)
Asian/Indian	-0.5778***	-0.5178**
	(0.1494)	(0.2352)
Coloured	-0.9145***	-1.1489***
	(0.1192)	(0.1844)
	-0.3913***	-0.3795***
Unemployed Head	(0.0400)	(0.0515)
	-0.2123***	-0.1854***
Rural	(0.0356)	(0.0549)
Eastern Cape	-0.1345**	-0.1705**
	(0.0552)	(0.0876)
Western Cape	-0.2030**	-0.2494*
	(0.0868)	(0.1408)
North-west	0.1040	0.1057
	(0.0779)	(0.1134)
Gauteng	-0.0224	0.0135
	(0.0662)	(0.1011)
Mpumalanga	-0.0176	-0.0031
	(0.0636)	(0.1060)
KZN	-0.0245	-0.0405
	(0.0625)	(0.0895)
Northern-Cape	-0.0651	-0.0974
	(0.0825)	(0.1197)
Free-state	-0.1301*	-0.0947
	(0.0717)	(0.1159)
	-0.4623***	-0.5101***
time2	(0.0357)	(0.0453)
	-0.2102***	-0.2250***
time3	(0.0297)	(0.0397)
	7.4126***	8.8660
_cons	(0.4981)	(0.5466)
No of groups	7356	2153
Number of observation	12994	6419

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Diagnostic test for Dynamic Panel Analysis:

Tests	Full Sample	
Arellano-Bond test for AR(1) in first differences:	Z=-0.13 Prob>0.0312	Z=-0.01 Prob>0.0344
Hansen test of overid. restrictions:	Chi2(4)=14.51 Prob>0.06	Chi2(4)=30.28 Prob>0.142
Hansen test excluding group: exogeneity of instrument	Chi2(1)=0.274 Prob>chi2=0.879	Chi2(1)=12.64 Prob>chi2=0.10
Difference (null H =	Chi2(3)=9.7	Chi2(3)=17.64

exogenous): exogeneity of instrument	Prob>chi2=0.879	Prob>chi2=0.345	
Hansen test excluding group: exogeneity of instrument	Chi2(1)=6.69 Prob>chi2=0.462	Chi2(1)=10.15 Prob>chi2=0.180	
Difference (null H = exogenous): exogeneity of instrument	Chi2(3)=11.78 Prob>chi2=0.759	Chi2(3)=20.13 Prob>chi2=0.214	
No. of Instruments in difference equation	25	25	
No. of Instruments in levels equation	25	25	

2.4.4 Effects of family structure on Household Consumption.

Table 2.6 documents results of the fixed effect, random effect and pooled regression analysis. The significace level of lag household per capital expenditure and its residual indicate that the assumption of constant variance is violated. It is also well documented that estimates are grossly bias downward in autoregressive model with fixe effect estimation. As previously mentioned, Stack (1974) and Ermisch and Di Salvo (1997) asserted that while family structure affect economic well-being, reversal effect is likely, where economic factors determine family structure arrangement and this could be a potential source of endogeinit. Thus, a more robust estimation methodology to deal with the problem of endogeneity and any possible issue of reversal effect (system GMM) as reported in Table 2.7)

Table 2.6: Pre-corrected Results: Effects of Family Structure on Household Consumption Expenditure

	Full Sample			Balance Panel		
Variables	**Fixed Coefficients**	**Random Coefficients**	**Pooled Coefficients**	**Fixed Coefficients**	**Random Coefficients**	**Plooled Coefficients**
Lag Household per Capital Consumption	2.0937*** (0.1069)	1.7523*** (0.1016)	0.9359*** (0.0303)	1.6811*** (0.1088)	1.4935*** (0.1326)	0.9278*** (0.0419
Residual of Lag Lag Household per Capital Consumption	-2.4041*** (0.1081)	-1.491 0.101	-0.5364*** (0.0314)	-1.972*** (0.1100)	-1.0888*** (0.1330)	-0.5231*** (0.0436
Married	-0.0209 (0.0397)	0.0029 (0.0191)	-0.0042 (0.0175)	0.0209 (0.0475)	0.0191 (0.0265)	0.0053 (0.0260
Cohabiting	0.4077*** (0.0542)	0.1371*** (0.0386)	-0.0820*** (0.0278)	0.3038*** (0.0651)	-0.0009 (0.0574)	-0.1505*** (0.0457
Divorce/separate	-0.4004*** (0.0534)	-0.1289*** (0.0369)	0.0352 (0.0304)	-0.2342*** (0.0585)	-0.0482 (0.0424)	0.0322 (0.0395
Widow	-0.4458*** (0.0450)	-0.1676*** (0.0292)	0.0044 (0.0192)	-0.2914*** (0.0480)	-0.0547 (0.0339)	0.0342 (0.0256)
Extended household	-0.0306 (0.0303)	-0.0620*** (0.0202)	-0.1459*** (0.0144)	-0.1005*** (0.0341)	-0.0619** (0.0263)	-0.1351*** (0.0205
Female-headed	0.9802*** (0.0806)	0.2801*** 0.0434	-0.0519 (0.0202)	0.8011*** (0.0928)	0.1427** (0.0578)	-0.0798** (0.0302)
Grandparent-headed	1.3938*** (0.0909)	0.4317*** (0.0703)	-0.1463*** (0.0292)	1.1524*** (0.1044)	0.2059** (0.0993)	-0.1987*** (0.0440)
Education_year	-0.1159*** (0.0087)	-0.050*** (0.0062)	-0.0036 (0.0023)	-0.0942*** (0.0096)	-0.0359*** (0.0081)	-0.0023 (0.0034)
African		1.1997*** (0.1477)	0.0608** (0.0285)		0.8598*** (0.1963)	0.0486 (0.0427)
Asian/Indian		0.1870*** (0.0872)	0.0155 (0.0659)		0.1677 (0.1218)	0.0841 (0.1064)
Coloured		0.9647*** (0.1281)			0.6628*** (0.1638)	
Unemployed_h	0.0719*** (0.0249)	-0.0486*** (0.0185)	-0.1281*** (0.0143)	0.01892 (0.0288)	-0.0673*** (0.0248)	-0.1286*** (0.0206)
Rural	0.2929*** (0.0769)	0.1582*** (0.0304)	-0.0277 (0.0176)	0.3247*** (0.0963)	0.1306*** (0.0435)	-0.0267 (0.0255
Income_stepimp	-0.2659*** (0.01793)	-0.0532*** (0.0161)	0.0866*** (0.0092)	-0.1832*** (0.0181)	0.0107 (0.0203)	0.0865*** (0.0129)
Tapwater	-0.18679 (0.24054)	-0.1752*** 0.0239	-0.0114 (0.0292)	-0.3006 (0.31393)	-0.1413*** (0.0313)	0.0061 (0.0418)
Toiletfacility	-0.3430 (0.27932)	-0.0211 (0.0345)	-0.0113 (0.0346)	-0.3036 (0.37257)	-0.0259 (0.0496)	-0.0095 (0.0491)
Eastern Cape	-0.7683** (0.2636)	-0.0195 (0.0332)	-0.0175 (0.0340)	-0.7180** (0.3548)	0.0283 (0.0404)	-0.0502 (0.0468)
Western Cape	-0.2766***	-0.0277	-0.0811**	-0.2845***	0.0329	-0.0924***

	(0.0334)	(0.0400)	(90.0207)	(0.03871)	(0.0503)	(0.0302)
North-west	-0.1195*** (0.0450)	-0.0863** (0.0390)	0.0674** (0.0296)	-0.1500*** (0.0546)	-0.0944** (0.0462)	0.0485 (0.0427)
Gauteng	-0.8203*** (0.1944)	-0.2527*** (0.0423)	-0.0590 (0.0326)	-0.7424*** (0.2646)	-0.1642*** (0.0514)	-0.0490 (0.0472)
Mpumalanga	-1.0659*** (0.2458)	-0.2379**** (0.0397)	-0.1141*** (0.0334)	-1.7300*** (0.43573)	-0.1584*** (0.0480)	-0.0963** (0.0478)
KZN	-0.4677* (0.2426)	-0.1029*** (0.0296)	-0.0808** (0.0260)	-0.4798 (0.3218)	-0.0543 (0.0360)	-0.0534 (0.0368)
Northern-Cape	-0.3580 (0.32796)	0.0147 (0.0408)	0.0196 (0.0349)	-0.3529 (0.4366)	-0.0004 (0.0484)	-0.0071 (0.0497)
Free-state	-0.5992** (0.2525)	-0.0824** (0.0402)	-0.0622 (0.0354)	-0.5028 (0.3213)	-0.0093 (0.0489)	-0.0389) (0.0513)
time2	-0.1823*** (0.0144)	-0.1438*** (0.0142)	0.1387*** (0.0161)	-0.1566*** (0.0182)	-0.1478*** 0.0227	-0.2493*** (0.0232)
_cons	-5.1437*** (0.65481	-5.14072*** 0.735169	0.2485*** (0.0157)	-2.7113 0.7010	-3.4292*** (0.9754	-0.0927*** (0.0217)
R-Squared			0.6082			0.6189
Prob>F			0.000			0.0000
rho	.78392	0.298963		.7675486	0	
No of groups	7,084	7,084		2,151	2,151	
No. of observation	12,261	12,261	12,261	6,105	6,105	6,105

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

The approaches and estimation strategies used to investigate the effects of family structure on household consumption expenditure is similar to that used for household income, dynamic panel analysis due to reversal causality. Thus, it is very likely that living arrangements in households may also respond to economic condition thus, fertility decisions, household management and marital decision may be affected by economic circumstances of the parties (Stack, 1974; Ermisch and Di Salvo, 1997). Specifically, it is likely that (a) higher-status men are more likely to marry, and if there is assortative matching, then higher-status men will marry higher-status women. (b) richer families typically have fewer children; (c) people with more economic power head household among others. Thus, marital status, headship in the household, family type and size are likely to be endogenous to economic status. Hence, a more robust estimatior such as system GMM was employed for this estimation, which uses internal instruments for the endogeneity.

Diagnostic tests such as include Arellano-Bond test for auto regression, Hansen test of over identification, Difference-in-Hansen tests of exogeneity of instrument subsets (Hansen test excluding group and difference) were conducted (Arellano and Bond, 1991; Holtz-Eakin, Newey and Rosen, 1988; Roodman, 2006). The Hansen test is insignificant showing that the null hypothesis that the over-identifying restrictions are valid is not rejected. Difference-in-Hansen tests of exogeneity of instrument subsets (Hansen test excluding group and difference) which are insignificant showing that the instrument used are exogenous. (Table 2.7). The number of instruments used at first difference and level equation are also displayed in the table. The results of lag variable of consumption show that the previous income of household has significant positive relationship with the present household consumption.

The results from dynamic model on the effects of family structure on household consumption are reported in Table 2.7. The results shows that extended family significantly negatively related to household consumption for full sample and balanced panel. This is more likely as households with extended members often tend to be relatively more as compared to purely biological households and quite often, have fewer productive members. Halpern-Meekin and Tach (2008) documented that the ratio of productive to non-productive members in the extended housed is often lower (leading to pressure on the resource) than that of the nuclear household. Because of that, the per capital household income tend to be less. He reported that nuclear family comprising the biological parents with children prove to be economically and sociologically viable than the extended ones. They further pointed out that, extended family structure is more stressful and could affect welfare of which children are the most vulnerable.

Results also show that household headed by female and grandparents have significant negative relationship with the household consumption. Buvinic and Gupta, 1997; World Bank, 2007, Deere and Leon (2003) documented that females are most disadvantaged especially in most developing countries and are more vulnerable and poorer than male and consequently, households headed by females tend to suffer from economic agony. They reported that most females, unlike their male counterparts, have limited access to productive resources, market and credit facilities (King et al., 2007; Storey 2004; Ratusi and Swamy, 1999).

As pointed in the previouse pages, women, women generally have double obligation of providing domestic needs and also participating in the labor market to earn income to support the family.

These constraints imposed on time and mobility could lead to other adverse consequence for the household such as low earnings and for that matter less consumption. Similarly, Greathead (1998) that women experiences series of life interruption events, which encompass maternity, motherhood, among others that could affect their education and labor participation and this eventually affect their earnings and consumption. Hamilton and Jenkins (2015) also documented that even though grandparents provide supporting and helping hands to nuclear household and other social support network, majority are economically unproductive and thus children under their shepherding could suffer economic hardship.

The significant negative relationship between African and coloured race with household per capital consumption within the expectation due to a wide spread of income poverty across most races in South Africa (UCT-GSDPP, 2018). It revealed that the widespread of poverty is a worrisome feature of South African society over 30.4 million people still living in poverty in 2015, out of which approximately 13.8 million of these were living below the Food Poverty Line. With this level of poverty, the consumption will also be low if one does not have a mean to afford. However, the more more one income or household income rises, as seen in the significant positive relationship of income step, the more the purchasing power also increase, hence more consumption bundle. Head Education is significantly positively correlated with household consumption. Garvais and Millear (2016) asserted that as one gets educated, more economic opportunities are open to earn income which also increases consumption tendency.

In the previous section, it was found that Western Cape and Northern Cape were negatively related to household income using (Limpopo province as the based line). This could also lead to low consumption. A report by Statistics of South Africa (2019) listed some provinces including the above as among the poor, where Gauteng and Western Cape were reported to be the list struck by poverty at 29,3% and 33,2%, respectively". Additionally, Time factor in the model (time2, time 3) are significantly negative using the based line of Time 1. Thus as time passes by, more opportunities are likely to unfold for individual to prepare and seize economic chance to earn income and consume more.

Table 2.7 Results of System GMM: Effects of Family Structure on Household Consumption Expenditure

Results of System GMM

Variables	Full Sample Coefficients	Balance Panel Coefficients
L1.	0.1424*** (0.0389)	0.0913*** (0.0382)
Married	-0.0263 (0.2638)	-0.2656 (0.2945)
Cohabiting	-0.1710 (0.3055)	-0.3629 (0.3131)
Divorce/separate	0.46967* (0.2807)	0.0612 (0.3433)
Widow	0.2225 (0.2177)	-0.1555 (0.2740)
Extended household	-0.0691** (0.2019)	-0.2571** (0.2626)
Female-headed	-0.3836** (0.2363)	-0.2960** (0.2997)
Grandparent-headed	-0.8633*** (0.1990)	-0.7626*** (0.2092)
Head's Education	0.0432*** (0.0067)	0.0349*** (0.0069)
African	-1.1704*** (0.1528)	-1.3416*** (0.1810)
Asian/Indian	-0.2831* (0.1526)	-0.1283 (0.24166)
Coloured	-1.1127*** (0.1250)	-1.0892*** (0.1469)
Unemployed Head	-0.2370*** (0.0458)	-0.2062*** (0.0507)
Rural	-0.0128 (0.1426)	-0.0969 (0.1296)
Income_step	0.1309 (0.1338)	0.3089*** (0.1299)
Good water	1.3331* (0.7721)	0.6777 (0.6296)
Toilet facility	0.0204 (0.1123)	0.0675 (0.1047)
Eastern Cape	0.1756 (0.1622)	0.0382* (0.1507)
Western Cape	0.0283 (0.1099)	-0.1256 (0.1278)
North-west	0.1510 (0.1030)	0.0520 (0.1250)

Gauteng	0.1265 (0.0965)	0.0849 (0.1051)
Mpumalanga	-0.0246 (0.0867)	-0.1164 (0.1046)
KZN	0.0090 (0.1112)	-0.0890 (0.1029)
Northern-Cape	-0.0010 (0.1035)	-0.1464 (0.1242)
Free-state	-0.0669 (0.0784)	-0.0973 (0.1078)
time2	-0.4082*** (0.0337)	-0.4199*** (0.0403)
time3	-0.2261*** 0.0308	-0.2398*** (0.0411)
_cons	5.5028*** (1.0046)	6.5358*** (0.9360)
No of groups	7084	2151
No of observation	12,261	6,105

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Diagnostic test for dynamic panel analysis:

Tests	Full Sample	
Arellano-Bond test for AR(1) in first differences:	Z=--7.68 Prob>0.044	Z=-1.60 Prob>0.045
Hansen test of overid. restrictions:	Chi2(4)=35.4 Prob>chi2 0.129	Chi2(4)=7.22 Prob>chi2 0.091
Hansen test excluding group: exofeneity of instrument	Chi2(1)=13.71 Prob>chi2=0.133	Chi2(1)=14.72 Prob>chi2=0.190
Difference (null H = exogenous): exofeneity of instrument	Chi2(3)=21 Prob>chi2=0.246	Chi2(3)=29.1 Prob>chi2=0.110
Hansen test excluding group: exofeneity of instrument	Chi2(1)=7.51 Prob>chi2=0.483	Chi2(3)=8.03 Prob>chi2=0.331
Difference (null H = exogenous): exofeneity of instrument	Chi2(3)=21.90 Prob>chi2=0.09	Chi2(3)=33.1 Prob>chi2=0.105
No. of Instruments in difference equation	29	29
No. of Instruments in levels equation	29	29

Standard errors are indicated in parentheses, *** p<0.01, ** p<0.05, * p<0.1

2.4.5 Study Limitation

It is very necessary to acknowledge some limitations encountered in the study before drawing conclusions. The first one is the unavailability of certain data for further analysis. For instance, in the terms of household reported well-being, items that constitute this well-being score were dropped from the subsequent three waves and this compelled the researcher to do cross-sectional analysis instead of panel analysis for further investigation of dynamic impacts of family structure on the household reported well-being. Also, the items the constitute the index were limited to housing needs, food, health and clothing needs of the household; other items beyond this scope were not including in the index. While acknowledging the uniqueness of the data, it is also worth emphasizing the potential for respondent bias in the measures of items for household reported well-being. Because items for household reported well-being data relied on experiences and not an objective indicator, it is likely for respondents either to understate or overestimate their experiences. However, this concern is partly mitigated by the fact that several items were used thus, minimizing any particular biase and appropriate estimation technique was used. Furthermore, most family structure variables are not indicative of causation for household subjective well-being. Cohabiting households however, have higher subjective well-being, which could be because couples will not be cohabiting together unless they have high subjective well-being as dissolving the arrangement is easier rather dissolving a marriage perhaps, so reversal causality may exist. The study also acknowledges that fixed effect technique is not strongly robust to endogeneity. Lastly, consumption expenditure technically should include all possible consumption for each household, however, in this study, the home-made consumption was not captured due to unavailability of data. The study however, employs right estimation techniques prescribed in the literature.

2.5 Conclusions and Recommendation

Household organization has witnessed continuous changes in many parts of the world especially in Africa due to the inauguration and experience of colonial project in the 19th century. Some of these coordinate changes include family structure, which has witnessed series of metamorphosis in many African households of which South Africa is by no means exception. Along with these family structure dynamics is the changing pattern of household well-being. This triggers an interesting research question to investigate the effects of family structure on household well-being. To this effect, there have been a very few empirical studies in this direction and consequently, the link between family structure and individual income poverty level has been established both locally and internationally. In South Africa, few studies have also been done in line with family structure welfare variables.

However, there are two essential gaps in the literature as far as the implications of family structure on household well-being is concerned. Firstly, the subjective aspect of household well-being has not been investigated in the existing study. Secondly, although there are studies on the association of family structure with household welfare, the existing studies could not bring to light the various components of well-being into a single analysis. This study is therefore very important to empirically examine how family structure in its entirety in a given data set affects household well-being in both monetary and subjective well-being terms. This study therefore uses OLS regression, fixed effect model and dynamic panel analysis techniques (system GMM) to investigate the effects of family structure (in its entirety on the four major component) on household well-being (in both subjective and monetary aspect) in South Africa. Findings emanating from this study show that intact married households have significant positive relationship with household reported well-being, while the relationship of cohabiting with household reported well-being and subjective well-being is positively significant. Furthermore, extended households, households headed by females and grandparents, have significant negative relationship with household income and consumption, Lastly, while grandparent headed household has positve relationship with household reported well-being, bigger household size significantly decrease household reported well-being.

Based on the findings, the implications for policy intervention stress the importance of gender tailored policy for improving household standard of living. This implies that when women are

given equal opportunities to work or to earn income and reach a state of economic autonomy it will translate to enhanced household standard of living. Thus, the South African government should have policy direction to make women recipients of cash transfer program or grant for poor families. It will be helpful in this program to specifically target female and grandparent-headed households. Moreover, coupling the program with income-generating and livelihood projects for poor women and grandparent will aid in ensuring a more sustainable and comprehensive gender targeting approach in poverty reduction programs. Furthermore, governement initiatives or or intervention from civil sociaty or organisation towards economic empowerment extended or larger household to improve their economic fortune especially for poorer household.

2.6 Appendices

Table 2.8: Multicollinearity Results: Household Reported Well-being

	Equal weighted index		Unequal weighted index	
Variable	**VIF**	**1/VIF**	**VIF**	**1/VIF**
House hold size	9.07	0.11026	9.07	0.11026
House hold size squared	7.33	0.136344	7.33	0.136344
Gauteng	3.6	0.27785	3.6	0.27785
African	2.72	0.367528	2.72	0.367528
Western Cape	2.62	0.38098	2.62	0.38098
KZN	2.32	0.431153	2.32	0.431153
Eastern Cape	2.22	0.450592	2.22	0.450592
Log Household income	2.21	0.451689	2.21	0.451689
Married household	2.18	0.457895	2.18	0.457895
Coloured household	1.94	0.515347	1.94	0.515347
Rural Household	1.92	0.520845	1.92	0.520845
Head's Education	1.74	0.574754	1.74	0.574754
Mpumalanga	1.73	0.578678	1.73	0.578678
Female head	1.71	0.583175	1.71	0.583175
Free State	1.68	0.595758	1.68	0.595758
widow	1.61	0.619842	1.61	0.619842
Grandparent head	1.6	0.623454	1.6	0.623454
Northwest	1.59	0.62842	1.59	0.62842
Extended family household	1.54	0.649509	1.54	0.649509

Cohabiting household	1.4	0.716012	1.4	0.716012
Unemployed head	1.33	0.749532	1.33	0.749532
Good water source	1.3	0.768133	1.3	0.768133
Northern Cape	1.28	0.779264	1.28	0.779264
Divorce/Separate household	1.23	0.815228	1.23	0.815228
Toilet facility	1.16	0.862814	1.16	0.862814
Asian/Indian household	1.15	0.868146	1.15	0.868146
Mean VIF	2.32		2.32	

Table 2.9 Variable Definition

	Variables	Definitions
Household well-being	Houhelopd reported well-being	An indexes composed from four items (housing, food, health and clothing needs for household)
	Life satisfaction (head)	measured from 1 to 10 scale for household head
	Household income	Measured as per capital income of each household (in Rand)
	Household consumption	Measured as per capital consumption of each household (in Rand)
Marital status	Intact married Cohabiting Divorced Widow Single	=1 intact married, otherwise 0 =1 cohabiting, otherwise 0 =1 divorced, otherwise 0 =1 widow, otherwise 0 =1 single, otherwise 0
Family type	Extended family	=1 extended family, otherwise 0
Heads hip	Male head	=1 male head Otherwise 0
	Female head	=1 female head Otherwise 0
	Grandparent head	=1 grandparent head Otherwise 0
Family size	Family size	Family size is measured as the number of members per household
Household	Race	
	African	=1 African , otherwise 0
	Asians	=1 Asians , otherwise 0
	Coloured	=1 Coloured , otherwise 0

	White	=1 White , otherwise 0
	Head's education	Years of formal school completed
	Religious belief	=1 has belief ,otherwise 0
	Source of water	=1 has good water source, otherwise 0
	Source of toilet	=1 has good toilet facility, otherwise 0
	Geography	
	Rural/traditional	=1 Rural/trad. , otherwise 0
	Urban	=1 Urban , otherwise 0
	Provinces	
	Western cape	=1 Western cape , otherwise 0
	Eastern Cape	=1 Eastern Cape , otherwise 0
	Northern Cape	=1 Northern Cape , otherwise 0
	Free state	=1 Free state , otherwise 0
	KwaZulu-Natal	=1 KwaZulu-Natal , otherwise 0
	North West	=1 North West, otherwise 0
	Gauteng	=1 Gauteng , otherwise 0
	Mpumalanga	=1 Mpumalanga , otherwise 0
	Limpopo	=1 Limpopo, otherwise 0

CHAPTER THREE

Early Motherhood and Women's Later Life Outcomes: Evidence from South Africa.

