South African Journal of Childhood Education
ISSN: (Online) 2223-7682, (Print) 2223-7674

Teenage motherhood and child outcomes: Evidence from South Africa

Authors:
Godfred Anakpo[1]
Umakrishnan Kollamparambil[1]

Affiliations:
[1]Department of Economics, Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author:
Godfred Anakpo,
godfredanakpo@gmail.com

Dates:
Received: 19 Jan. 2021
Accepted: 23 Oct. 2021
Published: 17 Dec. 2021

How to cite this article:
Anakpo, G. & Kollamparambil, U., 2021, 'Teenage motherhood and child outcomes: Evidence from South Africa', *South African Journal of Childhood Education* 11(1), a972. https://doi.org/10.4102/sajce.v11i1.972

Background: Child development and life outcomes are partly linked to prenatal and maternal conditions such as mother's age at birth. Thus, the issue of teenage motherhood has attracted significant concern from researchers and policymakers because of its potential implications for children. The existing literature on effects of teenage motherhood on children is typically limited to weight at childbirth. Other studies are mainly descriptive in nature and do not account for selection bias associated with teenage mothers and their deprived environment resulting in their children also being brought up in similar environment.

Aim: This article examined the effects of teenage motherhood on child outcomes, specifically on children's education, economic well-being, reported health status and body mass index (BMI).

Setting: Children (0–14 years) of teenage mothers (less than 20 years at first birth) in National Income Dynamics Survey (NIDS) data constitute the subjects under investigation in this study.

Methods: Using NIDS data, the study applied pooled regression, random effects model and propensity score matching (PSM) technique to examine the effect of teenage motherhood on child outcomes.

Results: The study confirms that the PSM method is more robust to selection bias than pooled regression and random effect techniques. The findings from this study reveal that teenage motherhood significantly increases child grade repetition and economic dependency. However, teenage motherhood association with child health and BMI is found to be insignificant.

Conclusions: Teenage motherhood has far-reaching effects on children outcomes, thus proactive, reactive and post-active policies and programmes focusing on minimising the effect of teenage motherhood and enhancing children's welfare are recommended.

Keywords: teenage motherhood; children outcome; South Africa; Propensity Score Matching; Life Outcomes; Early motherhood; Child development.

Introduction

It is well-documented that the physical, emotional, cognitive and social development that children experience from birth and childhood may have a long-enduring effect into their adult life (Excell 2016; Irwin, Siddiqi & Hertzman 2007; Peralta 2008; WHO 2016). Children outcomes such as health and cognitive development are partly linked to prenatal and maternal conditions such as mother's age at the time of their birth (Kirchengast & Hartmann 2003). Thus, teenage pregnancy and motherhood is a potential factor of children outcomes and life course development (Center on the Developing Child at Harvard University [CDCHU] 2017; Lanier & Zolotor 2014). The authors (CDCHU 2017; Lanier & Zolotor 2014) documented that the timing of motherhood and other maternal characteristics are important factors that affect sturdy brain architecture and self-regulation skills of a child, which are prerequisite precursors for healthy children's later outcomes. Teenage motherhood and its related implications on children outcomes have therefore triggered public and research concerns over the past decades (Augustine et al. 2015; Ndagurwa 2013).

A report by Save the Children Organization (2015) documented that about 13 million children are annually born to teenagers worldwide. Out of these births, more than 90% occur in lower- and middle-income economies. Africa takes its share of teenage motherhood phenomenon especially in Niger, where about 75% of girls are selected for marriage and 51% bear at least a child before reaching 18 years. This is followed by Mozambique, where 41% of women have babies before they turn 20 years. South Africa is not exempted from this trend. Statistics South Africa (2011) documented that 40.8% of all mothers in South Africa had their first child as teenagers and this early timing of motherhood has been a recurrent experience over many decades. Despite the

significant reduction in teenage fertility over the past decades, the present prevalence rate is still very high, amounting to 30% of the 15–19 years group reported to be ever pregnant. Of further concern is the fact that only around one-third of teenage girls return to school following childbirth (Willan 2013) despite the constitutional provisions, policy and programmes to minimise teenage pregnancy and encourage learner's education in South Africa.

For instance, the Bill of Right in the South African Constitution stipulates that 'everyone has the right to 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) (Republic of South Africa [RSA] 1996a, 1996b), education for learners is compulsory for children aged between seven and 15 years for Grade 9. 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). According to the Department of Education's Policy on measures for the prevention and management of learner pregnancy, 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.