3.1 Introduction

Motherhood and its later life consequences have received a considerable attention in recent years due to its fundamental and pivotal link to later life outcomes and inter-generational development of mothers. In most societies, motherhood is a cardinal developmental stage in women's lives that defines their traditional gender roles and social inclination in the societal cultural system (Ngum, Pranee, and Celia, 2015; Hobcraft and Kiernan, 2001; Ermisch, 2003). This critical stage of development is not only a key experience of women in the global planet but more importantly in Africa where motherhood is viewed as nucleonic precursor for family continuity with social life orientated towards children bearing. This, coupled with social recognition and privileges, creates a positive orientation towards motherhood (Bledsoe and Cohen, 1993). Over the last decade, however, the prevalence and trend of early motherhood has taken different dimensions in the global landscape.

The prevalence of adolescent motherhood is astronomically high in the United States and the United Kingdom compared to other countries in the developed world (Renata and Maria, 2016, Goodmany, Kaplan and Walker, 2004). Furthermore, although the prevalence rate of adolescent motherhood has been on a downward trend in most European countries, except for the United Kingdom, the trend is still very high in the United States (Richter, Norris, Ginsburg, 2006). With respect to the trend, Vinnerjung, Franzen and Danielsson (2007) have documented that the United States of America (USA) has reached a high level with a prevalence of the adolescent birth rate of 52.1% on 1000 women in the United States within the age group of 15-19 years, compared to other countries in the developed world, followed by the United Kingdom in Europe which registered 30.8%, then Canada with 20.2% of the prevalence rate and, finally, Australia with 18.4% of adolescents in the same age group. Asia follows a similar trend, recording 56 per 1,000 girls in the same age group, rising to 70 per 1,000 girls in Thailand (Chauke, 2013). The above percentages are above the world record of the World Health Organization (2011), which found that in every 1,000 girls, there are on average 65 births for people aged between 15 and 19.

In Africa, Niger holds the highest rate of adolescent pregnancies and marriages between minors: about 75% of girls are married and 51% have given birth to at least one child before the age of 18 (Stuart, 2013). While in Mozambique, 41% of women already have a child when they reach 20, 47% and 55% of women have a child before they turn 18 respectively in Chad and Mali. This prevalence rate is very similar to that in Nigeria, Liberia and other African countries, including South Africa (Health and Demographic Survey, 1992).

Teenage pregnancy, early motherhood, in South Africa, has reached an alarming proportion over the past years (Samantha, 2013; Sibeko, 2012; Karra and Lee, 2012; Makiwane et al., 2006). Statistics of South Africa (2011) reported that 40.8% of all mothers in South Africa had their first child while in teenage and this early timing of motherhood has been a recurrent experience over many decades. Additionally, Thandiwe (2011) revealed findings contained in a report by the Medical Research Council in the year 2008 on the incidence of teenage pregnancy among South African youth within 13-19 age group. He documented that 37% of school-going learners (boys and girls) across the nation had initiated sexual activities while a quarter (24.4%) of school-going girls became pregnant. This, according to the report, is an increase compared to the previous record in 2002. Despite the significant reduction in adolescent fertility in recent decades, the current prevalence rate is still very high, representing 30% of the 15-19 year old group said to be always pregnant, while only a third teenagers return to school later childbirth (Samantha, 2013). The high incidence of adolescent motherhood has raised a research concern about possible implications.

Several studies have been conducted to investigate the timing of motherhood and its effects on the subsequent socio-economic status of the mothers and their later life development with different methodologies. For example, in the United States, Great Britain and other developed countries, few studies have confirmed that adolescent motherhood has great potential to influence the outcomes of women's lives in the education and labor participation (Goodmany, Kaplan and Walker, 2004; Hobcraft and Kiernan, 2001). Similar studies have also been conducted in Australia and Asia (Watts, Liamputtong and Mcmichael, 2015). Other studies reveal that early motherhood could influence the mother's behavior and parenting attitude. In South Africa, only some descriptive studies such as Dlamini (2016) and Thandiwe (2011) have been conducted on the causes and educational impact of early motherhood in some segments of the country.

The available literature has established the high incidence of teenage pregnancy, but to what degree does it affect the later life outcome of teen mothers? This question remains a puzzle to which the existing empirical studies fail to fully address, nearly all the studies focus on educational impacts with a few others on economic effect of early motherhood. Other life outcomes such as life satisfaction have not been investigated in any of the studies. The psychological and health effects of early motherhood have also not been well investigated. In South Africa, the available studies on the impacts of early motherhood are mainly descriptive in nature, with most limited to educational impact.

Thus, the study goes beyond the education and economic impact of early motherhood to look into psychological well-being, life satisfaction and health outcomes of early motherhood using propensity score with different matching algorithms or techniques.

3.2 Literature Review

3.2.1 Theoretical Framework

Intersectionality theory establishes various developmental intersections that landmark women's life such as motherhood, which often comes with obligations (Collins 1990; Crenshaw, 1989). In this theory, as a woman enters into motherhood, the continuous demand and increasing responsibilities pose time constraints in pursuing other opportunity for better life outcomes especially on the part of early-time mothers. This motherhood experience especially in early time of life not only disrupts life pursuit such as education and availability of employment but also has potential effects on the physical and psychological well-being of the mothers (Genobaga, 2004).

This motherhood experiences is a norm, particularly with women living in Sub-Saharan African region, where marriage and childbearing are intrinsic part of socio-cultural system since marriage and child bearing, in many cases, define and spell out women's position in the society (Ngum, 2012; Benza and Liamputtong, 2015). Understanding motherhood experiences and for that matter, later life consequences of early mothers requires that previous economic backgrounds including childhood poverty and journeys they have experienced with other covariates are considered (Watts, Liamputtong, and Mcmichael, 2015).

Household production theory in Ribar and Wilhelm (1999), Becker (1965) and Gronau (1973) postulates that early motherhood has a great potential of affecting mothers' socioe-conomic and other life outcomes. According to this theory, the responsibilities that go with raising up children could adversely affect job market participation of teen mothers, which may ultimately translate into a decrease in income earnings and other work related rewards. Additionally, with mothers who are gainfully employed, the increasing demand of responsibilities at home also raise the tendency of absenteeism from work, reduction in work productivity and could potentially limit them from getting certain kind of job with pay (Ribar, 1999). Thandiwe (2011), Grethead (1998) and Naidoo (2005) have validated this in the South African context.

Economic approach is another tool for investigating the behavioral aspect of early motherhood. In this theory, women may analyze their present situation and fortune in light of economic benefit to gain following certain decision and action. Thus, those who see the opportunity cost of child bearing to be less than the potential economic befit from being a mother may choose to enter into early motherhood (Montgomery and Trussell, 1986; Becker, 1981). This also means that women evaluate both the short-term outcome and the long-term consequences of their decisions and actions in light of the poor educational and employment results of the current situation and can choose to enter the first maternity leave. In this situation, it is very likely that economic difficulties may be a driving force towards early motherhood rather than early maternity that causes poor economic well-being. Therefore, the issue of endogeneity becomes a problem, but this has been taken into consideration in the estimation of this study. While the negative relationship between early motherhood and socioe-conomic outcomes is possible as sanctioned by economic theory, it is also possible to see a positive relationship.

3.2.2 Teenage birth rate by race and province

The dynamics of fertility among teenagers has been documented to vary by race and province of residence in South Africa. Table 3.1 reports the distribution of teenage birth rate per 1000 women from 15-19 years by race and provinces for the 2001 and 2011 censuses and the percentage of teenagers who gave birth reported in 2016. The table shows that

Teenage birth rate was high amongst black African race (71 and 76, respectively) and coloured race (60 and 71, respectively) women. However, between 2001 and 2011, the teenage birth rate for the coloured race increased by 11 births per 1 000 women, whereas a decline of 5 births per 1 000 women was recorded for black African race. Generally, teenage childbearing is low among the white and Indian/Asian race; over the 2001–2011 period, the teenage birth rate for white adolescent women remained unchanged at 14 births per 1 000 women while the birth rate among Indian/Asian women slightly decreased from 22 births per 1 000 women in 2001 to 20 in 2011. The differences in teenage birth rate was also observed by province of residence. The table documents that teenage birth rate has increased from 2001 to 2011 in all the provinces, except Mpumalanga and Limpopo. In 2001, Mpumalanga (88), Limpopo (85) and KwaZulu-Natal (77) had the highest teenage birth rate. However, in 2011, the highest ABR was 82 births per 1 000 women for both Mpumalanga and Northern Cape. The two census years are marked by a lower teenage birth rate for Gauteng (48 and 57, respectively), followed by Western Cape (50 and 60, respectively).

In terms of the percentage of teenagers who gave birth in 2016, black African race recorded the higher percentage (12.5%) and coloured (11.1%) race had a live birth in 2016. Conversely, teenage motherhood was lower among the Indian/Asian and white population. Teenage motherhood was highest at 14.2% and 14.0% in Eastern Cape and Northern Cape, respectively. Low levels of teenage motherhood in 2016 were observable in Western Cape (9.6%) and Gauteng (8.1%).

Table 3.1 Teenage birth rate by race and province, Census 2001, 2011 and 2016

Race and Province	teenage birth rate per 1000 women from 15-19 years	teenage birth rate per 1000 women from 15-19 years	Percentage of teenagers who gave
	2001	2011	2016
Race			
Black African	71	76	12.5
Coloured	60	71	11.1
Indian/Asian	22	20	2.4
White	14	14	1.8
Province			
Western Cape	50	60	9.6
Eastern Cape	60	76	14.2
Northern Cape	61	82	14.0
Free State	58	71	10.3
KZN	77	78	12.6
North West	62	78	11.9
Gauteng	48	57	8.1
Mpumalanga	88	82	12.8
Limpopo	85	76	12.2
South Africa	65	72	11.6

Source: Statistics of South Africa, 2018

3.2.3 Policy on teenage pregnancy: South African perspective

The Department of Education's (2010) Policy on Measures for the Prevention and Management of Learner Pregnancy catalogue a range of proactive and reactive measures to curb the issue of teenage pregnancy among the adolescents. According to the Department of Education's Policy on Measures for the Prevention and management of Learner Pregnancy (2010), the Provincial Education Department must furnish each school with a copy of these measures, and ensure their strict compliance. They should also try to make sure that both educators and managers are equipped with up-to-date measure to tackle any challenges related to teenage pregnancy. Schools should also ensure that parents are well informed about these measures (Ramulumo and Pitsoe, 2013).

Mngoma (2010) reports that pregnancy among teenage pupils is still a huge challenge for many local schools that believe they are fighting a losing battle, with some reporting as many as 20

pregnant teenagers in their schools each year. This happens despite all the campaigns that are launched on sex education and even teachings in life orientation at school. In the executive summary of their research, Macleod and Tracy (2009) indicated that capacity at provincial and district level is identified as an obstacle to implementation in general, and that educators as well as district and provincial level coordinators and management experience a lack of resources that impinge on interventions. This leaves educators together with SMTs with few or no options for how to deal with teenage pregnancy at school (Ramulumo and Pitsoe, 2013).

Some of the school managers are not aware of or are either ignorant of the policy and guidelines of the Department of Education when it comes to teenage pregnancy. Majavu (2009) reports that the principal of Rosendal High School suspended between seven and 20 pregnant pupils from school – some before their pregnancies even became visible. He said that girls can't be running around the school because they might get hurt (Sowetan 2009). The challenge that principals of schools face is how to handle pregnant learners. In this case the principal is violating the Constitution of the Republic of South Africa and the South African Schools Act which allow teenagers rights to education irrespective of pregnancy.

Hlungwani (2011) reported in Sowetan Live that pupils at Mavalani Secondary School outside Giyani, Limpopo, went on rampage, destroying property after accusing the principal of reporting that 57 of their schoolmates were pregnant and the youngest expectant mother was 13 years old (Sowetan , 2011). This confirms the high rate of pregnancy among teenagers who are still at school. It further suggests that parents and educators may be failing in curbing teenage pregnancy. Principals face this challenge of teenage pregnancy daily. African school girls in particular are under pressure. In a context of fragmented family structures, where parents are either absent or working and living in urban areas and where schools offer no support for childcare, they bear the burden of baby care and their school work suffers, although not all African school girls experience the same difficulties (Bhana et al., 2008). This implies that lack of parental care may lead to teenage pregnancy. According to Bhana et al. (2008), principals of schools do not even have the skills and capacity to deal with pregnant learners; hence they encourage learners to resume schooling after giving birth. Even though the government and the Department of Education in particular are doing their utmost to curb and reduce the number of

pregnant teenagers attending school, the number is increasing yearly (Ramulumo and Pitsoe, 2013).

3.2.4 Teenage pregnancy in schooling versus MDG[3]s and EFA[4] goals

The Bill of Rights in the South African Constitution (RSA, 1996a) stipulates that "everyone has the right to a basic education, including adult basic education; and further education, which the State, through reasonable measures, must make progressively available and accessible" (Department of Education, 2010). In terms of the South African Schools Act (SASA) (RSA 1996a and 1996b), education for learners is compulsory for children turning 7 until the age of 15 or Grade 9 (whichever comes first). Although education is not compulsory for learners beyond Grade 9, the government encourages learners to enrol beyond Grade 9 and no learner who wishes to continue to Grade 12 is denied access to schooling (Department of Education 2010).

The 2000 Dakar Framework for Action sets out six Education For All (EFA) goals. The goals are global in nature. Via a process of consultation with stakeholders and with the assistance of the wider international community, as well as EFA follow-up mechanisms, countries were expected to set their own goals, intermediate targets and timelines within existing or new national education plans (UNESCO, 2000). The six EFA goals are as follows:

1. Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children.
2. Ensuring that by 2015, all children, particularly females, children in difficult circumstances and those belonging to ethnic minorities, have access to a completely free and compulsory primary education of good quality.
3. Ensuring that the learning needs of all young people and adults are met via equitable access to appropriate learning and life skills programmes.
4. Achieving a 50% improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.

[3] MDG stands for Millinium Development Goal
[4] EFA stands For Education for All

5. Eliminating gender disparities in primary and secondary education by 2015, and achieving gender equality in education by 2015, with the focus on ensuring females' full and equal access to, and achievement in basic education of, good quality.
6. Improving all aspects of the quality of education and ensuring excellence for all, so that recognised and measurable learning outcomes are achieved by all – especially in literacy, numeracy and essential life skills (Department of Education 2010).

While EFA goal number 2 ensures that by 2015 all children, females in particular, should have access to free and compulsory education, the Department of Education (2010) reports that pregnancy and teenage mothers constitute major causes of secondary school dropouts for girls. It seems as if it will be a big challenge to attain this goal because those learners that are mostly needed at school are dropping out because of pregnancy. Even though there are policies to deal with pregnant learners, principals are doing little to emphasize schooling when a learner becomes pregnant; instead they are encouraging learners to leave school. This argument is supported by Majangaza's (2011) report that a Transkei principal who expelled two pregnant learners from his school last year has again defied orders from the education authorities by again expelling pregnant learners (Ramulumo and Pitsoe, 2013).

Millenium development goal (MDG) number 2 focuses on achieving universal primary education. According to the Commission for Gender Equality's report (2010), studies have shown that girls tend to drop out earlier than boys because of numerous socioeconomic factors, such as teenage pregnancy, lack of access to safe transport, domestic responsibilities, and being orphaned as a result of their parents dying of HIV and AIDS. Education is central to the development of young people as it prepares them for the world of work and for life. In line with global trends, it is encouraging to note that young people in South Africa are spending more years acquiring the requisite levels of education (Ramulumo and Pitsoe, 2013). There are, however, various socioeconomic factors which impede learners' education process and cause them to drop out of schooling, such as teenage pregnancy and poverty (Commission for Gender Equality, 2010).

The report of the Commission for Gender Equality (2010) states that in 2008, the Department of Education in collaboration with the United Nations Children's Fund (UNICEF) commissioned

the Human Sciences Research Council to conduct a study on the prevalence of learner pregnancy in South African schools. The study revealed the following:

1. There was an increase in learner pregnancies between 2004 and 2008.
2. Provincial trends show a concentration of learner pregnancies in the predominantly rural Eastern Cape, KwaZulu-Natal and Limpopo provinces.
3. Learner pregnancies are predominant in schools that are poorly resourced, those located in poor neighborhoods, those schools having no fees and those located on land independently owned (farm schools), as well as in schools that involve considerable age mixing (combined schools). Pregnancy rates are lower in specialized schools.

3.2.5 Possible Effects of Pregnancy on Young Mothers

Teenage pregnancy poses possible disruption to educational attainment of teen mothers. Pregnancy goes with additional responsibilities. Due to the emergence of pregnancy, and the need to care for it and be available for prenatal services, pregnant teenagers often discontinue schooling, and most of them do not go back to school after child delivering, as confirmed later in this study with South African teenagers. This disruption in schooling may further disadvantage them economically (Thandiwe, 2011). According to Greathead (1998), the tertiary educational attainment of most mothers is limited and as a result, most of these mothers do not have the requisite job knowledge and skills that make them employable and competitive in the labor market, a situation that can further create permanent economic disadvantage. Additionally, most of these mothers end with jobs, which pay very low and therefore do not earn sufficient income to meet their needs and that of the family (Naidoo, 2005). In this condition of financial drawback, teenagers become dependent on family support and government grants for survival (Gouws, Kruger, and Burger, 2008).

Secondly, pregnancy has the potential of affecting mothers' psychological well-being. For instance, in a situation where they face difficulty in disclosing pregnancies due to potential hatred, rejection and reproach, pregnant teenagers suffer psychological trauma, and stress with some degree of depression. These effects sometimes manifest in many forms ranging from regret, grief, anger, and sometimes anxiety of life after delivering. These effects can develop into

advance stage of emergency, which in some cases, can affect the physical state of the mother (Jones and Battle, 1990). In some circumstances, unprofessional behavior of some health personnel or workers can aggravate the traumatic experience of the teenage mothers. Moreover, the young mothers do not normally have the necessary skills to bring up or raise children, and sometimes, the difficulty they experience in coping with the increasing pressure for caring to the newborn babies may fill them with anxiety, disappointment and other forms of emotional agony (Genobaga, 2004).

Teenage pregnancy poses significant health risk to the pregnant mothers. Most often, teenagers have the tendency of hiding pregnancy until the situation becomes more obvious. Some of them develop pregnancy related complications, which if not well managed result in emergency medical situation, which may damage their health, and sometimes, leave them physically deformed. (Bullock, 1992). Genobaga (2004) has documented that early mothers have an increased risk of health-related complications in the form of low weight, anemia, hypertension, poor diet, immature physiological development and are exposed to sexually transmitted diseases during pregnancy than older mothers (Thandiwe, 2011; Martin, 2003). Furthermore, Don, Audrey, Lucie, Catherine and Helen (2006) reported that the prevalence of parental death in South Africa was 27.3% for young people who were in the 15-24 age group; Of this, 7.9% was maternal death. Nteboheleng (2014) also documented that of the 562 deaths there were 33 maternal deaths of adolescents. Of these deaths, 54.5% were adolescents between 18 and 19 years of age. These relatively high rates of maternal mortality could lead to selective impairment, as evidenced in the limitation of the study for which an appropriate estimation technique was employed.

The likelihood of teen mothers feeling satisfied in life is lower compared to non-teen mothers are. Teenage mothers who experience disruption in schooling and could not return to school after delivering may become economically disadvantaged with a deep sense of unfulfilled dreams. This dissatisfaction becomes more down heartening especially when their peers make significant progress in life as compared to them. With satisfaction level, Jiang, Klein, and Saunders (2015), Festinger (1942) and Festinger (1954) under discrepancy theory provide a broad spectrum to explain life satisfaction. According to them, essentially, satisfaction is derived from a process that compares one outcome of experience with the other and establishes judgement based on the emerging wellness outcome of the comparison. Thus, the conclusion is arrived at by cognitively

processing the relationship between what one anticipated and the reality that occurs to establish one's life satisfaction level. This conclusively implies that an individual may be well satisfied when his reference points of comparison are peers of the same level and may feel less satisfy in the mist of well-off peers and vice versa.

Hoda, and Oraynab (2017) reported that other maternal factors, such as education and employment status greatly effect women later life outcomes. Irwin, Siddiqi, and Hertzman (2007) revealed that the geographical location is a key determinant of well-being as the availability of facilities and infrastructure create enabling environment and favorable opportunity that push one's economic fortune and overall well-being. Other factors that affect women later life outcome include religion (New, and Graham, 2018), infrastructure such as good source of water and toilet facility (Mahmud and Sawada, 2014), number (Heer, 1985), smoking (Allen, Cheryl and Hatsukami, 2016) and alcohol consumption (Bramson, Williams, Krumholz, and Vaccarino, 2001).

3.2.6 Empirical Findings in the Existing Literature

Before the rigorous empirical study was conducted by Geronimus and Korenman (1992) in the US, most of the available literature mainly focused on cross-sectional regression techniques, and concluded that teen motherhood and a host of women life later outcomes are negatively related. Following this, other studies with the application of various analytical techniques evolved, including family fixed and sibling fixed effects (Hoffman, Foster, and Furstenberg, 1993: Geronimus and Korenman, 1992), quasi-experimental technique (Hotz, McElroy, and Sanders, 1997; Bronars and Grogger, 1994; Olsen and Farkas, 1989), and instrumental variable approach (Klepinger, Lundberg, and Plotnick, 1995; Ribar, 1996; Ribar, 1994; Marini 1984; Rindfuss, Bumpass, and John, 1980), multiple regression equation model by (Ribar, 1999), technique for survival study and studies which used dynamic techniques (Upchurch and McCarthy, 1990; Ribar, 1996), propensity score matching approach (Levine and Painter, 2003; Viola and Jochen, 2015) and yielded different estimated results. Despite the successful endeavors by these researchers, most of their estimates are sensitive to different assumptions, lack consistency, and consequently, limits policy relevance of their studies.

Additionally, several other innovative and appealing techniques were launched to check any unobservable precursors or characteristics that may influence both treatment and outcome variables. This is a further improvement over the traditional regression, which controls observed characteristics.

Robinson (2002) on the other hand built a synthetic cohort to investigate the impacts of adolescent pregnancy on labor participation and earnings of young mothers involved. He found significant wage penalty associated with the early cohort, thus, salary penalty seems to be greater for this group than the delayed group. While his result took into consideration the sensitivity of result to parental class and the country of respondents, it however, excluded the sensitivity of result to other unobservables that may affect the outcome. Furthermore, other techniques such as fixed effect methodology and instrumental variable were used to address the issue of unobserved heretorogeneity. This strategy employs the uses of respondents who share similar background characteristics such as twins, sisters from same parents, or family, among others to eliminate the problem of endogneity and unobserved heterogeneity. Geronimus and Korenman (1992) who used samples taken from the National Longitudinal Survey of Young Women (NLSYW) applied this methodology. They found that after controlling for all the background characteristics, the effect was not statistically different from zero. One major problem with this estimation methodology is that it is often very difficult to get significant sample size that is big enough for this estimation. In other word, it requires large family size, and it is often very difficult to get more respondents who are twins to constitute the study sample. Secondly, that methodology does not entirely guarantee that once the background characteristics are controlled, there will not be any hidden individual effect.

However, similar study conducted by Hoffman, Foster and Furstenberg (1993b) based on the results of the NLSYW documented that there is a significant negative impacts of early motherhood on mothers' later life even though the effect is very small. This finding reinforces similar conclusion by Hoffman, Foster and Furstenberg (1993) who used PSID data to investigate the effect of early maternity. They argued that, using fixed effect only controls background or family characteristics but not individual characteristics, and that these hidden differing characteristics can affect the socio-economic outcome of the mothers as well. Bronars and

Groggar (1994) also used the same techniques and found that adolescent motherhood significantly affects mothers' participation in the labour market in the short run

Furthermore, Ermisch (2003) used Panel survey data from British Household over the years 1991-2001 to investigate the effects of early motherhood on the workelessness of the mothers. He found mothers who entered into motherhood in their teen are not likely to be employed in their thirtieth or fortieth even though their pay for work are not affected once employed. Even though he controlled for factors such as if father was employed in the teenage and if the teenager comes from single family. He however, pointed out that this is insufficient to control to satisfy the assumption of conditional independence (that is, motherhood is not significantly related with unobserved characteristics on the later outcomes) to be met for these estimated results to have an inference, or a causal interpretation.

Other researchers employed different techniques including instrumental variable technique for the estimation. These include the use of age at menarch and other indicators of sexual awareness on the part of the teenagers. For instance, Chevalier and Viitanen (2003) used age of menarche as an instrument for the estimation, while Klepinger, Lundberg, and Plotnick (1998) used menarche and state or county level information as instrument. Evidence from these results shows that studies that employed age as instrumental variable to estimate the effect of early motherhood should interpret the results with caution. This is because, age at menarche may change the time of pregnancy exogenously and that it is not likely that it may significantly affect whether or not a young or teenage mother gives birth, conditional on becoming pregnant. This latter avenue is needed to unmask the impacts of early motherhood on later socio-economic outcomes of early mothers. Furthermore, the unavailability of data as in the case of the current study greatly limits the use of this approach.

Another potentially useful methodology, which sparks a lot of debate, is to utilize the randomness of miscarriage as a way of delaying timing of motherhood at first birth. Following this new development, several studies were conducted by Hotz, McElroy, and Sanders (1997), Goodman, Kaplan and Walker (2004), Ermischet al (2003), and Ashcraft and Lang (2006), each of which used data on miscarriage as an instrument to investigate the effects of early motherhood on later life outcome of young mothers. This approach mimics a natural experiment, where the experience of miscarriage in this case is considered as a treatment, which exogenously delays motherhood age. This then effectively allows the counterfactual for the outcomes to be effectively built up, in

case the mother delayed birth. Fletcher and Wolfe (2009), however, suggest that miscarriage is associated with flawed and might not actually be random events, and might be associated with potential factors, which are related to the community. However, all three papers that adopt this method find results that are largely statistically insignificant. There is a substantial limitation to data on miscarriages in this study.

The next approach in the literature focuses on the use of Propensity Score Matching (PSM) technique, which aims at building a synthetic control group such that the treated group (*i.e.,* teenage mothers) can be compared to with the control group, the delayed mothers. Levine and Painter (2003) pioneered this innovative technique and found that, as with the sibling (fixed) and instrumental variable technique, the actual effect of teen motherhood on education is negative but is significantly lesser than cross-sectional results.

In South Africa, only a few multivariate quantitative studies exist on the impacts of early motherhood on women's emotional experiences on schooling and financial outcomes. Nothile (2016) conducted a qualitative study of teenagers' experience of motherhood in Kwa-Zulu Natal. He reported that mothers experience fear and sadness at the realization of pregnancy. Additionally, Malahlela (2012) used descriptive statistics to examine how the educators perceive impact of teenage pregnancy on the behavior of learners in some selected secondary schools in Mankweng area in the province of Limpopo. He found a negative relationship between teenage pregnancy and learners' school attendance and academic performance. Secondly, Yako (2007) also used descriptive analysis to investigate the effects of teenage pregnancy on the adolescent single mothers in Lesotho. He found that teenage pregnancy causes financial difficulty among the adolescent and deprive them of joy. Panday, Makiwane, Ranchod, and Letsoalo (2009) in their descriptive analysis found that, teenage pregnancy disrupts teenagers' education. Lastly, Maphothi (2014) used qualitative research method to investigate the impact of early motherhood on the educational outcomes of female learners in secondary school. He found that various experiences of motherhood affect the academic performance of female mothers. Almost all the studies done in South Africa on the impacts of motherhood on life outcome are, however, descriptive and qualitative in nature and are mainly on educational effects with few descriptive studies on financial and emotional challenges of early motherhood.

Two significant global issues are observed with the reviews in the forgoing studies, which are empirical gaps and methodological weaknesses. A few studies on the later life outcomes of early

motherhood have been done. However, most of these studies are on educational outcome with a limited work done on economic outcome. Furthermore, almost, no study has been done anywhere on how early motherhood affect women's life satisfaction. Additionally, there is a paucity of quantitative work done on the psychological and health effects of early mothers. Lastly, although a few studies exist in South Africa on the effects of early motherhood on mothers' schooling, financial and emotional outcomes, nearly all these studies are descriptive and qualitative in nature. Thus, this study aims at filling these gaps in the literature by investigating all the five later life outcomes as postulated in the theory, which encompasses education, economic well-being, psychological well-being, health outcomes and life satisfaction using propensity score with diferent matching algorithms.

3.3 Methodology

3.3.1 Data

This paper uses pooled data from four waves of National Income Dynamic Study (NIDS) survey collected from 2008-2014 in South Africa for the analysis. NIDS data contain a total of about 14072 different individual mothers across the four waves from 2008-2014 who have given birth at least once with relevant retrospective information such as childhood experiences, parental characteristics, time of motherhood and other background information of the mothers. The data contain life outcomes such as education, economic well-being, psychological outcomes, life satisfaction and health (perceived health status and obesity). Each subject has unique identifier and is related to household which also has unique identifier. Thus these identifiers were the means of merging and appending to create the data set for this analysis. In dealing with the missing observations, the data were carefully studied and analyzed (such as *mcartest* in stata version 14) to identify the causes of the missing observations and if the data points were missing completely at random, missing at random and not missing at random(Graham, 2009; Kim, and Curry, 1977; Rubin, 1976). In dealing with missing completely at random they recommended that one should to ignore the missingness if it constitutes less than 5% of the observation in large data and drop the entire variable if the missingness amounts to over 60% of the observations. The former rule was applied with caution as most of the variables with missing values have related questions which help in supplying data points for missing observations leaving no or missing

values of less than 1 % for outcome and explanatory variables.. Concerning missing values that are not randomly distributed across observations but are distributed within one or more sub-samples, the data points were derive from the primary indicators. For instance, where missing values exist in the "highest education attained" variable, it was derived from the separate response to questions of "highest school grade completed" or "highest level of tertiary education completed" variables.

Summary Statistics

Table 3.2A and 3.2B reports the summary statistics of demographic and socioeconomic characteristics of mothers for the full sample and across wave respectively. Table 3.2A shows that out of a total sample of 14,072, 31.5% are mothers who had first births in their teenage (before 20 years of age) while about 68.5% were delayed mothers, that is, they entered into their first motherhood experience at the age of 20 years and above. The table further reveals that 95.15% of teen mothers experienced childhood poverty while 93.5 % of non-teen mothers poor in their childhood. This statistics is fairly stable across waves in Table 3.2B. Although childhood poverty experience is higher for teen mothers than the delayed mothers, the high figures for both indicate that childhood poverty is a wide spread phenomenon in South Africa. This assertion is well documented in Statistics of South Africa (2019) that majority of South Africa is in some forms of poverty. The UCT Graduate School of Development Policy and Practice [UCT-GSDPP] (2018) also reported that a widespread poverty remains a concerning feature of South African society: according to a recently released report by Statistics South Africa, over 30.4 million people were still living in poverty in 2015, and approximately 13.8 million of these were living below the Food Poverty Line. The years of education, average monthly income (in rand),, life satisfaction level, psychological well-being, good health and obesity for teen mothers are, 8.4 years, R2688, 5.1 scale, 20.0 scale, 86.6% and 34.0 respectively. While that for delayed mothers are 8.5years, R4290, 5.2 scale, 20.3 scale, 77.3 % were in good health and 40.1 % were obese. Furthermore, about 24.7% and 38.1% of teen and delayed mothers respectively had no formal education which is relatively higher than those with some levels of formal education. This is expected because teen mothers are more likely to be out our labour force at least around maternal

period that may shorten their availability for learning, work or working experience and this could ultimately affect their income.

Additionally, the average period gaps (that is the year gap from the last delivery to the time of data collection) for teen mothers and delayed mothers were 14.0 and 16.6 years. Younger mothers in productive age would more likely incline to more childbearing than the delayed mothers and so it is expected that the age gap be lower for the teen mothers than the delayed mothers. The table also reveals that 58.8% and 69.3% of teen mothers and delayed mothers respectively had both parent alive during their teenage. It is believed that parents are primary source of moral support and advice for life choices and so their availability in the critical periods of children's development such as during adolescents' period maximizes chance of good choices such as those related to pregnancy. Concerning the marital status of these mothers, the table shows that out of wedlock recorded the highest for both teenage and delayed mothers, representing 62.8% and 40.8% respectively. This means that childbearing ocured outside marriage, which is a normal trend in South Africa (Statistcis of South Africa, 2018). It is also expected that where out of wedlock childbearing occurs, the chance of single parenting become higher thereby posing significant risk to mothers' outcomes and to the child development. The racial and provincial distributions of teen and delayed motherhood which trend is consistent across wave (Table 3.2B) is not surprising. This distribution is closely parelleled to the report by Statistics of South Africa (2018). African raise has always been the dorminant race in South Africa with rising level of teen childbearing. The trend for province is also almost the same. Table 3.2B also show that there is no substantial difference between motherhood outcomes (especially for life satisfaction, psychology/depression score, education, perceived health, underweight, overweight, and obseisty) and other covariates over time.

Table 3.2A Summary Statistics for all the waves

Variables	Teen Mothers %	Delayed Mothers%
Childhood poverty	95.15	93.5
Education*	8.4(3.9)	8.5(5.6)
Income*	2688.1(3705.1)	4290.0(6388.6)
Satisfaction*	5.1(2.3)	5.2(2.2)
Psychology/Depression*	20.0(4.2)	20.3(4.2)
Health Excellent	32.2	23.9
Health Very good	29.9	25.1
Health Good	24.4	28.2
Health Fair	8.3	14.7
Heaith Poor	5.0	7.9
Binary Good Health	86.6	77.3
underweight	4.13	3.6
overweight	24.2	24.3
Obesity	34.0	40.1
Year gap from last birth*	14.0(14.0)	16.6(14.0)
No. of Children*	2.5(2.2)	3.6(2.9)
Mother's formal education	24.7	38.1
Mother's Grade 0-7	12.6	12.2
Mother's Grade 8-11	10.1	8.9
Mother's Matrics	2.9	3.6
Mother's Tertiary	1.0	2.9
Unemployed parents	13.5	19.2
Unemployed mother	33.1	44.6
Married	17.9	30.5
Cohabiting	11.1	9.0
Divorce/separate	2.2	3.5
widow	6.4	16.1
Out of wedlock	62.4	40.8
African	84.4	80.9
Asian/India	0.3	1.3
Coloured	13.6	13.4
White	1.4	4.4
Western Cape	10.6	12.1
Eastern Cape	12.3	12.8
Northern Cape	7.5	7.1
Free State	5.8	5.4
KZN	29.8	29.3
Northwest	6.3	6.4
Gauteng	10.1	10.5
Mpumalanga	8.9	6.6
Limpopo	8.5	9.6

Total	**4,429**	**9,643**

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

Table 3.2B Summary Statistics Across Each Wave

	Wave 1 (2008) %		**Wave 2 (2010) %**		**Wave3 (2012) %**		**Wave 4(2014) %**	
Variables	Teen mothers	Delayed mothers	Teen mothers	Delayed mothers	Teen mothers	Delayed mothers	Teen mothers	Delayed mothers
Childhood poverty	95.6	93.5	94.6	93.1	93.8	94.6	95.4	92.9
Education*	8.3 (4.2)	7.5 (5.7)	9.3 (3.5)	8.9 (5.3)	9.4 (3.6)	9.4 (5.3)	9.6 (3.7)	9.7 (5.4)
Income*	1160.1 (997.8)	1501.9 (3173.8)	1237.5 (1813.1)	1576.7 (2269.8)	1301.1 (1588.3)	1860.7 (3084.2)	1513.5 (2344.9)	2035.2 (3650.1)
Satisfaction*	5.2 (2.3)	5.2 (2.2)	4.4 (2.2)	4.4 (2.2)	4.9 (2.4)	5.0 (2.3)	5.3 (2.2)	5.4 (2.2)
Psychology/Depression*	18.7 (5.5)	18.9 (5.5)	16.7 (4.9)	17.0 (5.5)	17.7 (4.2)	18.4 (4.4)	17.7 (4.2)	18.0 (4.2)
Health Excellent	29.3	19.5	42.4	32.8	33.3	27.4	30.9	26.8
Health Very good	25.9	21.9	34.8	30.0	33.8	28.1	33.0	28.2
Health Good	24.6	27.4	17.0	24.2	25.6	32.4	28.4	32.0
Health Fair	12.4	19.4	3.3	9.3	5.3	8.3	4.9	10.3
Heaith Poor	7.9	11.9	2.5	3.7	1.9	3.8	2.7	2.6
Binary: Good health	79.7	68.7	94.2	87.0	92.7	87.8	92.3	87.1
underweight	4.2	3.9	4.6	3.4	3.0	3.4	4.5	3.4
overweight	22.9	22.6	23.1	25.9	27.5	29.6	25.5	24.2
obese	36.4	39.8	25.7	36.5	32.5	39.1	35.5	44.9
Year gap from last birth*	17.5 (14.3)	19.9 (13.7)	8.9 (11.6)	12.6 (13.3)	10.8 (13.2)	11.9 (13.0)	11.9 (13.4)	13.3 (13.8)
No. of Children*	3.3 (2.6)	4.5 (3.3)	1.7 (1.2)	2.8 (2.2)	1.9 (1.5)	2.6 (2.1)	1.9 (1.5)	2.6 (2.0)
Both parent live	61.4	71.8	58.2	66.9	47.2	62.7	61.0	67.7

Mother's Grade 0-7	14.33	12.3	7.7	9.5	11.7	12.5	12.8	14.1
Mother's Grade 8-11	9.9	8.9	6.5	7.0	11.7	8.2	11.9	10.9
Mother's Matrics	2.5	4.0	2.8	2.0	3.0	4	3.6	3
Mother's Tertiary	1.0	1.9	0.9	1.0	0.6	1.9	1.2	1.9
Unemployed parents	14.6	20.2	12.1	20.1	12.6	17.8	12.7	16.3
Unemployed mother	36.1	49.0	22.8	36.4	36.9	42.9	31.7	39.9
Married	25.0	36.6	8.7	25.7	14.1	20.2	11.5	23.6
Cohabiting	11.6	8.5	8.1	8.0	9.1	10.5	12.9	10.3
Divorce/separate	2.8	4.3	1.6	2.7	1.6	2.5	1.5	2.6
widow	8.2	19.5	2.7	11.1	4.2	11.8	6.3	13.1
Out of wedlock	52.3	31.0	78.8	52.5	71.0	54.9	67.7	50.3
African	81.2	76.9	87.3	85.8	85.7	83.7	88.5	86.6
Asian/India	0.4	1.7	0.3	0.7	100	0.8	0.2	0.9
Coloured	15.4	14.6	12.1	11.3	13.4	13.6	11.0	11.6
White	3.0	6.7	0.3	2.2	0.8	1.8	0.2	0.9
Western Cape	12.4	12.9	11.1	10.9	8.5	12.6	7.6	10.3
Eastern Cape	11.9	13.5	10.8	11.3	13.9	11.7	13.2	12.8
Northern Cape	8.1	7.7	5.6	6.4	8.3	7.0	7.1	5.9
Free State	6.1	5.5	5.3	5.0	5.4	4.9	5.7	6.2
KZN	26.3	28.5	30.8	30.9	30.5	31.7	35.9	30.5
Northwest	6.3	6.9	6.9	5.7	4.8	5.9	6.7	5.8
Gauteng	10.8	9.4	9.3	11.8	9.8	10.8	9.3	12.3
Mpumalanga	9.5	6.5	9.8	7.8	8.8	4.9	7.3	7.3
Limpopo	8.4	9.0	10.4	10.1	8.8	12.5	7.3	8.6
Total	2,141	5,192	676	1,574	625	1,252	987	1,625

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

3.3.2 Variable Description

Dependent Variables

Educational outcomes: Education is measured in years, that is, the number of completed years of schooling that a mother had in formal education. It is expected that, early motherhood may disrupt schooling and thus share negative relationship with the educational outcome of the mother.

Economic outcomes: This is measured in South African Rand as monthly earnings from employment

Psychological well-being. Regarding the psychological (Emotional) well-being, mothers were asked to rate their psychological well-being in the following items: unhappy, depressed, lonely, restless, lost focus, often bothered, struggling, feel less hopeful, feel fearful, and not get going. This was measured in ordinal scale as none=1, sometimes= 2, quite often=3, all the time=4. Reliability test was conducted to measure the internal consistency of this group of items to measure psychological well-being to infer the homogeneity and degree of complementarity of the items. The scale shows a high internal consistency (α =.830) showing that the items can be indexed. The responses, as indicated above, were summed up as scores forming a linear scale ranging from 4 (never depressed) to 40 (always depressed) which is now an interval-level variable. This is based on Radloff (1977) and Walton and Takeuchi (2010) who constructed a scale for psychological impact analysis.

Life satisfaction level: Satisfaction level of mothers were measured on a scale which ranges from 1 to 10; where 1 means "Very dissatisfied" and 10 denotes "Very satisfied" This numeric scale was used as an interval-level variable for the analysis.

Health related outcomes: Four dummy variables were used. The first used perceived health status of the respondent. The perceived health variable was in ordered as follows: 1 for excellent health; 2 for very good health; 3 for good health; 4 for fair health; and 5 for poor health. This was collapsed into dummy variable where 1 was assigned if an individual is in a good health (1 to 3), or 0 (4 and 5) other wise. Secondly, the study also adopts WHO (2018) categorization for bmi as follows <18.5 is classified as underweight, 25.0-29.9 is overweight category, 30.0 and

above falls into obesity category. Thus the last three dummy variables were created for each, where 1 was assigned if underweight, overweight and obese respectively and 0 other wise.

Explanatory variables

Early motherhood: Mothers in the sample are categorized into teen mothers (less than 20 years at first birth) and non-teen mothers (mothers from 20 years and above at first birth). This study recognizes teen mothers or early mothers as mothers who had their first birth before the age of 20years.

Control variables

The background characteristics of mothers that were measured include childhood poverty (poverty level while at teenage), measured on the scale (1-6) from the poorest to the richest. This was further collapsed into poor (less than 3) and not poor (from 3 to 6), dummy scale was created where 1 is for poor and 0 for otherwise. Dummy variable was created for each component of marital status of the mothers, so 1 is assigned if the mother is in intact married, Living with partner, divorce, and never married family, 0 otherwise. This is repeated for the provinces. The age (at the time of data collection) is measured in years, while the number of children is measured in numbers. The average period gap (the period between the last birth and the time of data collection) is measured in years. Parental information was also measured. This includes educational level measured as dummy variable, 1 for at least one parent completing higher education (certificate, diploma, degree), 0 otherwise; occupation is a dummy variable measured as 1 for at least one parent gainfully employed and 0 for otherwise. Finally, 1 was assigned if both parent was alive while in teenage. Finally, dummy variable was created as follows; 1 if a mother is of any religious faith and 0 if otherwise.

3.3.3 Econometric specifications

The analysis of potential impacts of teen motherhood is analogous to treatment effect analysis under nonrandomized experiment or trial. Propensity[5] score matching has been design as a suitable econometric technique for this analysis in observational study. This is because data often do not come from randomized trials but from (nonrandomized) observational studies. In seminal work, Rosenbaum and Rubin (1983) proposed propensity score matching as a method to reduce the bias in the estimation of treatment effects with observational datasets. Since in observational studies assignment of subjects to the treatment and control groups is not random, the estimation of the effect of treatment may be biased by the existence of confounding factors. Propensity score matching is a way to "correct" the estimation of treatment effects controlling for the existence of these confounding factors based on the idea that the bias is reduced when the comparison of outcomes is performed using treated and control subjects who are as similar as possible. Since matching subjects on an n-dimensional vector of characteristics is typically unfeasible for large n, this method proposes to summarize pretreatment characteristics of each subject into a single-index variable (the propensity score) that makes the matching feasible.

The propensity score matching methodology follows probit model for propensity estimation for treatment group. Treatment D is a binary variable that defines if the respondent is or was a teenage mother, thus $D=1$ if she is or was early or teenage mother (treated group), $D=0$ otherwise (control group). X denotes variables that may affect the probability of being a teenage mother.

Thus, the probit model for the treatment is further specified below

$$\boldsymbol{D_i = \beta_0 + \beta_i X_i + \varepsilon_i} \qquad [3.1]$$

Where D denotes motherhood and X are the factors that influence motherhood such as childhood poverty, provinces, and parental education and unemployment,; and $\boldsymbol{\varepsilon_i}$ is the error term

[5]Propensity Score Analysis (PSA) was first introduced by Rosenbaum and Rubin, (1893). From that time PSA has become one of the most areas with much studied and frequently used new methods in statistics. Hundreds of publications have appeared covering philosophy, statistical theory variety of applications. Propensity score matching includes forming matched sets of treated (in this context, early mothers) and untreated subjects (delayed on non-early motherhood). Details of propensity estimator can be found many papers including Austin, (2011) and (Sabine & Marco, 2005).

The propensity score is defined by Rosenbaum and Rubin (1983) as the conditional probability of receiving a treatment given pretreatment characteristics:

$$\boldsymbol{P(X) = prob(D = 1|X) = E(D|X)} \quad [3.2]$$

where D ={0,1}is the indicator of exposure to treatment and X is the multidimensional vector of pretreatment characteristics. Rosenbaum and Rubin (1983) show that if the exposure to treatment is random within cells defined by $\boldsymbol{X}$,it is also random within cells defined by the values of the one-dimensional variable $\boldsymbol{P(X)}$. As a result, given a population of units denoted by i, if the propensity score $\boldsymbol{P(X)}$is known, then the Average effect of Treatment on the Treated (ATT) can be estimated as follows:

$$\boldsymbol{\tau = E\{Y_{1i} - Y_{0i}|\ D_i - 1)}$$
[3.3]
$$\boldsymbol{= E[\{Y_{1i} - Y_{0i}|\ D_i - 1, p(X_i)\}]}$$
$$\boldsymbol{= E[\{Y_{1i}|D_i - 1, p(X_i)\}-\quad E[\{Y_{0i}|D_i - 0, p(X_i)\}|\ D_i = 1}$$

where the outer expectation is over the distribution of $(p(\boldsymbol{X_i})|D_i = 1)$ and $\boldsymbol{Y_{1i}}$ and $\boldsymbol{Y_{0i}}$are the potential outcomes in the two counterfactual situations of (respectively) treatment and no treatment.

Formally, the following two hypotheses are needed to derive [3.3] given [3.2]

1. Balancing of pretreatment variables given the propensity score. If $\boldsymbol{P(X)}$is the propensity score, then

$$\boldsymbol{D \perp X \quad |P(X)}$$

2. Unconfoundedness given the propensity score. Suppose that assignment to treatment (teen motherhood) is unconfounded, that is

$$\boldsymbol{Y_1, Y_0 \perp D \mid X}$$

Then assignment to treatment (teen motherhood) is unconfounded given the propensity score, that is

$$\boldsymbol{Y_1, Y_0 \perp D \mid p(X)}$$

If the Balancing Hypothesis of Lemma 1 is satisfied, observations with the same propensity score must have the same distribution of observable (and unobservable) characteristics independently of treatment status. In other words, for a given propensity score, exposure to treatment is random and therefore treated and control units should be on average observationally identical.

The treated and untreated respondents (subjects) can be compared for similarity by means or using medians of continuous variables (covariates) and the distribution of their categorical counterparts (balancing property). The standardized form can also be used especially when different units are also involved. The standardized difference can be used to do the comparison between the mean of continuous variables and that also for binary variables between treatment groups (Austin, 2009; Flury and Riedwyl, 1986). When the continuous covariate is used, the standardized difference is specified;

$$\boldsymbol{d} = \frac{\boldsymbol{\pi_{treatment} - \pi_{control}}}{\frac{\sqrt{\boldsymbol{s^2_{treatment} - s^2_{control}}}}{\boldsymbol{2}}} \qquad [3.3]$$

Where $\boldsymbol{\pi_{treatment}}$ represents the sample mean of the covariate in treated subjects, $\boldsymbol{\pi_{control}}$ denotes untreated subjects, , $S^2_{treatmen}$ is the mean of the covariate in treated subjects and S^2_{contro} untreated subjects, respectively. In terms of dichotomous variables, the standardized difference is specified as follows:

$$\boldsymbol{d} = \frac{\boldsymbol{\hat{P}_{treatment} - \hat{P}_{control}}}{\frac{\sqrt{\boldsymbol{\hat{P}_{treatment}(1-\hat{P}_{treatment}) + \hat{P}_{control}(1-\hat{P}_{control})}}}{\boldsymbol{2}}} \qquad [3.4]$$

Where $\hat{P}_{treatment}$ is the prevalence or mean of the dichotomous variable for the treated, and $\hat{P}_{control}$ untreated subjects. Although in the literature, there is no universally established rule or criterion on the level of threshold standardized difference, a standard difference which is below 0.1 is assumed to indicate a negligible difference in the mean, median or prevalence of a covariate between treatment groups, in this case, early motherhood (Normand, et al., 2001).