The disruption in learners schooling because of teenage pregnancy may negatively impact their employability skills and financial well-being for themselves and their children. The high prevalence of early motherhood in the African and South African landscape has placed a compelling challenge on researchers to investigate the possible consequences and future implications.

A few empirical studies exist on the implications of teenage motherhood on children outcomes such as academic performance and health (Addo, Sassler & Williams 2016; Bradbury 2011; Geronimus & Korenman 1993; Hofferth & Reid 2003). These studies (Addo et al. 2016; Bradbury 2011; Geronimus & Korenman 1993; Hofferth & Reid 2003) are limited to the context of high-income economies, methodological limitations and do not consider other children outcomes such as economic well-being. It is also pertinent to address the phenomenon in the contexts of low- and middle-income countries where poverty and unemployment are higher whilst well-being in general is much lower compared with developed countries. South Africa is one such country with high levels of poverty, unemployment and low life satisfaction levels (Francis & Webster 2019).

Existing literature on the impacts of teenage motherhood on children outcomes in the South African context is mainly limited to health (Branson, Ardington & Leibbrandt 2015; Hoque et al. 2014; Hoque & Hoque 2010; Macleod 1999; Tshotetsi et al. 2019). None of these studies have focused on the effects of teenage motherhood on other outcomes such as education and economic well-being of children. Hence, this article aims at investigating the effect of teenage motherhood on children outcomes. The study contributes further to literature considering selection bias in the analysis. Specifically, it addresses the following objectives: (1) to examine the effect of teenage motherhood on children education, (2) to investigate the effects of teenage motherhood on children economic outcome and (3) to analyse the effect of teenage motherhood on child health related outcomes.

In doing so, the study is designed to test the hypotheses that children of teenage mothers perform poorer in school, face economic challenges because of the circumstances of the mother and are often associated with poorer health outcomes than children born to delayed (non-teenage) mothers. It is believed that early childbearing poses high risks of health complications to the teenage mothers, which could affect foetal development and for that matter children's health and cognitive ability later in life. Teenage childbearing also disrupts mothers' schooling, which consequently deprives them of employable skills required to earn income to provide for the children's need. Hence, the hypotheses of adverse effects of teenage childbearing on child outcomes are tested in this study.

Literature review

Theoretical framework

This article is guided by the maternity theory that maternal characteristics such as age at motherhood, well-being and parenting affect child outcomes (ed. O'Reilly 2007; Shrestha et al. 2019; Tough et al. 2010). According to this theory, childbearing at a young age, especially when the adolescent mother is not physiologically and anatomically of required age could pose a high risk to foetal growth by affecting its physiological development such as brain, which may affect child's cognitive ability, health and other outcomes (Lanier & Zolotor 2014). These child outcomes could also result from a host of factors including health-related complications of young mothers and poor responsive relationships of mother to children because of early childbearing.

The article is also guided by family system theory, which states that families are systemic and micro-social units (e.g. mothers, fathers and children) of interconnected relationships and action patterns where members grow, respond and interact with one another as partners (i.e. couple subsystem) and as sons and daughters (i.e. parent–child subsystem) (Burchinal, Vernon-Feagans & Cox 2008; Cabrera et al. 2011; Cox & Payley 1997; McLoyd 1990). In the family system, members influence one another through their own personal factors, resources and stresses (risk factors) and through the quality of their relationships they share (couple dyad), which can then have a spillover effect on the relationship with others in the system (parent–child subsystem) (Coley & Hernandez 2006). Thus, child outcome is linked to factors

that may be broadly classified as (1) biological and (2) family or environmental factors.

Becker (1965), Gronau (1973) and Ribar, and Wilhelm (1999), based on theory of household production, posited that early motherhood has potential of affecting not only mother's later life outcomes but also child outcome indirectly. The authors (Becker 1965; Gronau 1973; Ribar & Wilhelm 1999) added that the responsibilities associated with raising and nurturing children may disrupt mothers' participation in job market and may thus reduce their income earnings (Anakpo & Kollamparambil 2019). This may affect their financial ability to render adequate care to their children and for that matter, children's outcomes. In addition, teenagers who stop schooling because of pregnancy do not normally acquire the needed skills to help them fully participate in the job market (Anakpo & Kollamparambil 2019; Chigona & Chetty 2008). This situation makes teen mothers financially handicapped and incapable of providing the needed support to the children for better life outcomes.