Propensity Score Matching Algorithms

An estimate of the propensity score is not enough to estimate the ATT of interest. The reason is that the probability of observing two units with exactly the same value of the propensity score is in principle zero since p(X) is a continuous variable. Various methods have been proposed in the literature to overcome this problem, and the most widely used are Nearest-Neighbor Matching, Radius Matching, Kernel Matching, Stratification Matching, and sometimes caliper matching.

Stratified Matching

In this method, the range of variation of the propensity score is divided into intervals such that within each interval, treated and control units have, on average, the same propensity score (Dehejia and Wahba , 1999). Differences in outcome measures between the treatment and control group in each interval are then calculated. The average treatment effect is thus obtained as an average of outcome measure differences per block, weighted by the distribution of treated units across the blocks. It has been shown that five classes are often sufficient to remove 95% of bias with all covariates (Dehejia and Wahba , 1999)

$$\boldsymbol{\tau p^{S}} = \frac{\Sigma_{\boldsymbol{i}\in \boldsymbol{I(q)}} \boldsymbol{Yi^{T}}}{\boldsymbol{Nq^{T}}} - \frac{\Sigma_{\boldsymbol{i}\in \boldsymbol{I(q)}} \boldsymbol{Yi^{C}}}{\boldsymbol{Nq^{C}}} \qquad [3.5]$$

where $\boldsymbol{I(q)}$ is the set of units in block $\boldsymbol{q}$ and $\boldsymbol{Nq^{T}}$ q and $\boldsymbol{Nq^{C}}$ are the numbers of treated and control units in block $\boldsymbol{q}$. The estimator of the ATT in (2) based on the Stratification method is then computed using the formula

$$\boldsymbol{\tau^{S}} = \sum_{\boldsymbol{q=1}}^{\boldsymbol{Q}} \boldsymbol{\tau q^{S}} \frac{\Sigma_{\boldsymbol{i}\in \boldsymbol{I(q)}} \mathrm{D}_{\boldsymbol{i}}}{\Sigma_{\forall \boldsymbol{i}} \mathrm{D}_{\boldsymbol{i}}} \qquad [3.6]$$

where the weight for each block is given by the corresponding fraction of treated units and Q is the number of blocks.

One of the pitfalls of the Stratification method is that it discards observations in blocks where either treated or control units are absent. This observation suggests an alternative way to match treated and

control units, which consists of taking each treated unit and searching for the control unit with the closest propensity score; i.e., the Nearest Neighbor

Nearest Neighbor Matching

This method randomly orders the treatment and control patients, then selects the first treatment and finds one control with the closest propensity score (LaLonde, 1986). While in the Stratification method, there may be treated units that are discarded because no control is available in their block, in the Nearest-Neighbor method, all treated units find a match. However, it is obvious that some of these matches are fairly poor because for some treated units the nearest neighbor may have a very different propensity score, and, nevertheless, would contribute to the estimation of the treatment effect independently of this difference. The Radius Matching and Kernel Matching methods offer a solution to this problem

$$\boldsymbol{C(i) = min_j} \parallel p_i - p_j \parallel \qquad [3.7]$$

that is a singleton set unless there are multiple nearest neighbors. In practice, the case of multiple nearest neighbors should be very rare, in particular if the set of characteristics X contains continuous variables. The likelihood of multiple nearest neighbors is further reduced if the propensity score is estimated and saved in double precision.

$$\boldsymbol{\tau^M} = \frac{1}{\boldsymbol{N^T}} \sum_{\boldsymbol{i \in T}} \left(\boldsymbol{Yi^T} - \sum_{\boldsymbol{j \in C(i)}} w_{ij} Y_j^{\boldsymbol{C}}\right) \qquad [3.8]$$

$$= \frac{1}{\boldsymbol{N^T}} \left(\sum_{\boldsymbol{i \in T}} \boldsymbol{Yi^T} - \sum_{\boldsymbol{j \in T}} \sum_{\boldsymbol{j \in C(i)}} w_{ij} Y_j^{\boldsymbol{C}}\right)$$

$$= \frac{1}{\boldsymbol{N^T}} \sum_{\boldsymbol{i \in T}} \boldsymbol{Yi^T} - \frac{1}{\boldsymbol{N^T}} \sum_{\boldsymbol{j \in C}} w_{ij} Y_j^{\boldsymbol{C}}$$

where M stands for nearest-neighbor matching, and the number of units in the treated group is denoted by $\boldsymbol{N^T}$: where the weights w_i are defined by $w_j = \sum_{\boldsymbol{i}} w_{ij}$

Radius Matching

With radius matching, each treated unit is matched only with the control unit whose propensity score falls in a predefined neighborhood of the propensity score of the treated unit (Dehejia and Wahba, 2002). The benefit of this approach is that it uses only the number of comparison units available within a predefined radius, thereby allowing for use of extra units when good matches are available and fewer units when they are not. One possible drawback is the difficulty of knowing a priori what radius is reasonable.

$$\boldsymbol{C}(\boldsymbol{i}) = \{\boldsymbol{p_j} | \ \| \mathrm{p}_{\boldsymbol{i}} - \mathrm{p}_{\boldsymbol{j}} \| < \boldsymbol{r} \} \qquad [3.9]$$

That is , all the control units with estimated propensity scores falling within a radius r from $\mathrm{p}_{\boldsymbol{i}}$ are matched to the treated unit $\boldsymbol{i}$.

$$\boldsymbol{\tau^M} = \frac{1}{\boldsymbol{N^T}} \ \Sigma_{\boldsymbol{i}\in\boldsymbol{T}}(\boldsymbol{Yi^T} - \Sigma_{\boldsymbol{j}\in\boldsymbol{C}(\boldsymbol{i})} \mathrm{w}_{\boldsymbol{ij}}\mathrm{Y}_{\boldsymbol{j}}{}^{\boldsymbol{C}}) \qquad [3.10]$$

$$= \frac{1}{\boldsymbol{N^T}} \ (\Sigma_{\boldsymbol{i}\in\boldsymbol{T}}\boldsymbol{Yi^T} - \Sigma_{\boldsymbol{j}\in\boldsymbol{T}} \Sigma_{\boldsymbol{j}\in\boldsymbol{C}(\boldsymbol{i})} \mathrm{w}_{\boldsymbol{ij}}\mathrm{Y}_{\boldsymbol{j}}{}^{\boldsymbol{C}}$$

$$= \frac{1}{\boldsymbol{N^T}} \ \Sigma_{\boldsymbol{i}\in\boldsymbol{T}}\boldsymbol{Yi^T} - \frac{1}{\boldsymbol{N^T}} \Sigma_{\boldsymbol{j}\in\boldsymbol{C}} \mathrm{w}_{\boldsymbol{ij}}\mathrm{Y}_{\boldsymbol{j}}{}^{\boldsymbol{C}} \qquad [3.10]$$

where M stands for radius matching, and the number of units in the treated group is denoted by $\boldsymbol{N^T}$: where the weights $\mathrm{w}_{\boldsymbol{i}}$ are defined by $\mathrm{w}_{\boldsymbol{j}} = \Sigma_{\boldsymbol{i}} \mathrm{w}_{\boldsymbol{ij}}$

Kernel Matching

All treated units are matched with a weighted average of all controls, with weights inversely proportional to the distance between the propensity scores of the treated and control groups. Because all control units contribute to the weights, lower variance is achieved. Nevertheless, two decisions need to be made: the type of kernel function and the bandwidth parameter. The former appears to be unimportant (Dehejia and Wahba, 2002)

$$\boldsymbol{\tau^K} = \frac{1}{\boldsymbol{N^T}} \ \Sigma_{\boldsymbol{i}\in\boldsymbol{T}} \ \{\boldsymbol{Yi^T} - \frac{\Sigma_{\boldsymbol{j}\in\boldsymbol{C}} \boldsymbol{Yi}^{\boldsymbol{C}} \mathrm{G}(\frac{\mathrm{p}_{\boldsymbol{j}}-\mathrm{p}_{\boldsymbol{i}}}{\mathrm{h}_{\boldsymbol{n}}})}{\Sigma_{\boldsymbol{k}\in\boldsymbol{C}} \mathrm{G}(\frac{\mathrm{p}_{\boldsymbol{k}}-\mathrm{p}_{\boldsymbol{i}}}{\mathrm{h}_{\boldsymbol{n}}})} \qquad [3.11]$$

where G(·) is a kernel function and hn is a bandwidth parameter. Under standard conditions on the bandwidth and kernel,

$$\frac{\Sigma_{j\in C} Yi^{C} G(\frac{p_j - p_i}{h_n})}{\Sigma_{k\in C} G(\frac{p_k - p_i}{h_n})} \qquad [3.12]$$

is a consistent estimator of the counterfactual outcome Y0i.

Caliper matching

To improve the quality of matching, caliper can be used (Baser 2006). The caliper method defines a common support region (suggested one-fourth of standard error of estimated propensity score) and discards observations whose values are outside of the range defined by caliper.

3.4 Results And Discussions

This section proceeds with empirical findings of the study with discussions. It begins with propensity score estimation, and evaluation of underlying assumptions. The last section draws out the degree of impacts of motherhood on women's socioeconomic outcomes such as education, economic well-being, psychological outcome, life satisfaction, perceived health status and obesity using various propensity score matching algorithms in the literature.

Propensity Score Estimation with Probit model for Pre-birth covariates at teenage

Propensity score matching begins with results from probit model for covariates that may affect the likelihood of being a teen mother and this is used for the estimation of propensity score (predictive probability). The table 3.3 shows that childhood poverty and unemployed and uneducated mothers, African and Coloured race and provinces such as Western Cape and Mpumalanga are statistically significant.

These results are in line with that of Wellings, Wadsworth, Johnson, Field, and Macdowall (1999) who documented that teen mothers are likely to have certain pre-birth characteristics

while at teenage (for instance coming from a poor home at teenage) which may have adverse consequences for their life outcomes in the future, whether they are pregnant or not. Some pre-birth characteristics that affect teen motherhood are shown in the table 3.3. Results show that factors such as childhood poverty, mothers of teenagers with grade 8-11, unemployed mothers of teenagers, African and coloured race and Mpumalanga province are positively associated with teen motherhood significantly, while teenagers' mothers with tertiary education has significant negative relationship with teen motherhood. This finding reinforces similar result by Yako (2007) and Hobcraft and Kiernan, (1999) who concluded that factors such as family poverty, for that matter, childhood poverty is a very powerful and influential factor of teen motherhood especially in many developing countries. Also, mother with higher education such as tertiary education are more likely to instil moral and reproductive and sex educationa which may increase the chance of avoiding early childbearing of their teenagers. The outcome of probit model is used to estimate the propensity scores for further estimation of the effects of teen motherhood.

Table 3.3 Results from Probit Model: Covariates on Teen Motherhood (pre-birth charateristics while at teenage)

Variables	**Coefficients.**
Childhood poverty	0.1654***
	(0.0519)
Mother's Grade 8-11	0.1221**
	(0.0403)
Mother's with Matrics	0.0989*
	(0.0814)
Mothers with Tertiary education	-0.4896***
	(0.1226)
Unemployed mother	0.3385***
	(0.0256)
Unemployed father	0.0163
	(0.0293)
African Race	0.5309***
	(0.0785)
Indian/Asian Race	-0.2857
	(0.1769)
Coloured	0.5173***
	(0.0822)
North west	-0.0565
	(0.0478)
Western Cape	-0.0728*
	(0.044)1

Gauteng	-0.1374** (0.0512)
Mpumalanga	0.1829*** (0.0436)
Free State	-0.0398 (0.0505)
Cons	-1.4118*** (0.0929)
Prob >chi2	0.0000
Pseudo R2	0.0219
Observation	13,409

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Balancing Property and Overlap Check

The main purpose of a matching procedure is to reduce selection bias by increasing the balance between the treatment and control groups. This is done by satisfying the balancing property based on the covariates of the two groups (Hainmueller, 2008; Graham, Campos and Egel, 2012). While all the covariates need to be used, not all necessarily achieve balance for the two groups. Hence the model has to be re-specified till the balance property condition is met. To verify this the following approach, consisting of three quantifiable steps, is proposed to check for balance: 1) compare the means of the treatment and control groups for each explanatory variable; 2) Comparing the mean difference 3) Comparing the density estimates of the propensity scores of the control units with those of the treated units. In this respect, one would like to see insignificant differences or larger P values (criterion 1); low mean differences as a percentage of the average standard deviation and insignificant differences between the mean which is fully met in table 3.4. Furthermore, the model includes only the units that satisfy both the common support condition and the balancing property. The basic criterion of this approach is to delete all observations whose propensity score is smaller than the minimum score of treatment group and larger than the maximum score in the control group. The region of common support is [0.05677244, 0.4778333], observations which lie outside this region are discarded from analysis, and the final number of blocks - ensuring that the mean propensity score is not different for treated and controls in each block .

The overlap in propensity is shown in figure 3.1. It shows that the distribution of propensity scores across teen mothers and non-teen mothers. Parellel trends are graphed for both groups before matching satisfies the overlap condition for further analysis, matching. The graph displays the estimated density of the predicted probabilities for teen mother is a non-teen mother and the estimated density of the predicted probabilities that non-teen mother is teen mother. Neither plot indicates too much probability mass near 0 or 1, and the two estimated densities have most of their respective masses in regions in which they overlap each other. Thus there is no evidence that the overlap assumption is violated.

Table 3.4 Results of balancing and overlap assumption

Testing balancing property: Descriptive table for teen and non-teen mothers (pre-birth charateristics while at teenage)

Variables	**Teen mothers Mean**	**Non Teen mothers Mean**	**Differences**	**P-values**
Childhood poverty	0.57142	0.6052	-.0338	0.8605
MotherGrade 8-11	0.1004	0.0884	0.0120	
Mothers with Matrics	0.0289	0.0357	-0.0068	0.2021
Mother with Tertiary education	0.0940	0.0173	0.0867	0.1590
Unemployed mother	0.8421	1.000	0.1578	0.2582
Unemployed father	0.1428	0.1403	.0025	0.9854
African Race	.2960	0.2491	0.0468	0.2759
Indian/Asian Race	0.5714	0.6842	0.1127	0.5394
Coloured	0.1120	0.0967	0.0152	0.6034
North west	0.0320	0.0443	0.0122	0.5350
Western Cape	0.1428	0.2631	0.1203	0.4832
Gauteng	0.1428	0.0877	0.0551	0.6258
Mpumalanga	0.0160	0.0393	0.0233	0.1985
Free State	0.1040	0.0524	0.0515	0.0286

The region of common support is [.05677244,, . 47783331]
Estimated propensity score

	Percentiles	Smallest		
1%	0.094138	0.056772		
5%	0.193617	0.057919		
10%	0.224901	0.057919	Obs	13,409
25%	0.237144	0.057919	Sum of Wgt.	13,409
50%	0.327415		Mean	0.301076
		Largest	Std. Dev.	0.072169
75%	0.359175	0.477833		
90%	0.359175	0.477833	Variance	0.005208
95%	0.405731	0.477833	Skewness	-0.4764
99%	0.429473	0.477833	Kurtosis	2.93192

The balancing property is satisfied

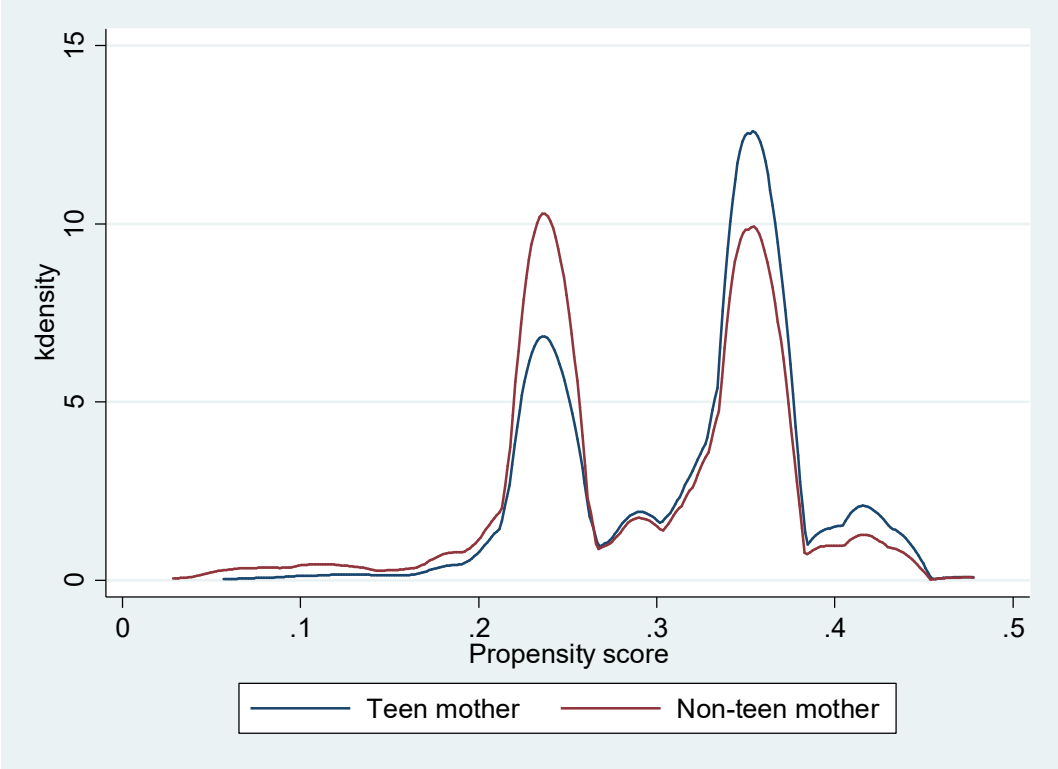


Figure 3.1: Distribution of the estimated Propensity Scores – common support between teen and non-teen mothers

3.4.1 Effects of teenage motherhood on women's later life outcomes

The fact that several types of propensity score matching exist immediately raises the question of choice: Which one is most appropriate? Surprisingly enough, however, the literature does not offer guidelines for making this choice. However, the use of different matching techniques enriches robustness check (Baser, 2006).

Results of all the matching algorithms in Table 3.5 shows that teenage motherhood has significant negative relationship on mother's educational outcome although the magnitude of the effect is small. Thus, the estimated effects (in years) of teen motherhood on the mothers' education are 0.24, 0.19, 0.14, 0.31 and 0.12 for stratification, nearest neighbor, radius , and caliper matching methods respectively. This finding is in line with the expectation because teenage pregnancy poses possible disruption to educational attainment of teen mothers. Thandiwe (2011) reported that pregnancy goes with increasing responsibilities and demands including availability for prenatal services. According to Greathead (1998), the tertiary educational attainment of most mothers is limited and as a result, most of these mothers do not have the requisite knowledge and skills that make them at a higher risk to other life outcomes.

Concerning the impacts of teen motherhood on the earnings or income. The effects are negative, thus being a teen mother reduces mothers earnings in Rand by 1213.2, 1303.0, 1003.0,1513 and 1131.7 for stratification, nearest neighbor, radius, and caliper matching methods respectively. Becker (1965) pointed that women who do work in the market, home responsibilities may increase absenteeism and otherwise detract them from the level of effort on a particular job. This decreases productivity reducing the earnings and the overall economic well-being of the teen mothers (Gronau, 1973). Additionally, due to low educational level of teen mothers, most of them end with jobs, which pay very low and therefore do not earn sufficient income to meet their needs and that of the family (Naidoo, 2005).

Teenage motherhood is also negatively associated with life satisfaction associated and depression score. This also not surprising as Greathead (1998) documented that unfulfilled dreams such as high educational attainment due to teenage pregnancy has a potential of landing young mothers in disadvantaged circumstances in the future, a situation that can create economic complication and life dissatisfaction. With satisfaction level, Jiang, Klein, and Saunders (2015), Festinger (1942) and Festinger (1954) under discrepancy theory provide a broad spectrum to explain life

satisfaction. According to them, essentially, satisfaction is derived from a process that compares one outcome of experience with the other and establish judgement based on the emerging wellness outcome of the comparison. Thus, the conclusion is arrived at by cognitively processing the relationship between what one anticipated and the reality that occurs to establish one's life satisfaction level. This conclusively implies that an individual may be well satisfied when his reference points are peers of the same level and may feel less satisfied in the mist of well-off peers and vice versa.

Pitso, Kheswa, Nekhwevha, and Sibanda (2014) found that the difficulty that pregnant women go through subject them to series of negative emotional experiences which, in some cases, are expressed as depression, trauma, anger, disappointment, anxiety and insecurity among others. These could negatively affect mothers' psychological well-being. The significant association of other factors including age, intact married, out-of-wedlock and religion shows that psychological well-being is a multifaceted phenomenon that hinges on series of variables, ranging from family complexity, personal and environmental forces (Compton and Hoffman, 2013).

Table 3.5 Results from Propensity Score Matching Models: Effects of Teen Motherhood on Women's Later life Outcomes (Education, Income, Life Satisfaction and Psychology)

Matching types	Education	Earnings/Income	Life Satisfaction	Psychology (Depression score
Stratification	-0.242**	-1213.2**	-0.110**	0.240***
	(0.010)	(113.6)	(0.044)	(0.021)
Number of Treated	4001	4012	4020	4013
Number of Controls	9000	8900	9111	9071
Nearest neighbour	-0.197**	-1303.02**	-0.044***	0.168**
	(0.041)	(133.59)	(0.011)	(0.012)
Number of Treated	3550	4429	4019	4013
Number of Controls	9016	1868	9110	9071
Radius	-0.139**	-1003.02**	-0.211**	0.288*
	(0.080)	(123.56)	(0.053)	(0.101)
Number of Treated	3103	2259	4020	3431
Number of Controls	5507	6510	9229	9178
Kernel	-0.310**	-1513***	-0.154**	0.248**
	(0.024)	(0.008)	(0.033)	(0.0212)
Number of Treated	4001	4011	4018	4013
Number of Controls	9000	8910	9110	9071
Caliper	-0.118***	-1131.7**	-0.1074**	2.356**
	(0.002)	(213.29)		(.0821)
			(.0453)	
Number of Treated	4001	4012	4020	4013
Number of Controls	9000	8900	9111	9071

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.6 reports estimates on health related variables. The results are positive for perceived health and underweight but negative for obesity. Although, the positive effect of teen motherhood on the perceived health is justified by the descriptive statistics (about 86.6% teen mothers perceived to be in good health), Tang, Zhao and Li (2017) asserted that there could be a real difference between self-reported health status and the anthropometrics measures. More importantly, the results show that teenage mothers are more likely to be underweight, but less likely to be obese. Both are significant and have consistent

estimates across all the matching techniques, while the over weight estimates are the same for stratification and radius matching in terms of direction of the effect, so also nearest neighbour, kernel and caliper methods.

This finding is consistent with that of Vivatkusol, Thavaramara and Phaloprakarn (2017) and Elchert, Beaudrot and DeFranco (2015). They showed that most teenage pregnant mothers were underweight because of poor nutrition and concern for their shape before and during the course of pregnancy so they needed more nutrition. Similar to our findings, a previous study in the USA showed that the most common pre-pregnancy BMI was normal weight. The second most common pre-pregnancy BMI in such a study was obesity, which contrasted with our finding of underweight (Montgomery, 2003). Werner, Savitz and Janevic (2012) reported that teenage pregnancies experienced more complications than adult pregnancies from incomplete development of pelvic organs and preterm birth, which also results in post-birth effect such as weight lost.