Empirical findings in the existing literature

One of the important early attempts to study the children outcomes of early motherhood was by Geronimus and Korenman (1993). The study compared the birth outcomes and maternal behaviours of sisters (with similar background characteristics) and found no evidence of greater risk of low birthweight for children born to early or teenage mothers compared with older mothers. This study, however, is limited to childbirth implications of early motherhood. They did not consider the later health outcomes of the child, as well as the educational and economic well-being of the children.

Studies such as Hofferth and Reid (2003) and Bradbury (2011) on the other hand found that after controlling for social and demographic characteristics of the mothers, children born to teenagers and younger mothers have significantly lower education scores rate (for math and reading test scores of children aged nine and higher) on behaviour problem index than children born to non-teen mothers. But, Geronimus, Korenman and Hillemeier (1994) and López Turley (2003) concluded that the poor performance of children could not only be attributed entirely to the age of the mothers but also to the background characteristics of the family. Their studies did not account for potential bias because of the confounding effects of household characteristics and early motherhood.

Lanier and Zolotor (2014) used a focus group discussion methodology to investigate early childhood (approximately ages 3–5 in preschool) intervention and teenage pregnancy prevention in North Carolina, country. The authors (Lanier & Zolotor 2014) reported that teenage pregnancy poses high-risk factors with poorer social, behavioural and developmental outcomes to children. Their study is, however, descriptive in nature without rigorous econometric analysis. Irwin et al. (2007) also carried out a study on early child development in Britain 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 children's social inclination and contact with the broader environment. This is because children's social skills formation begins from home and proper parenting and parent–child relationship at home lay good foundation for children's interaction with the outside world. Similarly, a study by the CDCHU (2017) has documented that poor prenatal characteristics such as teenage motherhood negatively affects child's brain architecture and academic success later in life. These studies, however, do not attempt to ascertain the degree of causal effect. Furthermore, other areas of child outcome such as economic well-being and health were not well investigated and all the studies were in the context of developed countries with relatively better underlying economic condition.

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 with developed countries. In South Africa particularly, there is a limited empirical work on the impact of teenage motherhood on children outcomes. In his historical studies in South Africa, Macleod (1999) 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, the study was a mere review of historical literature, which is mainly descriptive in nature without rigorous quantitative analysis. Branson et al. (2015), investigated health outcome of children born to teen mothers living in Cape Town, South Africa and concluded that the disadvantage of child born to teen mothers could not be fully linked to observed background characteristics. They found that early childbearing negatively affects children's birth weights and stunted growth with mixed race children than those from the African race. However, in their separate studies in South Africa, Tshotetsi et al. (2019) and Hoque et al. (2014) found that maternal age did not predict low birthweight but other factors such as attending antenatal care visits did. Furthermore, Hoque and Hoque (2010) also found no difference in the birthweight of babies born to teenage and non-teenage mothers and concluded that teenage pregnancy did not predict a low birthweight outcome in South Africa.

Firstly, 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 where poverty and unemployment levels are high and well-being is lower in general. Secondly, the existing studies in South Africa, although largely limited to health outcome, drew differing conclusions on birthweight effect of teenage motherhood. Further study is therefore needed to consolidate the findings using a more robust estimation methodology. The limitations of existing literature have motivated this study with a methodology better suited to address selection bias (because of lack of randomisation) in order to answer the question of how teenage motherhood affects child outcomes (education, economic outcomes and health) in South Africa.

Research methodology

This article uses data from National Income Dynamics Survey (NIDS) conducted by a research unit of the University of Cape Town, South African Research and Labor Research Unit (SALDRU). National Income Dynamics Survey that began its data collection in 2008 includes a nationally representative sample of individuals (over 28 000) and households (over 7300 families) across the country and this survey is repeated every 2–3 years, with the same and additional members. The NIDS data are partitioned broadly into household data, adult data and child data sets amongst others. The child data set contains information of children below 15 years of age (0–14 years). 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 & Stone 2009) and the information on such children within a particular wave can go as far as the age boundary above. This definition and the vulnerability of this age group has made it necessary to use this age definition of children for this article; thus, the analysis of child outcomes in this article is limited to the first-born children who were 0–14 years old, representing a total sample size of 12 202 in the data set (from waves 1–4 collected in 2008, 2010, 2012 and 2014, respectively). The sample is restricted to first-born children to avoid potential birth order biases. For instance, LeGrand and Mbacke (1993) found that first-born children are exposed to greater health risks than their younger siblings although they are more likely to be vaccinated. Furthermore, 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 delivery and so it may be misleading to use teen motherhood when referring to subsequent non-teen births, hence only the term first-borns is used.