Table 3.6 Results from Propensity Score Matching Models: Effects of Teen Motherhood on Women's Later life Outcomes (Health related outcomes)

Matching types	Perceived Health	Underweight	Overweight	Obesity
Stratification	0.061**	0.045**	-0.069	-0.051**
	(0.007)	(0.001)	(0.001)	(0.009)
Number of Treated	4011	4014	4004	4021
Number of Controls	9201	9131	9071	9101
Nearest neighbour	0.050**	0.077***	0.031*	--0.067***
	(0.012)	(0.003)	(0.012)	(0.014)
Number of Treated	4010	4014	4000	4021
Number of Controls	9201	9131	9072	9101
Radius	0.053*	0.056**	-0.034	-0.055**
	(0.010)	(0.03)	(0.012)	(0.009)
Number of Treated	2705	2125	1031	2031
Number of Controls	8450	5037	4371	9371
Kernel	0.068**	0.041**	0.084*	-0.054**
	(0.0210	(0.007)	(0.012)	(0.003)
Number of Treated	4011	4014	4004	4021
Number of Controls	9201	9131	9071	9101
Caliper	.0618**	0.0420***	0.244	-.0509**
	(.0072)	(0.011)	0.037)	(.1354)
Number of Treated	4011	4014	4004	4021
Number of Controls	9201	9131	9071	9101

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Sensitivity Analysis

Checking sensitivity of the estimated results with respect to deviations from identifying assumption has become an increasingly important topic in the applied evaluation literature (Li, Shen, Wu, and Li, 2011). If there are unobserved variables, which affect assignment into treatment, and the outcome variable simultaneously, a hidden bias might arise to which matching estimators are not robust (Baser, 2006). So sensitivity analysis was done to assess how strong the effects of unobserved covariates on the exposure and/or the outcome would have to be to change the study inference. From a statistical perspective, Rosenbaum (2002) emphasizes that, exposed and unexposed groups may differ on an unobserved characteristic even after matching on observed characteristics. In other words, individuals with the same observed covariates may have different probabilities of being exposed if they have different unobserved covariates. DiPrete and Gangl (2005) and Becker and Caliendo (2007) provide an ado-file (rbounds) which allows to test sensitivity for continuous outcome variables, whereas mhbounds focusses on the case of binary outcome variables which are applied in this study. Baser (2006) recommended that sensitivity analysis be conducted after matching, thus the Table 3.7 reports the results of sensitivity analysis. The results of the propensity score matching from the sensitivity analysis is reported as Γ=1 prob(1) in the table. The significant level of gamma, Γ=1, 2 and 3 prob(1) recorded under educational, earnings, life satisfaction and psychological shows that the results are not sensitive to bia at Γ=1 or insensitive to bias that will double or triple the odd of exposure to the treatment and outcome. The result is also not sensitive for perceived health and obesity at Γ=1 and 3. Under weight and over weight results are insensitive to bias at Γ=3 and Γ=2 respectively.

Table 3.7 Results of Sensitivity Analysis

Outcome	Gamma	sig+	sig-	t-hat+	t-hat-	CI+	CI-
Economics effect	1	0.00001	0.00001	2500	2500	2375	2664
	2	0.00001	0.00001	1700	4100	1605	4329.5
	3	0.00001	0.00001	1400	5125	1325	5400
Educational effect	1	0.00002	0.00001	9.00091	9.00096231	8.500081	9.00032
	2	0.00002	0.00001	8.00095	10.0096584	10.00053	10.00043
	3	0.00002	0.00001	6.00093	11.0096875	6.000021	11.0007
Life satisfaction	1	0.000012	0.000012	4.97614	4.97614	4.97389	4.97806
	2	0.0000182	0.0001874	4.97341	4.97839	4.97051	4.98005
	3	0.0039827	0.0026173	4.97005	4.98026	4.9658	4.98174
Psychological effect	1	0.000012	0.000002	5.00024	5.00024	5.00081	5.0005
	2	0.000056	0.000149	4.50058	6.00066	4.50004	6.00086
	3	0.000056	0.00009	6.00027	6.50069	4.0006	6.500013
	Gamma	p_mh+	p_mh-	Q_mh+	Q_mh-		
Perceived Health Status	1	0.005841	0.005841	2.52164	2.52164		
	2	0.30903	7.5e-10	0.498602	6.04538		
	3	0.007853	0	2.41569	8.41045		
Under weight	1	0.500233	0.500233	-0.000585	-0.000585		
	2	0.347006	0.178403	0.994019	0.92147		
	3	0.030169	0.004624	1.87832	2.60275		
Over weight	1	0.362667	0.362667	0.35134	0.35134		
	2	0.000062	0.001808	3.83905	2.90984		
	3	6.8e-10	2.1e-07	6.06042	5.05953		
Obese	1	0.003055	0.003055	2.74181	2.74181		
	2	1.8e-12	0.16223	6.95553	0.985333		
	3	0.000	0.000493	9.75409	3.29474		

Gamma : odds of differential assignment due to unobserved factors : sig+ - upper bound significance level: sig- - lower bound significance level: t-hat+ - upper bound Hodges-Lehmann point estimate: t-hat- - lower bound Hodges-Lehmann point estimate; CI+ - upper bound confidence interval (a= .95): CI- - lower bound confidence interval (a= .95: Q_mh+ : Mantel-Haenszel statistic (assumption: overestimation of treatment effect) : Q_mh- : Mantel-Haenszel statistic (assumption: underestimation of treatment effect): p_mh+ : significance level (assumption: overestimation of treatment effect) : p_mh- : significance level (assumption: underestimation of treatment effect)

3.4.2 Study Limitation

Before drawing conclusion to this study, it is necessary to highlight some limitations encountered in this study. Firstly, the findings from early motherhood effects on later life outcomes is not to be generalized to all the mothers in South Africa. The findings only reflect early mothers as contained in the data used in the analysis. Secondly, due to unavailability of hourly earnings, the study used monthly income for evaluating the economic well-being of mothers. The study is also limited by unavailability of long time data to track the dynamics of early mothers' life outcomes over a considerable period to clearly disentangle motherhood-induced outcomes from the effects caused by other confiding variables. Additionally, the study was limited by unavailability of information on all individual that were pregnant in their teen and unobservables. The study methodology is limited to propensity score with different matching algorithms, which is not immune to endogeneity, however, the necessary underlying conditions were satisfied to ensure more accuracy of the estimates. Propensity score matching does not deal with the problem of unobservable characteristics.

3.5 Conclusions and Recommendations

The high incidence of early motherhood remains a worrisome concern in the global planet of which South Africa is by no means exception. Several studies have highlighted that the age at which woman first enters into motherhood is a significant predictor of life-course development, and may have significant implications on later socio-economic status and well-being. To this effect, attempts to answer question of the possibility of early motherhood being an indicator and pathway to adverse later life outcomes of women have been triggered. Consequently, few studies have been conducted to examine the impacts of early motherhood on mothers' later life and socioeconomic outcomes. However, nearly all of the studies focus on the impacts of early motherhood on mothers' educational outcome with a limited study on the economic well-being. No study has been done on life satisfaction outcome of early motherhood. Additionally, the impacts on psychological well-being and health effects of early motherhood have not been well investigated. In South Africa particularly, the few studies that exist on the impacts of early motherhood on later life outcomes are mainly descriptive in nature and centered on education

with few descriptive analyses on financial difficulty and emotional consequences of early motherhood.

This paper therefore examine the impacts of early motherhood on mothers' later life outcomes such as educational outcome, economic well-being, psychological well-being, life satisfaction and health outcomes. In examining the effects of early motherhood on women's later life outcomes, the study employed propensity score with different matching algorithms. The study thus reveals that teen motherhood, for that matter early motherhood, has significant negative effects on women's educational outcome, economic well-being, psychological well-being and life satisfaction. Additionally, the outcome on health is adverse only in underweight category while high perceived health and less obesity are associated with teen motherhood.

Based on the results of the study, proactive, reactive and post-active policy interventions, which require the complementary role of policy-makers, government, parents, service providers and adolescents are recommended. Proactive measures are policy interventions and strategies to prevent child poverty and teenage pregnancy in general. This requires policy-makers to establish holistic policy interventions. Urgent proactive interventions to prevent child poverty and teenage pregnancy in general is underscored by the study. This policy needs to ensure that services and rights related to sex education and reproductive health are addressed in schools, including orientation towards sexual and reproductive health and life; the menstruation; contraceptives and sexually transmitted infections, among others.

Reactive measures to care for pregnant adolescents should include a collaborative effort with various family engagement strategies, working directly with the adolescent's family including male partners of the teen mothers, the child's grandparents with whom the child generally lived and remained dependent, in order to maximize their support. Parents of the pregnant teen should also be encouraged to provide necessary support in any form needed to the teen mothers including their children. This support should also include sufficient assistance from the government in a form of grant, subsidized or free health care services to help teen mothers.

Lastly, post-active policy efforts must be made (a) to help teen mothers return to school to better their education; (b) to provide additional training including job training and counselling and capacity building to young mothers. In addition, the school's integrated health policy that gives

adolescent rights as enshrined in the South African Schools Act (SASA) (1996) should be implemented to allow the adolescents pregnant teenagers to still be in school during pregnancy or go back to school after child delivery.

3.6 Appendices

Table 3.8 Variable Definition

	Variables	Definitions
Life Outcomes	Education	Years of formal school completed
	Economics (log)	Measured in South African rands
	Psychological score (depression score)	Measured in scale (4-40)
	Life satisfaction	1 Excellent, otherwise 0
	Health:	=1 Very good , otherwise 0
	Excellent	=1 Good, otherwise 0
	Very good	=1 Fair, otherwise 0
	Good	=1 Poor, otherwise 0
	Fair	
	Poor	=1 Good health
	Binary Health;	, otherwise 0
	Good health	=1 Not in good health
	Not in good health	, otherwise 0
	Underweight	Measured as 1 if one has BMI of <18.5
	Overweight	Measured as 1 if one has BMI of 25.0-29.9
	Obesity	Measured as 1 if one has BMI of 30
		Measured as 1 if one has BMI of 30 or more
Marital status	Intact married	=1 intact married, otherwise 0
	Cohabiting	=1 cohabiting, otherwise 0
	Divorced	=1 divorced, otherwise 0
	Widow	=1 widow, otherwise 0
	Out-of-wedlock	
Background	Childhood poverty	=1 Childhood poverty

		, otherwise 0
	Age	Measured in years
	No. children	Meausred in number
	Period from birth	Measured in years
	Deceased parents	=1 Deceased parents
		, otherwise 0
	Parents with no formal school	=1 if parents had no formal education,
	unemployed parents	otherwise 0
		=1 unemployed parents, otherwise 0
	Parent alive at age 15	=1 parents alive at age 15, otherwise 0
	Smoking	=1 Smoking, otherwise 0
	Alcohol intake	=1 Alcohol , otherwise 0
Household characteristics	Race	
	African	=1 African , otherwise 0
	Asians	=1 Asians , otherwise 0
	Coloured	=1 Coloured , otherwise 0
	White	=1 White , otherwise 0
	Head's education	Years of formal school completed
	Mothers of teenagers' Grade 0-7	=1 if had grade within 0-7, otherwise 0
	Mothers of teenagers' Grade 8-11	=1 if had grade within 8-9, otherwise 0
	Mothers of teenagers' Matrics	=1 if had grade matrics, otherwise 0
	Mothers of teenagers' Tertiary	=1 if had tertiary eduaction, otherwise 0
	Religious belief	=1 has belief ,otherwise 0
	Source of water	=1 has good water source, otherwise 0
	Source of toilet	=1 has good toilet facility, otherwise 0
	Geography	
	Rural/traditional	=1 Rural/trad. , otherwise 0
	Urban	=1 Urban , otherwise 0
	Provinces	
	Western cape	=1 Western cape , otherwise 0
	Eastern Cape	=1 Eastern Cape , otherwise 0
	Northern Cape	=1 Northern Cape , otherwise 0
	Free state	=1 Free state , otherwise 0
	KwaZulu-Natal	=1 KwaZulu-Natal , otherwise 0
	North West	=1 North West, otherwise 0
	Gauteng	=1 Gauteng , otherwise 0
	Mpumalanga	=1 Mpumalanga , otherwise 0
	Limpopo	=1 Limpopo, otherwise 0

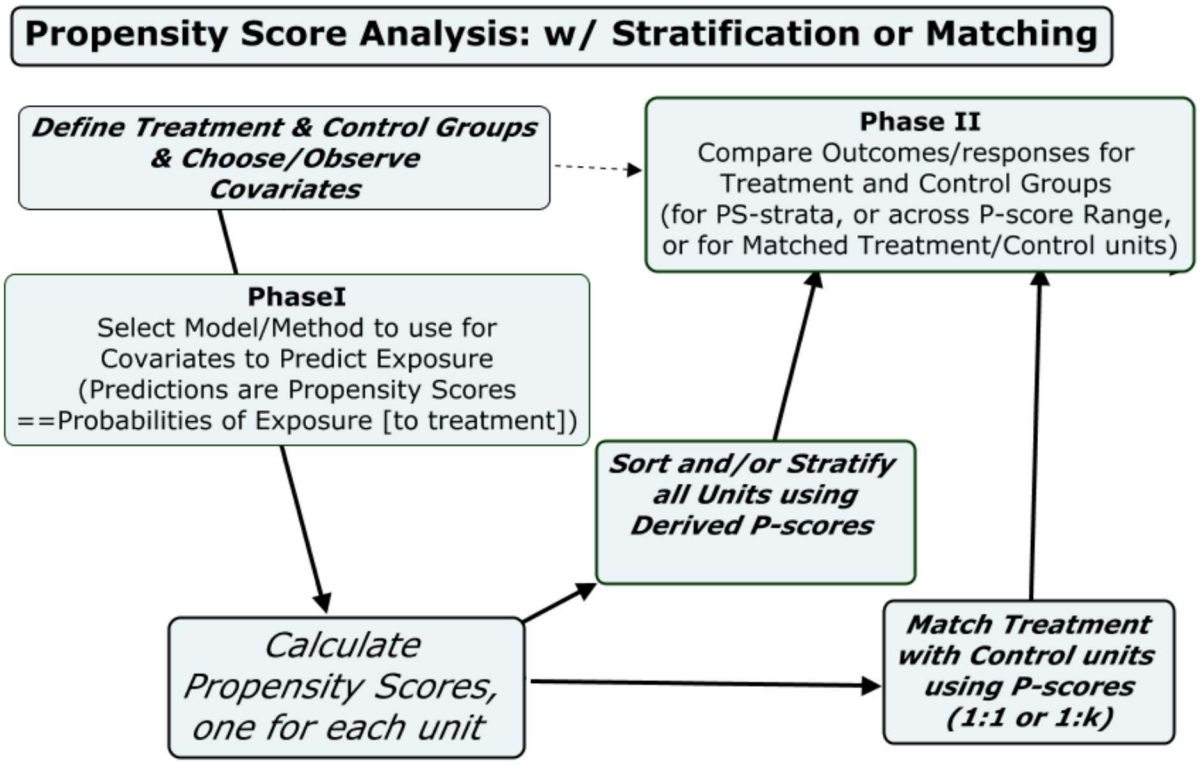


Figure 3.2: Propensity Score Matching Analysis Procedure. (Bob Pruzek, 2010)

Propensity score matching

Propensity score matching and regression adjustment techniques produce more reliable estimates under the following assumptions:

1. Assumption of Conditional Independence: One possible identification strategy is the assumption that given a set of observable covariates that are not affected by treatment, potential outcomes are purely independent of treatment assignment.
2. Common Support: As additional requirement besides independence is the joint support or overlap condition which rules out the phenomenon of perfect predictability of treatment given the observable covariates.
3. The treatment variables need to be exogenous.
4. Partial equilibrium character (no genera equilibrium effect). This implies that treatment does not indirectly affect the control observation.
5. All the variables that affect the treatment must be observable

CHAPTER FOUR

Effects of Early Motherhood on Child Outcomes: Evidence from South Africa

4.1 Introduction

Early child development is very critical to child outcomes and a healthy adulthood (World Health Organization [WHO], 2016). It is well documented that the physical, emotional, cognitive as well as social development that a child experiences from birth and during the early periods of childhood have enduring and lasting effects on the child, and might affect the growth and development of the child throughout his or her life (Irwin, Siddiqi, and Hertzman, 2007; WHO, 2016; Excell, 2016; Peralta, 2008). Early childhood development and child outcomes are linked to prenatal and maternal conditions such as mother's age a birth, making teenage pregnancy a potential factor of child outcomes and life course development (Lanier, and Zolotor, 2014; Center on the Developing Child at Harvard University, 2017). They documented that timing of motherhood with maternal characteristics is an essential factor for building sturdy brain architecture, healthy executive function, serve-and-return interactions and self-regulation skills of the child, which are prerequisite precursors for healthy child's later outcomes. This interesting relationship in the foregoing review begs further exploration of early motherhood and child outcomes.

Early motherhood and its related implications have triggered public and research concerns over the past two decades (Pedzisai, 2013; Augustine, Prickett, Kendig, and Crosnoe, 2015). Motherhood is widely established as an integral and vital component of development in women's lives, particularly in societies and sociocultural settings where traditional gender roles persist (Hobcraft, and Kiernan, 2001; Hofferth and Moore, 1979; Ermisch, 2003; Hoffman, Foster, and Furstenberg 1993, Ribar, 1999). The issue of motherhood becomes more prominent in most society, owing to the fact that it is considered as a cardinal developmental stage in women's lives that defines their traditional gender roles and social inclination in the societal-cultural system (Ngum, Pranee, and Celia, 2015; Hobcraft and Kiernan, 2001; Ermisch, 2003). As indicated in the previous chapter, teen motherhood is very prevalent in the globally environment.

A report by Save the Children Organization (2015) documented that annually, about 13 million children are born to teenagers worldwide. Out of these births, over 90% happen in developing

countries. Furthermore, Vinnerjung, Franzen, and Danielsson (2007) reported that among the developed countries, the prevalence rate of teenage mothers is highest in the United States of America (USA), where 52.1% per 1000 teenage mothers within the age group of 15-19 years. This trend is followed by the United Kingdom in Europe, Canada and Australia which recorded 30, 8%, 20, 2% and 18,4% respectively. Asia climbs the same trend with 56 for every 1000 teenage mothers within 15-19 years, which rises to 70 in every 1000 teenagers in Thailand (Chauke, 2013). Africa takes its share of early motherhood phenomenon especially in Niger (where about 75% of girls give in to marriage and 51% bear at least a child before reaching 18years), and Mozambique (where 41 % of women have a baby before they turn 20). South Africa is not exempted from this trend.

As reported in the previous chapter, Statistics of South Africa (2011) documented that 40.8% of all mothers in South Africa had their first child while in teenage and this early timing of motherhood has been a recurrent experience over many decades. Additionally, Thandiwe (2011) revealed findings contained in a report by the Medical Research Council in the year 2008 on the prevalence of adolescent pregnancy among the youth in South African within 13-19 age group. He documented that 37% of school-going learners (boys and girls) across the nation had initiated sexual activities while a quarter (24.4%) of school-going girls became pregnant. This, according to the report, is an increase compared to the previous record in 2002. Despite the significant reduction in teenage fertility over the past decades, the present prevalence rate is still very high, amounting to 30% of 15-19 years group reported to be ever pregnant while only a very few (one third) of these girls go back to continue school after childbirth (Samantha, 2013). The high incidence of early motherhood in the global and continental landscape has placed a compelling challenge on researchers on what might be the possible consequences and future implications.

The questions of early motherhood implications has received a few empirical studies in the existing literature. The previous chapter on early motherhood documented that a few studies exist on the implications of this subject. For instance, in America, Britain and other developed countries, a few studies have confirmed that early motherhood has a great potential of affecting women's later socio-economic outcomes in the areas of education and labor participation (Goodmany, Kaplan, and Walker, 2004; Hobcraft and Kiernan, 2001; Kiernan, 1980). Similar studies were also conducted in Australia and Asian (Watts, Liamputtong, and Mcmichael, 2015).

Other studies reveal that early motherhood could affect mother's parenting behavior and attitude. However, all these studies focus on the effects on the mothers without considering the implications on the children.

Very few studies however exist on the impacts of early motherhood on outcomes of children. Hofferth and Reid (2003) and Brue (2011) used multivariate analyses in the USA and Australia respectively to investigate early child bearing and its consequences for children's achievement and behavior. They found evidence that teen childbearing has a significant negative consequence for these outcomes. Kristin, Sharon and Fenaba (2016) also documented that the significant negative association of early childbearing with relatively lower academic performance and problem with behavior of children is largely due to the family background characteristics of the teenage mother rather than her age. Their study however, did not account for possible selection bias that could call for other robust methodology and rigorous econometric analysis. Furthermore, they did not also consider other aspect of child outcomes such as economic well-being of the child. In their study, Geronimus and Korenman (1993) compared sisters (with similar background characteristics) in terms of their birth outcomes and maternal behaviors to see how this could affect infant's health in the USA. They, however, found no evidence of significant negative relationship between teen motherhood and child's birth weight. This study is only limited to childbirth implication of early motherhood. They did not consider the later health outcome of child, as well as the educational and economic well-being of the child.

Lanier, and Zolotor (2014) used a focus group discussion methodology to investigate early childhood intervention and teenage pregnancy in North Carolina. They reported that teenage mothers are more vulnerable with poorer social, behavioral and development outcomes to children. Irwin, Siddiqi, and Hertzman (2007) also carried out a study on early child development in British with a conclusion that early child development is tied to prenatal and maternal characteristics such as teenage pregnancy and poor parenting. They further revealed that poor parenting affect child's social inclination and contact with the broader environment. Similarly, Center on the Developing Child at Harvard University (2017) undertook policy analysis of early childhood development in the United State and documented that poor prenatal characteristics such as teenage motherhood negatively affect child's brain architecture and academic success later in life. The foregoing three studies, however, are mere reports with very few that are descriptive in nature without rigorous econometric analysis to crystalize the degree of causal

effects. Other areas of child outcome such as economic well-being and health were not well investigated. Additionally, all the studies were done in the context of developed countries where, unemployment, poverty and inequality are relatively low. It is pertinent to address the phenomenon in contexts where poverty and unemployment are higher such as South Africa while well-being in general is much lower compared to developed countries.

Studies that focus on teen motherhood consequences on child outcome is very scanty in South Africa. Macleod (1999) found that teen mothers are more likely to have health related complications for their children. Branson, Ardington, and Leibbrandt (2015) reported a significant negative association of early childbearing and child's birth weight, and stunted growth with colored children than those from the African race. However, in their separate studies in South africa, Tshotetsi, Dzikiti, Hajison, and Feresu (2019) and Hoque, Towobola, Mashamba , Monokoane (2014) found that age at birth or maternal age did not predict low birth weight but other factors such as attending ante natal care visits. Similarly, Hoque and Hoque (2010) showed that teenage pregnancy did not predict a low birth weight outcome.

By comparison, there is little knowledge on the intergenerational effects of teenage motherhood on the economic, educational and later health outcomes of children especially in South Africa. Secondly, the existing studies in South Africa, though largely limited to health outcome, drew differing conclusions on birth weight effect of teenage motherhood. Further study is therefore needed to consolidate the studies on thi outcome. This problem has motivated the need for this study with right methodology to answer a question of how early motherhood affect child outcomes in South Africa.

Research Objectives

The study addresses the following research objective:

To examine the effects of early motherhood on child outcomes (education, Economic well-being, perceived health and birth weight) in South Africa.

4.2 Literature Review

This section provides reviews of related literature, which include theoretical foundation, critiques of empirical documentation and econometric approaches from previous studies and research gaps. The conceptual and empirical models draw on past and present research and theory highlighting early child development, early motherhood and pathways through which it might be associated with child outcomes, especially, economic well-being, educational attainment, health and body mass index.

4.2.1 Early Child Development and Child Outcome

Early child development affect child outcomes and constitutes a building precursor for healthy adulthood (World Health Organization [WHO], 2016). It is also documented that early childhood experiences such as physical, emotional, cognitive and social development have a lasting effects on the child, and might affect the child's growth and development throughout his or her life (Irwin, Siddiqi, and Hertzman, 2007; WHO, 2016; Excell, 2016; Peralta, 2008). Early childhood development and child outcomes are linked to prenatal and maternal conditions such as mother's age at birth, making teenage pregnancy a potential factor of child outcomes and life course development (Center on the Developing Child at Harvard University [CDCHU], 2017). Lanier, and Zolotor (2014) reported that pregnancy at teenage poses a high risk to foetal growth by affecting its physiological development such as brain, and other part of child's anatomical structure. Further, teenage pregnancy is associated with poorer maternal conditions, which affect early child development and child's later outcomes. CDCHU (2017) and Lanier, and Zolotor (2014) revealed that poor maternal characteristics affect responsive relationships of children early in life, which may lead to poor cognitive ability of the child later in life. They also pointed out that with regard to children, responsive relationships with parents especially the mother have many beneficial effect; (a) by promoting healthy development of child's brain (b) enhancing the buffering protection that is needed to prevent very challenging experiences from producing a toxic stress response (c) strengthening life core skills (d) enhancing child's social development skills. However, early motherhood with poorer maternal characteristics might adversely affect these experiences.