The mother's age at first birth was identified by finding the difference between the year at which she had her first child and the year in which she was born. Each first-born child in the same data set was classified as being born to a teenage mother (less than 20 years) or to a non-teenage mother (20 years and above).

By using the unique person code, each child's mother is linked to the information in the adult data set. The data provide relevant variables of interest in analysing the effects of teenage motherhood on children outcomes. 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 is also contained in the data set. The study is restricted to women who have given birth at least once and their children.

The question 'Does anyone currently receive a Child Support Grant (CSG), Foster Care Grant (FCG) or Care Dependency Grant (CDG) for this child?', which yields a binary 'yes' or 'no' response, is used to assess the economic dependency of a child. The 'yes' response may be considered as a reflection of mother's inability to meet child's economic needs. The educational outcome of the children is assessed using the question 'Has this child ever repeated a grade?', again with a binary response. The health outcome of the child is assessed using indicators: reported health status and body mass index (BMI). The study calculates the BMI based on the height and weight reported in the child data set. The health status is obtained from the question, 'Overall, how is this child's health, would you say it is excellent, very good, good, fair or poor?'. The responses were then collapsed to binary form where 1 denotes good health (excellent health, very good health, good health) and 0 otherwise.

This study employs three progressive econometric strategies to investigate the effects of teenage motherhood on children outcomes. These are pooled regression (logit and OLS), random effect binary model and propensity score matching (PSM) technique.

Pooled regression model

$$CHME_i = \alpha + \beta EM_i + \gamma X + \varepsilon_i \quad \text{[Eqn 1]}$$

Each Child outcome variable (CHME) is an explained variable in Eqn 1 model, which are (1) child's economic dependance[1] measured as 1 if a child depends on CSG other than parental support, 0 for otherwise (2) educational outcome measured as 1 if the child repeated grade and 0 for otherwise, (3) health measured as 1 if the child is reported as in a good health and 0 otherwise and (4) BMI measured as kilogram per meter square. Early or teenage motherhood (EM) is the main explanatory variable in Eqn 1, and this is measured as 1 if the child is born to a teenage mother, 0 if otherwise. α, β and γ are the parameters but β is the parameter of interest that measures the effect of teenage motherhood on children outcomes. X denotes a vector of control variables including family structure environment in which the child was living and εi is the error term. Estimation is undertaken using the pooled logistic regression model (for economic well-being, educational and health outcomes variables). Pooled robust ordinary least squares estimation is used for the BMI estimation.

The pooled models, however, do not account for the possible heterogeneous or child-specific effects that might be associated with each child; hence, a random effects binary model is used to account for the individual effects.

Random effects model

$$CHME_{it} = \alpha + \beta EM_{it} + \gamma_{it} X_{it} + \delta_t + \mu_{it} \quad \text{[Eqn 2]}$$

But $u_t = \eta_i + \varepsilon_{it}$

1.In this article, child's economic dependence or outcome means that parents or caregivers do not have the financial means to care for the children and so depend on CSG for the child's needs.

EM is the early motherhood variable. The model (2) is fully specified as:

$$CHME_{it} = \alpha + \beta EM_{it} + \gamma_{it} X_{it} + \delta_t + \eta_i + \varepsilon_{it} \quad \text{[Eqn 3]}$$

In this analysis, maximum likelihood (ML) is used as the estimator for the random effects binary logic model while generalised least squared (GLS) estimator was used for the estimation for the BMI.

Although pooled regression models and random effects models are useful in their own merit, the confounding factors (such as income and common living environment of the mother and child) could bias the relationship between age of motherhood and child outcomes. Hence, the PSM technique is employed to account for the selection bias with pooled data (Leuven & Sianesi 2003).