Bernal (2008) and Bianchi (2000) and Gimenez-Nadal JMolina (2013) documented other maternal factors other than early motherhood, such as education and employment status greatly

effect child outcome. They reported that while higher maternal education provides a healthy pathway of parenting, employment provides resource capacity to match child needs for better outcome later in life. Additionally, Irwin, Siddiqi, and Hertzman (2007) revealed that the geographical location of the child play significant role in determining whether a child would grow up into poverty, drop out of or do well in school. Other household factors that affect child outcomes include, household income (Dahl, Lochner, 2012; Blau, 1999), family structure (Keding, Bianchi, 2008; Aughinbaugh, Rothstein, Pierret, 2005), race (Pachter and Garcia, 2009), household size and number (Heer, 1985).

4.2.2 Early Motherhood and Child Outcomes

Women developmental stages and landmark events with possible implications are enshrined in the Intersectionality theory (Collins, 1990; Crenshaw, 1989). As specified in the previous chapter, these developmental stages enshrined in the above theory are very cardinal to and exemplify the early mothers with children who are the focal subjects of this research (Watts, Liamputtong, and Mcmichael, 2015). Thus, understanding the experiences and implication of early motherhood requires careful consideration of the potential intergenerational consequences for the children.

Additionally, Economic theory posits that childbearing is a package, which goes with important opportunity costs for the mothers, thus mothers, at least, exit labour force temporarily in time of pregnancy, leading to loss of job experience and earnings from work and this could eventually affect child outcomes especially with the case of single parents (Loughran and Zissimopoulos, 2009; Taniguchi, 1999). Delaying motherhood on the other hand can shift or postpone timing of motherhood to another period with less economic impact. This may help delayed mothers to be economically advantaged and are better positioned to render good care to their children thereby improving child outcomes (Ellwood, Wilde, and Batchelder, 2004; Augustine, Prickett, Kendig, and Crosnoe, 2015).

Ribar, Wilhelm (1999), Becker (1965), and Gronau (1973), based on theory of Household production, posit that early motherhood has potential of affecting not only mother's later life outcomes but also child outcome indirectly. They added that the responsibilities associated with raising and nurturing children may disrupt mothers' participation in job market and may thus

reduce their income earnings. This may affect their financial ability to render adequate care to their children. Furthermore, they indicated that mothers who are actively working in the job market, the responsibilities of raising and nurturing children may increase their absenteeism from work and thus affecting earning and ability to provide adequate need to the children (Ribar, 1999). Thandiwe (2011), Greathead (1998) and Naidoo (2005) have validated this in the South African context.

Existing literature has documented a range of factors that relate early motherhood and child outcomes. These factors may be broadly classified as (1) biological and (2) family or environmental factors. Hofferth, and Reid (2003) pointed out that early motherhood may affect mothers' physiological make-up, create social and emotional immaturity, disrupts educational attainment and resultant human capital development, which create disadvantaged trajectories that result in adverse effects on child outcomes. Additionally, teenagers who stop schooling due to pregnancy do not normally acquire the needed skills to help them fully participate in the job market. Thus, this limitation of skills may create financial and technical inabilities to participate in labor market. This situation makes teen mothers financially handicapped and unable to provide the needed support to the children. Furthermore, early motherhood has a potential of creating a certain kind of family structure environment that affect child development. This family structure environment (such as single parenting, out-of-wedlock among others) may result in negative implications on the children.

According to Macleod (1999), mothering is a crucial topic that has received significant attention within the discipline of sociology, or social work, psychology among others. He further documented that teenagers normally encounter difficulty in interpreting emotional gesture of their children, that is, they struggle to know what the emotional needs of their children are and therefore are unclear about it. Furthermore, due to the stress that teenage mothers often go through, they are less likely to respond quickly and are less sensitive to the children's need as compared to the mature mothers, due to lack of parental skills. This report is also upheld by Genobaga (2004) who asserted that teenage mothers lack the requisite parental skills to provide the needed childcare in 24-hours basis as compared to their mature counterpart. They added that not only do some of these pregnant teenagers suffer rejection from the male family or foster parents, but also more importantly, the kind of emotional stress they go through, regular feeling of

depression, stress coupled with loneliness and anxiety may also affect the state and development of their unborn babies, and subsequent later childhood outcomes.

Secondly, less than 36% of pregnant teenagers actually seek prenatal care and services within the first trimester of their pregnancy (Macleod, 1999). In this condition, infant is at the high risk of being premature even before birth and are more likely of having low birth weight. He reported that about 22% of pregnant teenagers at the age of 17year or lesser at the King Edward Hospital had a low birth-weighed infant (that is, less than 2.5gk). Furthermore, Cameron, Richter, McIntyre, Dhlamini, and Garstang (1996) compared children of teenagers under 17years of age, between the age of 17 and 19 years and those within the age of 20-29 years in Baragwaneth Hospital in Soweto. The children born to the youngest teenagers were found to be significantly smaller than those born to the older mothers (Macleod 1999). In addition, lack of continuous prenatal care also leads to a high incident of neuro-development and its related problems including cerebral seizure palsy, disorder and mental retardation of the child (Bullock, 1992).

Thirdly, Bullock (1992) documented that teenage pregnancy is associated with significant risk to the young mothers and consequently the child outcome. He reported that in most occurrences when a teenager realizes her pregnancy there is a tendency on her part to hid it from notice until it becomes obvious. Consequently, some suffer health related complications and to some extent, mothers suffer from physical deformity due to emergent medical intervention. This might also become a risk factor to the child outcomes. Genobaga (2004) reported that teenage mothers are in a greater risk of experiencing medical complications during pregnancy which may include medical condition such as pre-eclampsia, hypotension and that certain critical condition may have induced labor prior to the normal time. Similarly, teenage mothers are also prone to poor nutrition (which could affect the right weight needed during pregnancy), anemia, weak bones in subsequent time in life, and other health deteriorating condition (Thandiwe, 2011). This may lead to physiological deformity to the unborn child.

Moreover, teenage mothers are in a greater risk of contracting sexually transmitted diseases (such as AIDS), which can easily be transferred to the baby. The report also shows that some teenagers do not have full physiological and anatomical development that can prepare them to carry and maintain pregnancy and continue to stay healthy even after delivering, thus they are more likely

to transfer such diseases to their child (Martin, 2003). Furthermore, teenage mothers' children are often bombarded with relationship in many ways. For instance, in cases where unplanned pregnancy occurs and the parents do not want to accept responsibility of the pregnancy or do not agree to enter into marriage, it becomes very difficult to integrate or share relationship with the refusing family. Sometimes, the negative reaction from parents can also create a sense of embarrassment and rejection. This becomes more consequential in poor communities. Thus, in this situation, the feeling of anger and distress are sometimes transmitted to the child (Macleod, 1999).

4.2.3 Empirical Study on the Effects of Early Motherhood on Child Outcomes

Very few studies exist on the impacts of teen motherhood on child outcomes. Firstly, Geronimus and Korenman (1993) compared sisters (with similar background characteristics) in terms of birth outcomes and maternal behaviors to see how this could affect infant's health in the USA. Thus, they compared these sisters who entered into motherhood at different ages to ascertain how this affect the birth weights of their children. The authors rather found evidence that maternal precursors and other family background largely accounts for many of the health-related outcomes (such as birth weights) than the age at birth. They find no evidence that children born to early or teen mothers are at the greater risk of having lower birthweight than the older mothers. This study, however, is only limited to childbirth implication of early motherhood. They did not consider the later health outcome of the child, as well as the educational and economic well-being of the child.

Bruce (2011) used data collected from the Longitudinal Study of Australian Children (LSAC) to examine young motherhood and its possible effects on child functioning ability. He found that children who are within the age of 4-5 years and whose mothers were under the age of 25 years when they were born perform less than those from the older mothers. He also documented that children who are 16-18-year of age and who are still living or staying with their mother exhibit certain disadvantages which affect their education and labor market outcomes later in life. He also pointed out that children of teen mothers were more likely to repeat grades. Furthermore, he used Household Income and Labour Dynamics in Australia (HILDA) survey to investigate the outcomes of children born to both teenagers and young adults after controlling for background

characteristics and effect of first-born child. He did not find any significant difference in the year 12 completion of the siblings. Their study, however, did not account for possible selection bias that could call for other robust methodology and rigorous econometric analysis. Furthermore, they did not also consider other aspects of child outcomes such as the economic well-being.

Furthermore, Turley (2003) used a national sample to investigate a test score and school performance of children within 3-16 years of age. He reported that the association of poorer score and questionable behavior with children of teen and young mothers could not be attributed entirely to the age of the mothers but also to the background characteristics of her family. He, however, pointed out a significant relationship between age at first birth and test score of non-firstborn children, but this effect, according to him, is insignificant at age at the time of childbirth. His finding is similar to Geronimus, Korenman, and Hillemeier (1994) who reported that the disadvantages associated with children of early mothers (of the same family origin, sisters) reduced significantly after controlling for background characteristics. They argued that age at birth is not a key predictive variable of outcome, since they observed that test score improves over time. This study is also limited to child score and behavior and does not embody rigorous econometric analysis to account for child selection bias and time differential elements.

Furthermore, Hofferth and Reid (2003) used multivariate analyses technique in USA to investigate how early childbearing affects children's achievement and behavioral trend over time. They found that after controlling for social and demographic characteristics of the mothers, children born to teenagers and younger mothers have significantly lower scores rate and higher behavior-problem index than children born to non-teen mothers. They further documented that when time factor is taken into account, only one out of the four achievement score was significantly lower for children born to teen mothers than those born to non-teen mothers.

Lanier, and Zolotor (2014) used a focus group discussion methodology to investigate early childhood intervention and teenage pregnancy in North Carolina. They reported that teenage pregnancy poses high risk factors with poorer social, behavioral and development outcomes to children. Their study is however, descriptive in nature descriptive in nature without rigorous econometric analysis. Their study was conducted in the context of developed country where poverty, unemployment and inequality are relatively low. It is pertinent to address the phenomenon in contexts where poverty and unemployment are higher such as South Africa while

well-being in general is much lower compared to developed countries. Irwin, Siddiqi, and Hertzman (2007) also carried out a study on early child development in British with a conclusion that early child development is tied to prenatal and maternal characteristics such as teenage pregnancy and poor parenting. They further revealed that poor parenting affect child's social inclination and contact with the broader environment. Similarly, Center on the Developing Child at Harvard University (2017) undertook policy analysis of early childhood development in the United State and documented that poor prenatal characteristics such as teenage motherhood negatively affect child's brain architecture and academic success later in life. These studies, however, are mere reports without rigorous statistical attempt to crystalize the degree of causal effect. Other areas of child outcome such as economic well-being and health were not well investigated. Furthermore, all the studies were in the context of developed countries with relatively better economic condition. It is important to address the phenomenon in the contexts where poverty and unemployment are higher as in the case of South Africa, which is the study area.

In South Africa particularly, there is a severe shortage of empirical work on the impacts of teen motherhood on child outcomes. Macleod (1999) in his historical studies in South Africa found that early mothers who gave birth in their early teen are more likely to have babies with health-related problems and complications, a situation that maybe intergenerational and may affect child development and life outcomes. However, his study was a mere review of historical literature, which is mainly descriptive in nature without quantitative and rigorous analysis. Branson, Ardington, and Leibbrandt (2015) however investigate health outcome of children born to teen mothers living in Cape Town, South Africa using propensity score reweighted regression. They reported that the disadvantage of child born to teen mothers could not be fully linked to observed background characteristics. They found a significant negative association of early child bearing and child's birth weight, and stunted growth with colored children than those from the African race. However, in their separate studies in South africa, Tshotetsi, Dzikiti, Hajison, and Feresu (2019) and Hoque, Towobola, Mashamba , Monokoane (2014) found from their logistic regression results that teenage mothers who attended ante natal care (ANC) have babies with healthier birth weights while non-teen mothers who did not receive antenatal care have significant number of underweight babies. They therefore concluded that age at birth or maternal

age did not predict low birth weight but other factors such as attending ante natal care visits. Further, Hoque and Hoque (2010) used logistic regression analysis in their study to compare the incidence of adverse obstetric and perinatal outcomes of adult mothers to teenage mothers who delivered at Empangeni Hospital in South Africa. They found no difference in the birth weight of babies born to teen and non-teen mothers and concluded that teenage pregnancy did not predict a low birth weight outcome. Furthermore, there is a dearth of literature on the intergenerational effects of teenage motherhood on the economic, educational and later health outcomes of children especially in South Africa. This study is necessary to fill this gap and to consolidate the existing study.

4.3 Methodology

This section enshrines the methodological approach used to examine the impacts of early motherhood on child outcomes. It encompasses methods with various econometric strategies and description of data used in the analysis as well as detailed descriptions of the variables and their measurements.

4.3.1 Data

This study used data from National Income Dynamics (NIDS) conducted by a research unit of the University of Cape Town, South African Research and Labor Research Unit (SALDRU). NIDS began its data collection in 2008 which was a nationally representative sample of individuals and households across the country. The survey was repeated again in 2010, 2012 and 2014 with the same and additional members. These data sets were partitioned broadly into household data, adults data, child data set (0-14) among others by NIDS. In child data set, NIDS defined children as those below 15 years of age, that is 0-14 years, which is also a vulnerable age group (Pearson and Stone, 2009) and the information on such children within a particular wave can go as far as the age boundary above. This and the vulnerability of this age group has made it necessary to use this age definition of children for this paper; thus, the analysis of child outcomes in this paper is limited to the first-born children who were 0-14 years old. The sample is restricted to first-born children to avoid potential birth order biases. For instance, LeGrand and Mbacke (1993) find that first born children are exposed to greater risks especially health than their younger siblings

although they are more likely to be vaccinated. Secondly, including siblings may defeat the objective of the study as a mother who was in her teen at the time of first birth might no longer be a teen mother in her subsequent delivering and so maybe misleading to use teen motherhood when referring to subsequent non-teen births, hence the use of only the first-borns .

Child data set has about 8360 different firstborn children within the age from 0-14 years across all the waves. The data also provides information on the parents of each child such as their dates of birth, and first-born as well as children's dates of birth. By finding the difference between the date (year) at which a mother had her first child and the date (year) of her birth, a mother's age at first birth was identified and each first-born child on the same data set was classified as being born to a teen mother (less than 20 years) or to a non-teen mother (20 years and above). One key interesting thing about the data is that each child's parent's name (in this case, mother) is identified with a pid number and this pid is the same as the unique identifier for that mother throughout all the data sets. This made it possible to scoop any further information on the parents in any part of the data sets.

The data provide relevant variables of interest in analyzing the effects of teen motherhood on child outcome. Firstly, the data provide information on children in the areas of economic status educational outcome, health, weight, and other anthropometric measures and demographic characteristics. Information on mothers, those who gave birth at least once, includes maternal and background characteristics such as time of first birth. Furthermore, essential information on family structure environment including family types, household head composition, marital status, biological relation, family size, and background factors are also contained in the data set.

In dealing with the missing observations, the data were studied and analyzed (such as mcartest commad in stata version 14) to identify the causes of the missing observations and if the data points are missing completely at random, missing at random and not missing at random (Graham, 2009; Kim, and Curry, 1977; Rubin, 1976). In dealing with missing completely at random they recommended that one should to ignore the missingness if it constitutes less than 5% of the observation in large data and drop the entire variable if the missingness amounts to over 60% of the observations. The former rule was applied with caution as most of the variables with missing values have related questions which help in supplying data points for missing observations

leaving no or missing values of less than 1 % for outcome and explanatory variables. Concerning missing values that are not randomly distributed across observations but are distributed within one or more sub-samples, the data points were derive from the primary indicators.

Table 4.1A and 4.1B displays the summary statistics for the full sample and across all the waves respectively of the outcomes and background characteristics of the children. The table reveals that 72.5% and 67.7% of children of teen mothers and non-teen mothers respectively dependent on government grant. This trend is fairy distributed across te four waves in Table 4.1B. This significant figure begs an answer to the question of what accounts for the dependency on government grant and other forms of social supports. Is it the result of early motherhood, family structure arrangement, or other confounding factors? This is investigated in the following pages. The table also shows that about 11.56% and 13.1% of children of adolescent mothers and non-teen mothers respectively repeated grade for at least once. Furthermore, only 0.8% and 0.44% of children born to teen and non-teen mothers respectively were perceived to be in poor health condition, while the majority have an excellent and very good record of perceived health accounting for 35.8% for children born to teen mothers and 36.0% for those born to non-teen mothers. The average body mass index is 20.03 for children born to teen mothers and 20.05 for those born to non-teen mothers.

Additionally, children born to teen mothers (34.0%, 29.7%, and 3.4%) and those born to non-teen mothers (39.1%, 28.6%, and 3.3%) live in intact married, out-of-wedlock divorced family and have deceased parents respectively. The high proportion of children born to out-of-wedlock parents stimulates speculation of possible implications on child outcomes. This means that such children were born to parents outside marriage. This condition could constitute a perennial risk to the upbringing and development of such children. The table further shows that 6.5% and 10.7% of children born to teen and non-teen mothers respectively were living in an extended family home, that is, living with family members other than biological parents. Furthermore, children of young mothers (16.8 %, 31.8% and 34.3%) and those born to non-teen mothers (26.4%, 39.3%, and 13.9%) were living in house headed by male, female and grandparents respectively. The higher proportion of female-headed and grandparent households makes South African households unique among other countries in Sub-Sahara countries where males mostly dominate the headship. This deviation can be attributed partly to the high rate of out-of-wedlock parents, where

women have children outside marriage, and many of these women end up becoming single parents and heads of families or leaving the children with their grandparents. The table also shows that children born to teen mothers live in a household with an average of 7.1 members, which is a bit higher than 6.4 for those born to non-teen mothers. The average household income for children born to teen and non-teen mothers according to the table is R4388.2 and R6132.2 respectively so also in Table 4.1B where the pattern is repeated so also with other outcomes and covariates. In this table, Africans are the majority in each wave, followed by coloured, then white and Asians.

The table also documents that female children adolescent mothers constitute 43.5% and were Africans by race representing 52.2% as compared to 50.9% for female and 84.7% for race of children of teen mothers. Majority of children live in rural/traditional areas (56.6% and 49.3% for children born to teen and non-teen mothers respectively), mothers' year of education (10years and 10.9 years for children early and delayed mothers respectively). With regard to access to access to some form of toilet facility (93.9%% and 95.1% for children of teen and non-teen mothers respectively). The provincial distribution of children of teen mothers is also reported in Table 1 for Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga and Limpopo as 10%, 11.5%, 7.2% 5.6% 32.4% 5.8% 7.7% 7.9% and 9.1 %respectively. The proportion of children born to non-teen mothers is also reported in the table for Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga and Limpopo as 11.5%,7.5%,5.4%, 27.0%, 7.3%,7.4% and 10.3% respectively. This distribution is in line with expectation according to census published by Statistics of South Africa (2011).

Table 4.1A Summary Statistics for all waves

	Variables	Definitions	Children born to Teen Mothers-whole sample	Children born to Non-teen Mothers-whole sample
			Mean & Std. Dev.	Mean & Std. Dev.
Child outcomes	Education	=1 repeated grades ,otherwise 0	250 (11.56%)	789 (13.10%)
	Recipient of child grant	=1 child depends on grants and other social support, otherwise 0	1,585 (72.5%)	4,094 (67.7%)
	Health; Excellent	1 Excellent, otherwise 0	796 (35.8%)	2,212 (36.0%)
	Very good	=1 Very good , otherwise 0	500 (22.5%)	1,311 (21.3%)
	Good	=1 Good, otherwise 0	242 (10.9%)	713 (11.6%)
	Fair	=1 Fair, otherwise 0	33 (1.5%)	100 (1.6%)
	Poor	=1 Poor, otherwise 0	18 (0.8%)	27 (0.44)
	Binary Health; Good health	=1 Good health , otherwise 0	2,118 (97.2%)	5,872 (97.3%)
	Under weight at Birth (<2.5kg)	Measured in kg per meter square	128 (9.3%)	319 (8.1%)
Marital status	Intact married	=1 intact married, otherwise 0	750 (34.0%)	2,380 (39.1%)
	Out-of-wedlock	=1 Out-of-wedlock , otherwise 0	645 (29.7%)	1,722 (28.6%)
	Divorced	=1 divorced, otherwise 0	74 (3.4%)	198 (3.3%)
	Deceased parents	=1 Deceased parents, otherwise 0	467 (21.5%)	1,073 (17.8%)
Family type	Extended family	=1 extended family, otherwise 0	146 (6.5%)	657 (10.7%)
Headship	Male head	=1 male head Otherwise 0	371 (16.8%)	1,609 (26.4)
	Female head Grandparent head	=1 female head Otherwise 0	704 (31.8%)	2,399 (39.3%)

		=1 grandparent head Otherwise 0	1,133 (51.2%)	2,094 (34.3%)
Family size	Family size*	Family size is measured as the number of members per household	2,218 (7.12)	6,142 (6.4)
Other individual and Household characteristics	Race			
	African	=1 African , otherwise 0	1,879 (84.7)	5,046 (82.1%)
	Asians	=1 Asians , otherwise 0	4 (0.2%)	72 (1.2%)
	Coloured	=1 Coloured , otherwise 0	320 (14.4%)	870 (14.6)
	White	=1 White , otherwise 0	15 (0.7%)	154 (2.5%)
	Gender; Female	=1 female , otherwise 0	1,138 (52.2%)	3,074 (50.9%)
	Mothers' education*	Years of formal school completed	2,218 (10.0)	6,139 (10.9)
	Mothers of teenagers' Grade 0-7	=1 if had grade within 0-7, otherwise 0	10.8	12.7
	Mothers of teenagers' Grade 8-11	=1 if had grade within 8-9, otherwise 0	9.0	6.5
	Mothers of teenagers' Matrics	=1 if had grade matrics, otherwise 0	3.0	3.1
	Mothers of teenagers' Tertiary	=1 if had tertiary eduaction, otherwise 0	0.5	1.4
	Source of toilet	=1 has good toilet facility, otherwise 0	2,071 (93.9%)	5,794 (95.1%)
	Household income (per capital)*	Household income in rand	2,218 (4388.2)	6,142 (6132.2)
	Geography			
	Rural/traditional	=1 Rural/trad. , otherwise 0	1,255 (56.6%)	3,015 (49.3%)
	Provinces			
	Western cape	=1 Western cape , otherwise 0	222 (10.0)	709 (11.5)
	Eastern Cape	=1 Eastern Cape , otherwise 0	255 (11.5%)	666 (10.8%)
	Northern Cape	=1 Northern Cape , otherwise 0	159 (7.2%)	462 (7.5%)
	Free state	=1 Free state , otherwise 0	125 (5.6%)	329 (5.4%)
	KwaZulu-Natal	=1 KwaZulu-Natal , otherwise 0	719 (32.4%)	1,659 (27.0%)
	North West	=1 North West, otherwise 0	129	446
	Gauteng			

	Mpumalanga		(5.8%)	(7.3%)
		=1 Gauteng , otherwise 0	172 (7.7%)	641 (10.44)
	Limpopo	=1 Mpumalanga , otherwise 0	177 (7.9%)	453 (7.4%)
		=1 Limpopo, otherwise 0	196 (9.1%)	614 (10.3%)

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

Table 4.1B Summary Statistics Across waves

	Wave 1 %		**Wave 2 %**		**Wave 3 %**		**Wave 4 %**	
Variables	**Teen mother**	**Delayed mother**	**Teen mother**	**Delayed mother**	**Teen mother**	**Delayed mother**	**Teen mother**	**Delayed mother**
Education	11.8	14.6	15.9	24.4	11.8	7.5	6.6	4.7
Child grant	66.7	57.7	76.5	70.1	69.8	68.9	77.5	71.8
Excellent health	43.5	45.3	54.4	52.7	50.2	49.3	48.5	51.9
Very good health	32.1	28.5	29.3	29.4	30.5	29.9	32.8	31.5
Good health	17.3	19.3	10.7	12.5	16.5	17.3	16.7	14.7
Fair health	3.9	3.9	0.7	1.5	0.9	1.7	1.5	1.6
Poor health	1.8	1.3	1.1	0.4	100	0.2	0.3	0.2
Binary good health	94.2	94.6	98.1	98.1	99.1	98.1	98.1	98.1
Under weight at birth	9.5	9.9	10.0	7.6	8.0	7.2	9.4	8.2
Intact married	37.9	45.9	36.7	43.3	33.8	36.2	27.5	31.9
Out-of-wedlock	25.7	20.7	26.6	26.6	36.4	34.6	32.1	31.9
Divorced	2.5	4.5	4.9	3.5	2.8	2.3	3.1	3.0
Extended family	16.1	39.1	2.6	3.5	2.5	2.9	2.9	3.4