Propensity score matching

Propensity score matching technique normally uses treatment estimators to estimate two parameters: The average treatment effect (*ATE*) is defined as the mean of the difference between the treated (born to teenage mothers) and controlled group (born to non-teenage mothers), that is, $(y_1 - y_0)$

$$ATE = E(y_1 - y_0) \quad \text{[Eqn 4]}$$

b. Average treatment effect on the treated (*ATET*), that is, on children of teenage mothers is the mean of the difference $(y_1 - y_0)$, which is the counterfactual mean, amongst the children of the teenage mothers, the respondents:

$$\left(ATET = E\left(y_1 - y_0\right) | D = 1\right) \quad \text{[Eqn 5]}$$

The propensity score methodology follows probit wmodel for propensity estimation for treatment group (teenage mothers) using the nearest neighbour matching technique. 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), $D = 1$ otherwise (control group). X is defined to denote variables that may affect the probability of being a teenage mother:

$$y = \begin{cases} y_1 \, if \, D = 1 \\ y_0 \, if \, D = 0 \quad ATE = E\left(y_1 - y_0\right) \end{cases} \quad \text{[Eqn 6]}$$

where y is the vector of children outcomes such that y_1 denotes the outcomes of children of teenage mothers and denotes the outcomes of children of non-teenage mothers. The ATE is therefore $E(y_1 - y_0)$.

The ATET, is the mean of the difference between the treated and the controlled group, $(y_1 - y_0)$, which is the counterfactual mean, of the outcome of children born to teenage mothers:

$$(ATET = E(y_1 - y_0 | \, t = 1)) \quad \text{[Eqn 7]}$$

Thus, the probit model for the treatment is further specified here:

$$D_i = \beta_0 + \beta_i X_i + \gamma_i K_i + \varepsilon_i \quad \text{[Eqn 8]}$$

where D denotes teenage motherhood and X are the factors that influence motherhood such as childhood poverty, provinces and parental education and life status and K is the control variables, which include race, availability of healthcare and contraceptives:

$$P(x) = prob(D = 1 / x) = E(D / x) \quad \text{[Eqn 9]}$$

The treated and untreated groups can be compared for similarity by means or using medians of continuous variables and the distribution of their categorical counterparts (balancing property). The standardised form can also be used especially when different units are also involved. The standardised 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 & Riedwyl 1986).

Results and discussions

Summary statistics

Table 1 displays the summary statistics on the outcomes and background characteristics of the children. It also displays the definition of variables of interest and their measurements. The table reveals that 85.1% and 68.7% of children born to teenage mothers and non-teenage mothers, respectively, are dependent on CSG. This means that parents or caregivers do not have the financial means to care for the children and so depend on the CSG from the government. However, the CSG (Rand 430 per month in 2020) in South Africa is lower than the food poverty line amount (Rand 585 per month in 2020), and it is not adequate to support a child to achieve his or her full potential. The table also shows that about 15.8% and 10.2% of children born to teenage mothers and non-teenage mothers, respectively, repeated grade for at least once. Furthermore, only 0.9% and 0.7% of children born to teenage and non-teenage mothers, respectively, were in poor health condition, while the majority have an excellent and very good record of perceived health accounting for 45.5% for children born to teenage mothers and 49.6% for those born to non-teenage mothers. The average BMI of 20.03 for children born to teenage mothers is not significantly different from 20.05 for those born to non-teenage mothers.

Pooled regression and random effects results and discussions

Results of the effects of teenage motherhood on children's economic dependence and grade repetition are documented in Table 2. Both the pooled logistic and random marginal effects results reveal that being born to teen mothers increases the probability of a child's economic dependency significantly. This dovetails with the further finding that educational attainments of child's mother and household income are

TABLE 1: Summary statistics.

Variables	Definitions	Children born to teen mothers-whole sample N = 3162 Percentage	Children born to non-teen mothers-whole sample N = 9040
		Percentages (%)	Percentages (%)
Child outcomes			
Economic well-being	= 1 child depends on CSG, otherwise 0	85.1	68.7
Education	= 1 repeated grades, otherwise 0	15.8	10.2
Health			
Excellent	=1 Excellent, otherwise 0	45.5	49.6
Very good	=1 Very good, otherwise 0	32.7	31.7
Good	=1 Good, otherwise 0	18.4	15.9
Fair	=1 Fair, otherwise 0	2.3	2.0
Poor	=1 Poor, otherwise 0	0.9	0.7
Binary health outcome; good health	=1 Excellent, otherwise 0	77.9	70.0
Good health	=1 Excellent, otherwise 0	20.03*	20.05*
Body mass index*	Measured in kg per meter square	(3.019)	(3.07)
Marital status			
Intact married	= 1 Intact married, otherwise 0	24.9	25.1
Out-of-wedlock	= 1 Out-of-wedlock, otherwise 0	59.3	57.2
Divorced	= 1 Divorced, otherwise 0	1.1	1.5
Deceased parents	= 1 Deceased parents, otherwise 0	11.8	7.1
Family type			
Extended family	= 1 Extended family, otherwise 0	81.1	67.1
Headship			
Male head	= 1 Male head otherwise 0	24.1	26.3
Female head	= 1 Female head otherwise 0	41.8	43.4
Grandparent head	= 1 Grandparent head Otherwise 0	29.5	13.9
Family size			
Family size*	Family size is measured as the number of members per household	5.24* (2.39)	5.089* (2.36)
Other individual and household characteristics			
Race	-	-	-
African	= 1 African, otherwise 0	77.1	71.6
Asians	= 1 Asians, otherwise 0	0.4	0.9
Mixed race	= 1 Mixed race, otherwise 0	10.8	12.9
White Gender	= 1 White, otherwise 0	1.9	1.5
Female	= 1 female , otherwise 0	43.5	43.3
Mothers' education*	Years of formal school completed	11.681* (4.198)	13.891* (4.382)
Source of water	= 1 Has good water source, otherwise 0	81.8	86.8
Source of toilet	= 1 Has good toilet facility, otherwise 0	97.7	98.7 (0.115)
Household income (per capital)#	Household income in rand	707.989 (1151.4)	1094.1 (2419.8)
Geography	-	-	-
Rural/traditional	= 1 Rural/traditional, otherwise 0	55.7	50.2

Source: NIDS, Wave 1-4 data (2008, 2010, 2012, 2014)

CSG, Child Support Grant.

Statistics of variables with asterisk '*' are means and standard deviations are in parenthesis.

negative predictors of child's economic dependency. A significant number of teenage mothers do not have the financial means to provide adequately for their children and so depend on CSG from government. As alluded to before, the CSG amount is lower than the food poverty line, and thus not adequate to support a child fully by any means. Despite this, it is not surprising that children of teenage mothers have to rely on this support because of over 50% youth unemployment in South Africa (Ismail & Kollamparambil 2015). Furthermore, teenage mothers are severely hit by poverty and the majority of them do not have employable skills to earn income that could help them care for their children (Anakpo & Kollamparambil 2019). Our finding is consistent with Becker (1965), Gronau (1973) and Ribar and Wilhelm (1999), who found that women who drop out from school are often economically disabled and therefore do not have the financial capacity to care for their children. Furthermore, according to the theory of household production, the responsibilities associated with raising and nurturing children may disrupt the mother's participation in job market and thus reduce the income and earnings (Becker 1965; Gronau 1973; Ribar & Wilhelm 1999). This, in turn, affects their financial ability to render adequate care to their children.

In terms of children's educational outcomes, both the pooled logistic and random marginal effect models indicate teenage

TABLE 2: Results of pooled logistic and random effect models: Effects of early motherhood on economic dependency and grade repetition.