Male head	19.6	34.6	14.5	26.3	14.0	22.6	17.8	23.3
Female head	24.7	27.3	29.8	39.5	41.4	48.1	34.6	40.8
Grandparent head	55.7	38.0	55.5	34.2	44.6	29.2	47.5	35.9
Family size*	6.8 (3.5)	5.9 (3.5)	7.2 (3.5)	6.7 (3.8)	7.2 (3.5)	6.6 (3.7)	7.3 (3.7)	6.5 (3.5)
Mothers of teenagers' Grade 0-7	12.6	12.0	7.5	10.1	11.5	14.0	11.1	15.3
Mothers of teenagers'Grade 8-11	10.6	11.3	5.0	3.8	8.0	4.9	11.7	7.3
Mothers of teenagers'Matrics	2.8	7.2	2.4	1.8	3.4	2.6	3.7	2.6
Mothers of teenagers'Tertiary	0.3	3.1	0.5	0.6	1.2	1.1	0.5	1.3
African	78.7	75.2	85.6	83.7	87.4	83.6	88.5	84.4
Asian/ Indian	0.31	2.5	0.2	0.7	100	0.8	0.2	0.9
Coloured	19.7	15.2	13.8	13.9	11.7	13.6	100	11.2
White	1.2	7.0	0.4	1.5	0.9	1.9	0.2	0.6
Female child	52.2	48.8	49.8	50.2	52.3	53.6	54.2	54.1
Mothers' education*	9.8 (2.7)	11.3 (4.4)	9.8 (2.7)	9.9 (4.6)	10.1 (2.8)	11.0 (4.4)	10.2 (2.7)	11.6 (3.9)
toiletfacility	92.5	92.0	94.6	96.2	93.8	94.7	95.1	96.7
Household income (per capital)*	3214.1 (3389.4)	5710.9 (9424.1)	4107.0 (5086.0)	53356.6 (12979.2)	4765.7 (6112.0)	6138.7 (8800.2)	5652.7 (6640.4)	7269.9 (7461.8)
Rural/traditional	54.0	46.5	56.7	51.1	58.3	51.4	58.1	47.7

Western Cape	12.9	12.7	11.9	11.3	7.11	11.9	7.4	10.5
Eastern Cape	10.6	10.0	10.8	13.1	11.2	9.2	13.2	10.4
Northern Cape	9.10	8.6	5.5	6.9	7.8	6.9	6.1	7.7
Free state	5.8	5.9	4.9	4.8	5.7	5.3	5.9	5.5
KwaZulu-Natal	30.6	25.8	29.5	26.2	34.2	27.6	35.8	28.2
North West	6.8	9.0	7.0	6.6	3.9	7.2	5.1	6.7
Gauteng	7.4	10.3	8.3	10.4	9.2	10.1	6.6	10.9
Mpumalanga	8.0	8.2	9.2	8.6	8.0	6.5	6.8	6.2
Limpopo	8.5	9.2	10.0	10.1	9.5	11.9	8.5	9.8
Total	**648**	**1267**	**542**	**1781**	**436**	**1419**	**592**	**1675**

Statistics of variables in asterisk '*' are means and standard deviations (in parenthesis)

4.3.2 Variable Discussions

Dependent variables

Educational effect: The educational performance or status of the child was measured as a dummy variable where 1 was assigned to a child who repeated a grade, 0 otherwise at a given age.

Recipient of Child grant: Since child grant is meant to improve outcome of children, many studies (e.g. UNICEF, 2010; Leila, et al., 2017; Adeola, 2019) have used this variable as child outcome in the South African context. Therefore, this study follows this literature to measure child grant as outcome variable in this analysis With respect to child outcomes, primary caregivers (PCG) were asked to provide information on the children. PCG was asked if the child receives child grant, due to financial difficulty from the parents. This is measured as a dummy variable, which is 1 for receiving child grant, 0 for parents or family support.

Health: The analysis utilizes primary caregiver's (PCG) report for physical health information of children. So, the PCG were required to indicate whether children's overall health was in excellent condition, very good condition, good condition, fair condition, or in poor. The ordered variable:

Excellent=1, Very good=2, Good=3, Fair=4, Poor=5 was collapsed into two categories= 1 for good health (1-3) and 0 for otherwise.

Under weight: This study used weight category based on the WHO (2018) that, weight less than 2.5kg at child birth is considered as underweight, thus dummy variable was created for 1 (underweight) if a child weighed less than 2.5kg at birth.

Explanatory variables

Early motherhood: Mothers in the sample are categorized into teen or early mothers (less than 20 years at the time when they first gave birth) and non-teen mothers (mothers from 20 years and above at the time when they first gave birth). For the purpose of this study, mothers who had their first birth before reaching the age of 20 years are called teen or early mothers.

Control variables

Variables related to child's background were observed. Firstly, the marital status of parents of children was identified as being in an intact married family, divorce or separate family, out-of-wedlock family, and a widow or widower family. Each sub-category is treated as a dummy variable for 1 if yes, 0 otherwise. The household head composition in which the child belongs is in three categories; male-headed (1 if yes, 0 otherwise), female headed (1 if yes, 0 otherwise), and grandparents headed family (1 if yes, 0 otherwise). The family structure is also measured based on the family type; derivatively, two categories are identified; nuclear families (parents with biological or adopted children only; 1 if yes), 0 otherwise, (extended families which includes other members with or without biological relatives). Lastly, family structure based on household size is measured in terms of the number of members per household. Other control variables include deflated household income adjusted for household size (measured in rand), Race (African, Colored, white or Indian) measured as 1 for each, 0 otherwise. Geographical location (1 for rural, 0 for urban). Additionally, sex is measured as a dummy variable for 1 if a child is a female, 0 otherwise, the age of a child and mothers' education were measured in years. For sanitation and water, 1 is assigned if toilet facility was available for household with the child, 0 otherwise and the same coding was applied for tap water availability (1 for yes and 0 otherwise). Each time v

ariable is dummy, and is aligned to the year of data collection, labelled as time1, time2, time3 and time4 for 2008, 2010, 2012 and 2014 respectively. Each was assigned 1 for yes and 0 otherwise.

4.3.3 Econometric Strategy

The existing empirical studies on the effect of teenage motherhood on child outcome have sought to compared outcomes of children of teen mothers with those of delayed mothers or with same mothers at later age to gauge if there is any outcome disparity between the two groups, particularly if children of delayed mothers do better. This throws a challenge of disentangling teenage motherhood-induced consequences from the effect caused by background precursors. "While this question is inherently not answerable, four primary methodologies are used in the teen childbearing literature to construct, under specific assumptions, plausible counterfactuals" (Branson, Ardington, and Leibbrandt, 2015). These methodologies can broadly be categorised as controlling for unobserved heterogeneity using instrumental variables 'natural experiments', family fixed effects and 'selection-on-observables approach'.

While the methodological approaches offer potential breakthrough for counterfactual estimation, each technique has strength and weaknesses. For instance, using instrumental variables or natural experiment in the first methodological approach as in the existing literature is not feasible under this study to estimate the effects of teen motherhood on child outcomes. Similarly, it is questionable whether the fixed effects approach is appropriate for the assessment of the effect of being born to a teen mother on child outcomes given genetic similarities between siblings/cousins. The wealth of information available in NIDS data, makes the selection-on-observables methodologies most appropriate. The 'selection-on-observables' approach investigates the question of whether observable pre-childbearing differences between teen mothers and older mother can explain why children of teen mothers appear disadvantaged. This is the question addressed in this paper and entails creating a comparison group of older mothers who have similar observed pre-childbearing characteristics to teen mothers with the exception that they gave birth at an age older than nineteen (Branson, Ardington, and Leibbrandt, 2015).

Following Branson, Ardington, and Leibbrandt (2015) specification with slight modification, children born to teen mothers receive the 'treatment', denoted by binary variable $\boldsymbol{T_i}$. Let $\boldsymbol{Y_i(1)}$denote the outcome child i would obtain under treatment and $\boldsymbol{Y_i(0)}$ the outcome obtained if the child is born to a mother who was older than nineteen.

$$\text{Yi} = \boldsymbol{Y_i} = \boldsymbol{T_i Y_i(1)} + \boldsymbol{(1 - T_i)\ Y_i(0)} \quad [4.1]$$

is observed, but never the pair ($\boldsymbol{Y_i(1)}$, $\boldsymbol{Y_i(0)}$); a child is either born to a teen mother or an older mother. Let the propensity score, in other words the conditional probability of being born to a teen mother, be denoted by

$$\boldsymbol{P(x) = P(T_i = 1 | X_i = x)}, \quad [4.2]$$

where $\boldsymbol{X_i}$ is a list of the mother's pre-childbirth characteristics.

$$\alpha(\boldsymbol{x}) = \boldsymbol{E}[\boldsymbol{Y_i(1)} - \ \boldsymbol{Y_i(0)} \mid \ \boldsymbol{X_i = x}] \quad [4.3]$$

denote the covariate-specific average treatment effect. According to Rosenbaum and Rubin (1983) the average treatment effect on the treated denoted by

$$\text{ATT}(\boldsymbol{x}) = \boldsymbol{E}[\alpha(\boldsymbol{x}) | \ \ \boldsymbol{T_i = 1}] \quad [4.4]$$

Two assumptions underlie the consistent estimation of the teen mother coefficient. The first assumption, commonly referred to as the selection-on-observables assumption, requires that, given $\boldsymbol{X_i}$, the set of observed covariates, treatment is random (Rosenbaum and Rubin 1983). This assumption allows the construction of a hypothetical counterfactual for teen mothers from women who did not give birth in their teens but are similar on observed variables that affect both the potential outcomes and the probability of being a teen mother.

The second assumption, the overlap or common support assumption, requires that no value of the observed covariates predict treatment assignment exactly. Formally, the common support assumption required to estimate the ATT is $\boldsymbol{P(x) < 1}$ (Angrist and Pischke 2009). This assumption ensures that the estimates are calculated off a sample in which both the treated and control observations have values for the observed covariates ((Branson, Ardington, and Leibbrandt, 2015)). This avoids the calculation of estimates on parts of the sample where the covariate distributions of the treatment and controls do not overlap (Angrist and Pischke 2009), i.e. avoids out of sample extrapolation.

A hypothetical counterfactual for teen mothers can be calculated by reweighting the group of women who did not give birth in their teens. In this way the ATT is estimated as the difference in the average outcomes between the treated observations and a group of controls weighted by their

covariate similarity to the treated observations. Specifically, Busso et al. (2009) show that when

$$\sum_{j=1}^{n}(1\text{-}T_j)\boldsymbol{w_{ij=1}} \qquad [4.5]$$

Where $\boldsymbol{w_{ij=1}}$ is defined as the weight defined below, the general notation for the reweighting estimators of ATT is

$$= \frac{\sum_{i=1}^{n} T_i Y_i}{\sum_{i=1}^{n} T_i} - \frac{\sum_{j=1}^{n}(1\text{-}T_j)V_J Y_j}{\sum_{j=1}^{n}(1\text{-}T_j)V_J} \qquad [4.6]$$

Where $\boldsymbol{V} = \frac{\sum_{i=1}^{n} T_i w_{ij}}{\sum_{i=1}^{n} T_i}$ s the average weight observation j in the control group (older mothers) receives across all treatment observations i (Busso et al. 2009).

We use a double robust specification to estimate the ATT (Robins et al. 1995). This means we are interested in calculating $\boldsymbol{\beta_1}$in the following weighted regression.

$$Y_i = \alpha_0 + \boldsymbol{\beta_1 T_i} + \boldsymbol{Z_i \beta} + \boldsymbol{p(x_j)} + \boldsymbol{p(x_j)^2} + \boldsymbol{p(x_j)^3} + \boldsymbol{\varepsilon_i} \qquad [4.7]$$

where $\boldsymbol{\beta_1}$is an estimate of the relationship between being born to a teen mother and the outcome of interest, x_j is the estimated propensity score and ε_i is the error term. propensity weighted logistic regressions are then used for the analysis, which outcomes are binary. A cubic function of the propensity score is included in the specification as in the instance that the outcome equation is correctly specified but the function of the propensity score is misspecified, this estimator will be more consistent than just reweighting by the inverse propensity score weight (Robins et al. 1995). The weight constructed to estimate β1 in equation 2 is a two-step estimator, relying on first estimating the propensity score and then using this score to construct a weighted counterfactual from the older mother sample.

The weight is constructed as follows

$$w_{ipw}(j) = \frac{\frac{p(x_j)}{1-p(x_j)} .SW_j}{\Sigma_{j\in\{T=0\}} \frac{p(x_j)}{1-p(x_j)} .SW_j} \quad [4.8]$$

Where $w_{ipw}(j)$ presents Hirano et al.'s (2003) inverse probability weight (IPW) normalized to one. This assigns a weight to children born to older mothers that is proportional to the conditional probability that their mother gave birth in her teens. The weight takes into account the NIDS sample design with SW_j denoting the sampling weight provided in the data for observation j. The weights sum to one by design.

4.4 Results and Discussions

In a large randomized control trial (RCT) where subjects are assigned to treatment or control by flip of a fair coin, the probability of being assigned to treatment (i.e., the propensity score, PS) is 0.5. This means that approximately half of the subjects will be treated while the other half will not. The randomization implies that, on average, measured as well as unmeasured covariates will be balanced between the two treatment groups. In contrast, treatment assignment is a non-random process (Ali, Groenwold, and Klungel, 2014). Nevertheless, PS methods help researchers mimic randomization by creating a sample of subjects receiving the treatment that is comparable on all measured covariates to a sample of subjects not receiving the treatment (Austin 2011, 2007; Jo and Stuart 2009). Hence, randomization in a RCT and mimicking random assignment of treatment in PS analysis (e.g., by PS matching) are sufficient to generate group of subjects with the same PS yet receiving different treatment modalities (Ali, Groenwold, and Klungel, 2014). PS methods provide an effective way of controlling for covariates in case of a limited number of events, thereby overcoming the "dimensionality problem," where the introduction of a new balancing covariate in the regression model increases the minimum necessary number of observations (outcome events) in the sample (Cepeda et al. 2003; Glynn, Schneeweiss, and Stürmer, 2006). To do this analysis, this current study based on the literature, requires estimation of propensity of propensity score, checking out the balancing properties and overlap condition and estimating the effect using weighted logistic regression.

The relationships between pre-birth characteristics and teen motherhood are documented in table 4.2. The reults show significant positive relationships of childhood poverty, unemployed mothers, African and olourd raced with teen childbearing. This relationship is negative for

tertiary education, North West and Western Cape. Other studies with similar findings include Wellings, Wadsworth, Johnson, Field, and Macdowall (1999), Yako (2007) and Hobcraft and Kiernan, (1999). The predicted results from the probit model were used to estimate the propensity scores for further estimation of the impacts of teen motherhood on child outcomes.

Table 4.2 Estimation of Propensity Score with Probit Model

Variables	**Coefficients**
Childhood poverty	0.1914**
	(0.0764)
MotherGrade 8-11	0.0431
	(0.0583)
Mothers with Matrics	0.1640
	(0.1074)
Mother with Tertiary education	-0.7277***
	(0.1901)
Mothers deceased while at teenage	1.1958***
	(0.1120)
Unemployed mother	0.1562***
	(0.0403)
Unemployed father	0.0074
	(0.0453)
African Race	0.6711***
	(0.1590)
Indian/Asian Race	-0.3125
	(0.2979)
Coloured	0.7566***
	(0.1634)
North west	-0.1741**
	(0.0712)
Western Cape	-0.1534**
	(0.0685)
Gauteng	-0.1682**
	(0.0626)
Mpumalanga	0.0257
	(0.0666)
Free State	-0.0075
	(0.0761)
Cons	-1.3840***
	(0.1766)
Prob >chi2	0.0000
Pseudo R2	0.0322
Observation	7,824

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Balance Property and Overlap Check

The matching procedure aims at reducing bias by increasing the balance between the children of the teen mother and that of the delayed mothers (Hainmueller, 2008; Graham, Campos and Egel, 2012). To do this involves series of procedures which encompasses estimating the means of the covariates for both children of teen and delayed mothers and then comparing the means difference. A small mean difference between these two groups is desirable for balancing. In this respect, one would like to see insignificant differences or larger P values (criterion 1); low mean differences as a percentage of the average standard deviation and insignificant differences between the mean which is fully met in Table 4.3. The Table also displays the region of common support (0.06361728, 0.84185838) ensuring that the mean propensity score is not different for treated and controls in each block .

Figure 4.1 displys the overlap assumption in propensity score. In this figure, the teen and delyed motherhood are well distributed for the propensity score as evidenced by the parellel trends exibited by the two groups before matching. Thus the the overlap assumpton condition was satisfied. It shows the estimated density of the predicted probabilities for teen mother is a non-teen mother and the estimated density of the predicted probabilities that non-teen mother is teen mother. By comparison none of the plots in the graph exhibit probability mass closs to 0 or 1 and the two estimated densities have most of their respective masses in regions in which they overlap each other. Thus there is no evidence in both the table and the graph that the overlap assumption is violated.

Table 4.3 : Evaluation of balancing property and overlap assumption

Testing balancing property: Descriptive table for teen and non-teen mothers

Variables	Teen mothers Mean	Non Teen mothers Mean	Differences	P-values
Childhood poverty	0.7368	0.7099	0.0269	0.8072
MotherGrade 8-11	0.0901	0.0654	0.0248	0.3120
Mothers with Matrics	0.0316	0.0417	-0.0101	0.2115
Mother with Tertiary education	0.0591	0.01416	0.0175	0.1459
Unemployed mother	0.7568	0.7343	0.0226	0.3763
Unemployed father	0.6767	0.6696	0.0070	0.7961
African Race	0.8526	0.8432	0.0094	0.8511
Indian/Asian Race	0.2105	0.2592	-0.0487	0.6466
Coloured	0.1400	0.1400	0.000	0.6789
North west	0.1052	0.0802	0.0250	0.7101
Western Cape	0.2632	0.2839	-0.0208	0.8499
Gauteng	0.3684	0.1790	0.1894	0.0507
Mpumalanga	0.0501	0.0434	0.0067	0.5785
Free State	0.0551	0.0363	0.0188	0.1042

Note: the common support option has been selected

The region of common support [.06361728, .84185838]

Estimated propensity score

	Percentiles	Smallest		
1%	0.091201	0.063617		
5%	0.237956	0.063974		
10%	0.25706	0.064816	Obs	7,824
25%	0.301032	0.064816	Sum of Wgt.	7,824
50%	0.335199		Mean	0.335384
		Largest	Std. Dev.	0.090776
75%	0.360284	0.822159		
90%	0.376559	0.822159	Variance	0.00824

95%	0.392736	0.841858	Skewness	2.357887
99%	0.796891	0.841858	Kurtosis	15.60903

The balancing property is satisfied

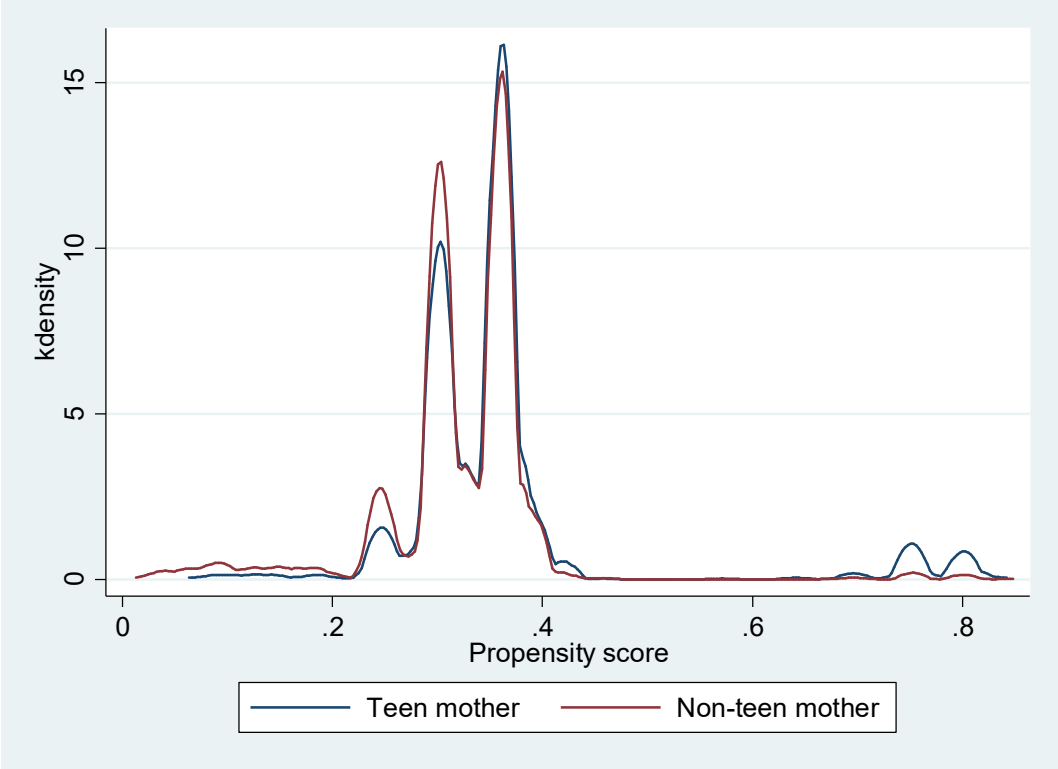


Figure 4.1: Distribution of the estimated Propensity Scores – common support between teen and non-teen mothers

4.4.1 Effect of teen motherhood on child outcomes.

This section unveils results and discussion of the study. It presents the estimates with discussions on the impacts of early motherhood on child outcomes such as education, Recipient of child grant, perceived health, and under-weight using propensity weighted logistics regression (propensity reweighting procedures were explained in the preceding pages).

Results of logit regression (marginal effects) are reported in the following tables. DeMaris, (1995) recommends the employment of marginal effect or probabilities if the analysis focuses on predicting the probability of an event, given a set of characteristics of respondents and odds ratio when one is merely interested in the impact or effect of independent variables. The logit model considers the significance and the direction but it does not tell us more about the effect of predictive variables on the outcome of an event. However, it is more useful and informative to discuss further, how the degree of a change of one variable affect the probability the other, which in this context, is the child outcome. For that reason, the estimated parameters were transformed into marginal effects which are presented in this chapter. The computed marginal effect gives the degree of impact or change in the probability of being repeating grade.

The result in Table 4.4 shows that children born to teen mothers are 3.9% more likely to repeat grade than those born to non-teen or older mothers. Bullock (1992) and Genobaga (2004) documented that, some teenage mothers are physiologically immature and that pregnancy at such age may impair the physiological and mental development of their progeny. This condition may later contribute to the child's poor performance in school.

Additionally, children from households headed by females are 3.2 % more likely to repeat grade than those from the male-headed household. Amson (2005) reported that children living in households headed by females are often more likely to repeat or drop out of school. He further documented that living in the family with bigger membership competes with both physical and financial resources and parental attention, which may potentially affect children's performance at school.. As reported earlier in Table 1, majority of these children come from out-of-wedlock homes with some living with single parents and this may lead to adverse child outcome on child education. Thus, in this circumstance, the extending and helping hand from grandparents could

potentially enhance the fortune of child education. This may justify the negative relationship between grandparent headed home and child grade repetition.

The table also that an increase in the household size by one is 0.7% more likely to cause grade repletion among children born to teen mothers than those of the delayed mothers. Furthermore, children living with more biological children are more likely to repeat grade by 3.4%. This finding is in line with Downey (1995) who found inverse relationship between household size and children's educational performance. He pointed out that there is an issue of resource dilution, and that parents have finite levels of resources (time, energy, money, etc.) and that these resources are diluted among children as siblingship as size increases.

Additionally, children with educated mothers are less likely to repeat grade by 0.6%. This finding is consistent with Augustine (2017) who revealed that an increase in mothers' educational attainment is linked to an increase in child performance at school.

The table also shows that female children are 3.8% less likely to repeat grace compared to male. Concerning child's school performance in school, Richardson, Koller, and Katz (1986) identified and classified reasons why boys do not fare as well in school performance. These according to their findings include biological (e.g., X-linkage of intellectual traits) and social (e.g., sex-role training is more stringent for boys than for girls, and parents may place more pressure on boys for academic achievement). Social factors are rapid social change that has been taking place in the carrying out of adult sex roles and whether this has filtered down to changes in the sex-role training in the socialization of children.

Furthermore, children living in household with more income are less likely to repeat grade by 1.4%. Christopher and Cooper (2015) documented that "We can now confidently say that money itself matters and needs to be taken into account if we want to improve children's outcomes," , "We often focus on gaps at school – but what the evidence shows is that money doesn't only make a difference to children's cognitive outcomes, it also makes a difference to their physical health, to birth weight, and to social and behavioral development." Fifty-five of 61 studies carried out in eight countries over the past three decades showed increases in income to have a positive effect across a variety of measures, according to the systematic review carried out by Cooper and Kitty Stewart of the Centre for Analysis of Social Exclusion at the London School of Economics. Significantly, the measurable impact of increasing a family's income is

similar in size to the measurable impact of investment in education – suggesting that attempts to boost poorer children's attainment at school, for example via the pupil premium paid to schools educating the poorest children, or subsidized early years education and nursery places – may be misdirected, if at the same time family incomes are falling.

The table also shows that, African child is 7.2% more likely to repeat grade. This finding is not surprising as the poverty level among African race in highest (Statistics of South Africa, 2011) compared to the other race so children from this race might not receive the necessary resource commitment that could increase the chance of better academic performance. Time 3 and 4 are negatively significant as favorable opportunities unfolds with the passage of time, chances of improvement will be higher than the first period.

A cubic function of the propensity score is included in the specification as in the instance that the outcome equation is correctly specified but the function of the propensity score is misspecified, this estimator will be more consistent than just reweighting by the inverse propensity score weight (Robins et al. 1995).

In determining if receipt of child grant (measure for child economic well-being) is more likely for children of teenagers than those from the older counterpart, Table 4.4 reveals that if other covariates are not controlled, the effect is 7.7% more likely for the children of teen motherhood. However, the effect is insignificant when all other factor/ covariates are controlled. This means that the impacts are induced by these background precursors rather than the teen motherhood. These background factors include, marital status, head composition, family types and race. The results show a significant positive relationship between married parents and child dependency on government and other forms of social supports. Thus, children from cohabiting and widow(er) parents are more likely to receive government grants and other social support due to poverty by 10.9 % and 8.7%. Contrary to Tank (2011) and Jane (2014) who reported that married family complements each other and provides economic support that could equally benefit the children from widow(er) do not usually enjoy these advantages as well as some cohabiting parents who are not legally tied .

Furthermore, children born in the households headed by females and grandparents are more likely to receive child grant by 11.1% and 11.7% respectively than those from the household

headed by male. Hamilton and Jenkins (2015) argued that, even though grandparents are key sources of moral and physical support to nuclear household and other social support networks, majority are economically unproductive and thus children under their shepherding could suffer economic hardship. Furthermore, living in a bigger household size is significantly positively related to child's economic dependency on government grant by increasing the probability of child dependency by 1.6%. This finding is in line with a similar revelation by Bjorn and Kristian (2016) who concluded that big household size competes with limited resources, which may not be sufficient to meet the needs of members as compared to the smaller household especially where only one party is employed.

While the result shows a significant negative relationship between educational attainments of child's mother, household income with child economic dependency, the relationship is positive for children from African and coloured race. The more education one has, the higher the likelihood of being engage in economic activities to earn income, hence better economic capacity is available to meet children's need that depending of social grant. Due to the high level of poverty among African race and coloured race (Statistics of South Africa, 2011), it is expected that most children from these race depend of grant.

Concerning the effect of location on well-being, Gallies (2014) reported that location bears significant meaning to well-being. He pointed that the outcome of one living in area with higher cost of living or poorer area with deprived economic opportunity is less likely to be better especially for the unemployed. This is not expecting as Statistics of South Africa (2011) reported for Western Cape and Gauteng.

Table 4.4 Results of Propensity Weighted Logistic Regression Model: Effects of Early Motherhood on Child Education and Economic Well-being (Grant)

Variables	Grade repetition Marginal effects	Grant Marginal effects	Grant (no control of covariates) Marginal effects
Teen motherhood	0.0394*** (0.0153)	-0.0340 0.0290	0.0774*** (0.0223)
Married	-0.0099 (0.0224)	0.0462 0.0439	
Cohabiting	-0.0264 (0.0271)	0.1098** 0.0519	
Widow	0.0073 (0.0232)	0.0876** 0.0461	
Out of wedlock	-0.0263 (0.0231)	0.0709 0.0450	
Extended household	0.0223 (0.0159)	-0.1339** 0.0308	
Female-headed	0.0318** (0.0140)	0.1105*** 0.0257	
Grandparents head	0.0105 (0.0144)	0.1172*** (0.0262)	
Mother's Education	-0.0061*** (0.0013)	-0.0185*** (0.0025)	
Household income	0.0149** (0.0059)	-0.0910** (0.0119)	
Rural/Traditional areas	-0.0213* (0.0118)	0.0199 (0.0217)	
Household size	0.0076*** (0.0019)	0.0162** (0.0036)	
African	0.0716** (0.0380)	0.3817** (0.1424)	
Asian/Indian	-0.0603 (0.0425)	0.2976 (0.1599)	
Coloured	-0.0538 (0.0404)	0.3523** (0.1420)	
Eastern Cape	-0.0044 (0.0219)	-0.0320 (0.0387)	
Western Cape	0.0123 (0.0232)	-0.1867** (0.0443)	
Northwest	0.0054 (0.0243)	-0.1011** (0.0438)	
Gauteng	-0.0016 (0.0227)	-0.1643** (0.0410)	
Mpumalanga	0.0182 (0.0229)	-0.0814* (0.0428)	

KZN	0.0211 (0.0177)	-0.1165** (0.0321)
Northern Cape	0.0184 (0.0241)	-0.0964** (0.0449)
Free State	-0.0187 (0.0267)	-0.0576 (0.0461)
Female child	-0.0378** (0.0093)	0.0090 (0.0169)
No of Biological children	0.0341** (0.0039)	0.0024 (0.0088)
Propensity score	-0.2410** (0.5550)	3.9336** (1.9991)
Propensity score ^{2}	0.5109 (1.5319)	-9.8037* (5.2297)
Propensity score^3	-0.2540 (1.2255)	7.5933 (3.9484)
tim2	0.0259* (0.0136)	0.0194 (0.0262)
tim3	-0.0406** (0.0165)	0.0485* (0.0271)
tim4	-0.0665** (0.0159)	0.1253*** (0.0264)
Observation	7,801	7,801

Standard errors are indicated in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4.5 displays statistical relationships between early motherhood and child health outcomes, that is perceived health and birth weight. While teenage motherhood is significantly related with perceived health (which is based on parental judgement of child's health), it is insignificant for the low birth weight. The insignificant relationship of teenage motherhood with child's birth weight (underweight at birth) is consistent with Tshotetsi, Dzikiti, Hajison, and Feresu (2019), Hoque, Towobola, Mashamba , Monokoane (2014) and Hoque and Hoque (2010) in South Africa. Tshotetsi, Dzikiti, Hajison, and Feresu (2019) and Hoque, Towobola, Mashamba , Monokoane (2014) found in their separate studies that teenage mothers who attended ante natal care (ANC) have babies wih healthier birth weight while non-teen mothers who did not receive antenatal care have significant number of under weight babies. They therefore concluded that age at birth or maternal age did not predict low birth weight but other factors such as attended ante natal care visits. Further, Hoque and Hoque (2010) compared the incidence of adverse obstetric and perinatal outcomes of adult mothers to teenage mothers who delivered at Empangeni

Hospital in South Africa. They found no difference the birth weight of babies born to teen and non-teen mothers. Further binary logistic regression showed that teenage pregnancy did not predict a low birth weight outcome. The findings however, contradict the studies by Branson, Ardington, and Leibbrandt (2015) in South Africa. They found a significant negative association of early child bearing and child's birth weight, and stunted growth with colored children than those from the African race. Other studies have suggested that young mothers (13 to 19 years) are more likely to deliver a low birth weight infants, compared to adult mothers (20 to 45 years) (Althabe et al., 2015; Alemu and Umeta, 2015). Ngoma et al (2016) found that teenage mothers had a higher risk of delivering a low birth weight infant than adult mothers.

Concerning birth weight, some background precursors play a major role according to two papers examine health outcomes of children born to teen mothers, specifically. Geronimus and Korenman (1992) use a cousin fixed effects framework to assess whether there is a teen-mother-child-health-disadvantage using the US National Longitudinal Study of Youth. They investigate the incidence of low birthweight and some pre and post childbirth maternal health behavioral outcomes, including prenatal care, smoking and drinking during pregnancy, breastfeeding and well child visits. Once pre-childbirth characteristics common between sisters who give birth are controlled for, they find very limited evidence of a link between poor child health and maternal age. Later initiation of prenatal care and a higher incidence of smoking during pregnancy among teen mothers were the only outcomes found to remain significant after adjusting for family background (Geronimus and Korenman 1992). Using the same data, Rosenzweig and Wolpin (1995) compare results on the effect of teenage childbearing on gestational age and child birthweight using both a cousin fixed effects and a sibling fixed effects2 specification. In line with the findings of Geronimus and Korenman (1992) they find no evidence that children born to teen mothers are at risk of lower birthweight in either specification, and find only marginal differences in gestational age when siblings are compared. This could also explain why North West, KNZ and Free state are significantly related to child birth weight.

Table 4.5 Results of Propensity Weighted Logistic Regression Model: Effects of Early Motherhood on Child Health

Variables	Perceived health Marginal effects	Under weight Marginal effects
Teen motherhood	0.0132** (0.0067)	0.0086 (0.0153)
Married	-0.0050 (0.0131)	-0.0352 (0.0234)
Cohabiting	-0.0131 (0.0152)	-0.0331 (0.0289)
Widow	-0.0022 (0.0132)	-0.0312 (0.0249)
Out of wedlock	-0.0119 (0.0125)	-0.0427* (0.0248)
Extended household	0.00951 (0.0076)	-0.0346 (0.0222)
Female-headed	0.0050 (0.0070)	-0.0277* (0.0168)
Grandparents head	0.0053 (0.0071)	-0.0122 (0.0164)
Mother's Education	-0.0375 (0.0320)	-0.0106 (0.0444)
Household income	0.0030 (0.0293)	0.0028 (0.0454)
Rural/Traditional areas	0.0005 (0.0006)	-0.0015 (0.0015)
Household size	0.0031 (0.0026)	-0.0070 (0.0063)
African	0.0158** (0.0061)	-0.0104 (0.0133)
Asian/Indian	-0.0016** (0.0005)	-0.0010 (0.0017)
Coloured	-0.0139 (0.0313)	0.0103 (0.0481)
Eastern Cape	0.0301** (0.0112)	-0.0061 (0.0218)
Western Cape	0.0048 (0.0117)	-0.0398 (0.0269)
Northwest	0.0020 (0.0095)	-0.0547** (0.0264)
Gauteng	0.0198* (0.0107)	-0.0133 (0.0243)
Mpumalanga	0.0192* (0.0116)	-0.0464* (0.0263)
KZN	0.0147** (0.0074)	-0.0375** (0.0184)

Northern Cape	0.0055 (0.0106)	-0.0024 (0.0261)
Free State	0.0098 (0.0111)	-0.0775** (0.0337)
Female child	0.0043 (0.0043)	0.0167 (0.0105)
No of Biological children	0.0027 (0.0020)	-0.0047 (0.0050)
Toilet facility	0.0014 (0.0091)	-0.0017 (0.0244)
Propensity score	0.4062 (0.35733)	-0.7000 (0.6932)
Propensity score ^{2}	-1.0065 (0.9462)	1.6342 (1.8937)
Propensity score^3	0.7214 (0.7488)	-1.2889 (1.5082)
tim2	0.03105*** (0.0069)	-0.0226 (0.0157)
tim3	0.0275*** (0.0072)	-0.0250 (0.0182)
tim4	0.0255** (0.0063)	-0.0107 (0.0163)
Observation	7,801	7,801

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

4.4.2 Study Limitation

Firstly, the finding from early motherhood effects on child outcome is not to be generalized to all the children in South Africa. The findings only reflect early mothers as contained in the data used in the analysis and the effects on the outcomes of children born to them thus, not all mothers and children in South Africa were observed. The study is limited by unavailability of long time data to thoroughly investigate the dynamics of child outcomes over long period and to disentangle these effects from other confounding factors other than early motherhood. The study is also limited to propensity reweighted logistics regression since all the child outcome of interest are binary. Lastly, Propensity score reweighted regression does not deal with the problem of unobservable characteristics.

4.5 Conclusions and Recommendation

Early child development is very critical to child outcomes and this phenomenon is primarily linked to prenatal and maternal conditions such as mother's age at birth. Thus, the issue of early motherhood has attracted significant concern from researchers and development partners due to its potential implications. The previous chapter on early motherhood documented that a few studies exist on the implications of early motherhood but focused mainly on the effects on the mothers. The existing works on effects of early mothers on children are either limited to childbirth weight or descriptive in nature with a very limited finding on child score. By comparison, there is little knowledge on the intergenerational effects of teenage motherhood on the economic, educational and later health outcomes of children, especially in South Africa. This gap, coupled with the worsening record of child outcome, has motivated the need for this study. Hence, this paper examines the effects of early motherhood on child outcomes, especially on child's education, economic well-being, perceived health outcomes, and birth weight using propensity weighted logistic regression techniques. Findings from this study thus reveal that teen motherhood significantly increases child grade repetition and economic dependency. The effect on economic dependency however, became insignificant after controlling background precursors such as household income and parental marital status, family types and head composition of the household to which the child belongs. Furthermore, teen motherhood association with child health perceived health is significantly positive but insignificant for birth weight.

Based on the findings from the study, it is recommended that policy intervention targeted (a) to increase provision of childcare programmes especially to the disadvantaged children (b) provide some form of supports to the mothers such as education and economic support (as these positively affect child outcome such as child grade). Other proactive measures include: (a) sex education and family life policy and programs for the teenagers covering key areas such as value choices analysis, decision-making and analysis skills and teaching that touches "life choice" and behavioral change programs designed to help teenagers. This will help address the problem of out-of-wedlock and teenage childbearing. There should also be a programme to encourage parents' involvement with children to foster healthy academic morale and discipline to the children. There should also be effective child educational policy by the government and other policymakers to encourage well-performing children in school and special educational programme tailored to uplift academically non-performing child students.

Secondly, health and welfare improvement programme should be designed, with the existing welfare policy such as social grants be increased to a wider coverage to include children who are economically handicapped and disadvantaged, especially those living in families headed by female and grandparent who are not economically viable.

Lastly, it is recommended that marital education programme be instituted with particular focused on the existing couples and those preparing into the institution of marriage to support healthy marriages and to discourage unhealthy practices such as divorce. This will greatly help the existing couple and prepare the prospective couple with marriage life experience, possible challenges and ways to resolve them and will go a long way to provide complementary economic support and congenial environment for better child outcomes.

4.6 Appendix

Table 4.8 Variable Definitions

	Variables	Definitions
Child outcomes	Education	=1 repeated grades ,otherwise 0
	Economic well-being	=1 child depends on grants and other social support, otherwise 0
	Health;	
	Excellent	=1 Excellent, otherwise 0
	Very good	=1 Very good , otherwise 0
	Good	=1 Good, otherwise 0
	Fair	=1 Fair, otherwise 0
	Poor	=1 Poor, otherwise 0
	Binary Health; Good health	=1 Good health , otherwise 0
	Birth weight (<2.5kg)	=1 if under weight (<2.5kg), otherwise 0
	Teen motherhood	=1 teen mother(<20years), otherwise 0
Marital status	Intact married	=1 intact married, otherwise 0
	Out-of-wedlock	=1 Out-of-wedlock , otherwise 0
	Divorced	=1 divorced, otherwise 0
	Deceased parents	=1 Deceased parents, otherwise 0

Family type	Extended family	=1 extended family, otherwise 0 +/-
Headship	Male head	=1 male head Otherwise 0
	Female head	=1 female head Otherwise 0
	Grandparent head	=1 grandparent head Otherwise 0
Family size	Family size	Family size is measured as the number of members per household
Other individual and Household characteristics	Race	
	African	=1 African , otherwise 0
	Asians	=1 Asians , otherwise 0
	Coloured	=1 Coloured , otherwise 0
	White	=1 White , otherwise 0
	Gender; Female	=1 female , otherwise 0
	Head's education	Years of formal school completed
	Source of water	=1 has good water source, otherwise 0
	Source of toilet	=1 has good toilet facility, otherwise 0
	Household income	Log of household income
	Geography	
	Rural/traditional	=1 Rural/trad. , otherwise 0
	Provinces	
	Western cape	=1 Western cape , otherwise 0
	Eastern Cape	=1 Eastern Cape , otherwise 0
	Northern Cape	=1 Northern Cape , otherwise 0
	Free state	=1 Free state , otherwise 0
	KwaZulu-Natal	=1 KwaZulu-Natal , otherwise 0
	North West	=1 North West, otherwise 0
	Gauteng	=1 Gauteng , otherwise 0
	Mpumalanga	=1 Mpumalanga , otherwise 0
	Limpopo	=1 Limpopo, otherwise 0

CHAPTER FIVE

Summary, Conclusions and Recommendations

5.1 Introduction

This study broadly examines family structure, early motherhood and child outcome in South Africa. It particularly sought to answer three main research questions: (1) How does family structure affect household well-being? (2) What are the effects of early motherhood on women's later life outcomes? And (3) How does early motherhood affect child outcomes? In addressing these objectives, the study used data from National Income Dynamics Survey (NIDS) collected from 2008 to 2014 in approximately 2 years intervals with a nationally representative sample of over 28,000 people in about 7,300 families throughout the country, with relevant information on households, adult and children.

5.2 Summary and Conclusions

Family structure may be related to household well-being. Existing literature shows very few studies linking family structure and family poverty (economic well-being); however, three essential gaps are identified in the literature as far as the impacts of family structure on household well-being is concerned. Firstly, the few studies that exist on households look mainly at the household income and poverty, while ignoring the subjective well-being aspects. Secondly, the existing studies have failed to consider the family type component and have not put all the family structure components in a single analysis for each well-being outcome for most determinant of well-being. Therefore, the first paper investigates the effects of family structure (in its entirety on the four major components) on household well-being (in both subjective and monetary aspects) in South Africa. To do this, family structure was compartmentalized into four main categories as enshrined in the theory, which include marital status, family type, head composition and household size, each of which has sub-categories. The study further used four indicators for assessing household well-being; household reported well-being, household satisfaction, household income and consumption. The paper applied OLS regression, fixed effect and dynamic panel analysis techniques for the estimation. Findings emanating from this study show that intact married households have significant positive relationship with household reported well-being, while the relationship of cohabiting with household reported well-being and

subjective well-being is positively significant. Furthermore, extended households, households headed by females and grandparents, have significant negative relationship with household income and consumption, Lastly, while grandparent headed household has positive relationship with household reported well-being, bigger household size significantly decrease household reported well-being.

The high incidence of early motherhood remains a worrisome concern in the global planet of which South Africa is by no means exception. Several studies have highlighted that the age at which a woman first enters into motherhood is a significant predictor of life-course development, and may have significant implications on her later socio-economic status and well-being. To this effect, attempts to answer question of possibility of teen- motherhood being an indicator and pathway to adverse later life outcomes of women have been triggered. Consequently, few studies have been conducted to examine the impacts of early motherhood on mothers' later life and socioeconomic outcomes. However, nearly all of these studies focus on the impacts of early motherhood on women's educational outcome with a limited study on the economic well-being. No study has been done on life satisfaction outcome of early motherhood. Additionally, the impacts on psychological well-being and health effects of early motherhood have not been well investigated. In South Africa particularly, the few studies that exist on the impacts of early motherhood on later life outcomes of women are mainly descriptive in nature and centered on education with few descriptive analyses of financial difficulty and emotional consequences of early motherhood.

The second paper therefore investigates the impacts of early motherhood on women's later socio-economic outcomes such as educational outcome, economic well-being, psychological well-being, life satisfaction and health (perceived health and body weight) outcomes. In examining this effect, propensity score with different matching algorithms was employed. The study reveals that teen motherhood has significant negative effects on women's educational attainment, economic well-being, psychological well-being and life satisfaction, even after controlling for background precursors. The study thus reveals that teen motherhood, for that matter early motherhood, has significant negative effects on women's educational outcome, economic well-being, psychological well-being and life satisfaction. Additionally, the outcome on health is adverse only in underweight category while high perceived health and less obesity are associated with teen motherhood.

The previous chapter on early motherhood documented that few studies exist on the implications of early motherhood but focused mainly on the effects on mothers. The existing works on the effect of early mothers on child outcomes are either limited to childbirth weight or descriptive in nature with a very limited finding on child's academic score.

By comparison, there is little knowledge on the intergenerational effects of teenage motherhood on the economic, educational and later health outcomes of children, especially in South Africa. Furthermore, the issues of selection bias associated with choosing mothers and children have not been accounted for in the previous studies. This problem, coupled with the worsening record of child outcome, has motivated the need for this study The third paper therefore examines the effects of early motherhood on child outcomes, especially on child's economic well-being, education, health outcomes (perceived health status and weight at birth) using propensity weighted logistic regression analysis. Findings from this study thus reveal that teen motherhood significantly increases child grade repetition and economic dependency. The effect on economic dependency however, became insignificant after controlling background precursors such as household income and parental marital status, family types and head composition of the household to which the child belongs. Furthermore, teen motherhood association with child health perceived health is significantly positive but insignificant for weight at birth

Based on the findings, it is recommended that the government should provide social intervention policy such as cash transfer program or grant to more vulnerable households such as female and grandparent headed household and lend similar economic support to the needing extended or larger households since they take a significant share of the households in South Africa. Secondly, school authorities should promote reproductive and sex education to the learners to discourage to minimize or prevent teenage pregnancies in school. Reactively, the South African Schools Act (SASA) (RSA 1996a and 1996b), that guarantee formal education for learners even during pregnancy should be enforced by the government through the school authorities so that pregnant learners remain or return to school after delivery to ensure that they access good education that would make them employable for better life outcomes. The government should also tailor special support including job training for those teen mothers in special condition. There should also be a programme to encourage parents' involvement with children to foster healthy academic morale and discipline to the children. There should also be effective child educational policy by the

government and other policymakers to encourage well-performing children in school and special educational programme tailored to uplift academically non-performing child students.

5.3 Study Limitations

Beside the limitations acknowledged in the previous chapters of this thesis, it is also important to highlight one major limitation with respect to NIDS data, which have implications for external validity. Strictly speaking, NIDS data is a random sample of individuals across South Africa for the survey. Therefore, once an individual is selected for the survey, his or her household and all the members related to that individual including children automatically became part of the study. Thus, the study population is certainly not a random sample of the households, mothers and children in South Africa as a whole. Consequently, this study does not seek to make generalizations of the findings, as external validity is not possible, since the sample is not representative of all households, mothers and children in South Africa.

5.4 Suggestion for future research

Despite the limitations, the findings from this study provide useful ingredients and road map for future research. Firstly, it is possible that transition from one family structure to another affects the overall household well-being. Therefore, future research may explore to what degree does this transition affect household well-being. In doing this, more focus should be given to each at a time for detailed analysis to explore the degree of transition and the corresponding change in welfare level of the household.

Furthermore, future research should also be directed to exploring changes of later life outcomes of early motherhood at different stages in the mothers' life. This requires longitudinal data set collected for a longer period to make the effects more pronounced and disentangle any possible factors that might be related to the outcomes.

Lastly, future research should examine factors that affect child outcomes and at various stages of growth including those mentioned in the analysis. Particular emphasis should be put on the maternal characteristics and environment. These areas have not been explored extensively in the research.

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