Variables	Economic dependency				Grade repetition			
	Pooled logistic model: Marginal effect		Random effect model: Marginal effect		Pooled logistic model: Marginal effect		Random effect model: Marginal effect	
	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors
Teen motherhood	0.178**	0.037	0.116**	0.043	0.066**	0.016	0.032**	0.013
Family type: Extended	0.001	0.008	0.004	0.010	0.002	0.005	0.001	0.006
Female-headed household	0.021**	0.009	0.027**	0.010	0.030**	0.018	0.025**	0.015
Grandparent-headed household	0.077**	0.011	0.056**	0.012	-0.101**	0.010	-0.141**	0.089
Intact married household	-0.061***	0.015	-0.056***	0.014	-0.079***	0.017	-0.101***	0.014
Out-of-wedlock household	0.040***	0.014	0.030**	0.014	0.076***	0.022	0.079***	0.026
Divorce/separate	0.017	0.012	0.015	0.011	0.001	0.001	0.0001	0.001
Household size	0.054***	0.013	0.053***	0.012	0.026*	0.008	0.013*	0.007
Education of mother	-0.006***	0.001	-0.006***	0.001	-0.053***	0.006	-0.053***	0.005
Log household income	-0.050****	0.018	-0.055***	0.0183	-0.051***	0.005	-0.053***	0.007
Age of the child	-0.021	0.018	-0.011	0.019	0.014	0.017	0.011	0.014
Gender: Female	0.007	0.021	0.005	0.019	-0.002	0.010	-0.012	0.010
Geography: Rural	0.074***	0.009	0.080***	0.011	0.024***	0.006	0.024***	0.007
Employment status: Unemployed	0.059***	0.009	0.037***	0.009	0.047***	0.017	0.024*	0.015
African race	0.078***	0.012	0.088***	0.015	0.042	0.059	0.029	0.059
Asians	0.118	0.073	0.112	0.089	-0.051	0.116	-0.062	0.112
Mixed race	0.250***	0.046	0.292***	0.055	0.058	0.061	0.051	0.062
LR chi^2	639.4	-	-	-	525.91	-	-	-
Pseudo R^2	0.0984	-	-	-	0.0552	-	-	-
Wald chi^2	-	-	312.47	-	-	-	483.96	-
Probability > chi^2	0.0000	-	0.000	-	0.0000	-	0.000	-
Number of observation	11719	-	11719	-	11603	-	11603	-

Source: Authors' estimation from NIDS, Wave 1-4 (2008, 2010, 2012, 2014)

LR, Likelihood ratio.

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

motherhood as significant positive predictors of grade repetition (Table 2). The majority of teenage mothers in South Africa end up dropping out from school and given that literature has identified the mother's educational attainment as the single largest predictor of a child's education, it is only expected that children of teen mothers face adverse educational outcomes (Abuya et al. 2013, 2018). Concerning teenage mothers' education, the South African Law (Department of Education 2010; RSA 1996a, 1996b) has policy and programmes to minimise pregnancy amongst learners and even encourage teenage mothers to return to school after delivery, but many do not take advantage of such provision for themselves and the outcome of their children.

In addition, teenage mothers often are not able to engage in productive economic activities, thus limiting their ability to provide adequately for their children, which in turn impacts their performance at school. In many cases children born to out-of-wedlock teenage mothers, which is widespread in South Africa, stay with relatives other than biological parents and often do not receive the needed parental care and encouragement that motivate good academic performance (Makiwane 2011). A further argument put forth by Bullock (1992) and Genobaga (2004) is that some teenage mothers are physiologically immature and pregnancy may impair the physiological and mental development of their progeny, which confirms the maternity theory mentioned earlier (ed. O'Reilly 2007). This condition may later contribute to the child's poor performance in school.

A significant positive effect of households headed by females and grandparents on the economic dependency of the children was identified. This is not surprising given the income criteria used by the South African Social Service Agency (SASSA) to determine beneficiaries of CSG. Female-headed households carry a higher risk of poverty in South Africa (Anakpo & Kollamprambil 2021) and therefore children from such households qualify for CSG. Compared with the CSG, the old age pension (OAP) in South Africa is very generous (over three times the food poverty line). Furthermore, even where grandparents are availing the pension, the child qualifies as a beneficiary for CSG based on the income criteria applied to parents. However, the age criteria for qualifying for OAP is 60 years and some of the grandparents have not reached the age to avail it and are also not economically productive. Teenage pregnancy is often generational and some grandparents may be under 40 years old. It is common for children orphaned because of HIV or AIDS to grow up with grandparents (Operario et al. 2007). Also, children in rural areas are often left behind with grandparents as parents migrate to urban centres in search of employment opportunities (Kropf & Robinson 2004). In such

instances, although they are not in a position to alleviate economic hardship, grandparents are key sources of moral and physical support to the children. In line with this, our results show that grandparents-headed households are negative predictors of grade repetition. Retired grandparents who have more time on their hands could potentially enhance the child's education. The generous OAP in South Africa also adds to the well-being of grandchildren in the household. Duflo (2003) found this relation to be strong especially between granddaughters and grandmothers who received the OAP.

On the other hand, children living in households headed by females have significantly higher probability of grade repetition. The high prevalence of out-of-wedlock births especially amongst young mothers in South Africa (see Table 1) is a factor of high female-headed household (Anakpo & Kollamparambil 2019) because of the absence of their male counterparts, whilst others relinquish their parental responsibilities to the grandparents of the children. This situation coupled with economic disadvantage is likely to affect child outcomes such as education. Our results are in line with Sibanda (2005) and Plaatjie (2013).

Table 2 also reports that living in intact married household lowers the probability of a child's economic dependency. Unlike out-of-wedlock where responsibility may fall on one party (often the mother), married couples are more likely to have economic complementarity, which may translate to higher household income and the ability to care for the children (Social Work Policy Institute 2011). The study (Social Work Policy Institute 2011) found that married family complements each other and provides economic support that could equally benefit the children. The married family also enjoys certain privileges, which enhance the overall well-being of the household in which the child lives. The finding also reinforces similar conclusion by Anderson (2014) that an intact family enjoys economic complementarities especially with productive couples, which help in the overall economic wellness of the family including children. According to the study, intact-married families, where more hands are involved, provide opportunities for specialisation of responsibilities and role assignment, which are precursors of efficient capital accumulation and wealth creation that help in the betterment of children's economic well-being specifically and family life generally.

Moreover, intact-married families have a significant negative relationship with grade repetition of the children (Table 2). This result is in line with expectations because an intact family often provides a stable environment, which encourages learning and good performance at school (Gibson-Davis & Brooks-Gunn, 2007; Harknett 2009). Bempechat (1992) has documented the role that parents play in encouraging and supporting children to realise their full potential, which enhance their academic performance in school. In an intact family, children also enjoy good family atmosphere that motivate them to learn for good academic performance. This coupled with parental monitoring, help to crystalise children's performance at school. On the other hand, out-of-wedlock parents increase the probability of child grade repetition and children's economic dependency (Table 2). Out-of-wedlock parents are particularly predominant in South Africa, as revealed in this study (where about 50.6% of children in the sample were born in out-of-wedlock). Single mothers have little financial capacity and so have to depend heavily on CSG for the children's needs. This finding reinforces similar conclusion made by Ndagurwa (2013) and Nkwanyana (2011) who highlighted that children are mostly the direct victims of adverse consequences of unplanned pregnancy. The studies further reveal that children born out-of-wedlock are more likely to live in a broken home and suffer deep financial difficulties because of the absence of economic complementarity of both parents and are in high risk of child delinquency.

Our results show household size to be a positive predictor of a child's economic dependency (Table 2). Larger household size results in resources having to be stretched and thinly spread over its members (Booth & Kee 2009; Cáceres-Delpiano 2006). Household size has been found to perpetuate poverty and it prevents income mobility in South Africa (Woolard & Klasen 2005). Poverty is recorded to be higher in the rural areas in South Africa (Kingdon & Knight 2006), therefore it is not surprising that economic dependency of children in the rural areas is higher. Lastly, the racial divide of poverty in South Africa is well-documented (World Bank 2018), therefore the result showing the children from African race are more likely to be economically dependent on grant is in line with the expectation and often, African race is the highest beneficiaries of CSG amongst all the races (as shown in Table 1 of this article and in Beukes et al. 2017).

The results do not show any significant effect of teenage motherhood on the children's reported health status and BMI (Table 3). The findings, however, go against the general notion that teenage mothers generally experience more difficulties and complications and are more likely to experience adverse health consequences for both the mother and the child (Pitso et al. 2014). This discrepancy can be partly attributed to the high percentage of children in very good health in Table 1. Other studies (Geronimus et al. 1994; López Turley 2003) also arrived at similar conclusion that the mother's age at first birth is not a key predictive variable for child outcome such as child health (as found in this study).

Propensity score matching technique results and discussions

Propensity scores and summary result of matching assessment are reported in Table 4a and 4b. Results on PSM in Table 5 show that on average, teenage motherhood significantly increases children's economic dependency by 0.167 and 0.175

TABLE 3: Results of pooled logit and random effect model: Effects of early motherhood on child health and body mass index.

Variables	Child perceived health				Body mass index			
	Pooled logit model: Marginal effect		Random effect model: Marginal effect		Pooled		Random effect model	
	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors
Teen motherhood	0.031	0.036	0.027	0.031	0.257	0.262	0.287	0.266
Family type: Extended	0.013	0.012	0.013	0.012	-0.085	0.093	-0.092	0.096
Female-headed household	-0.018	0.015	-0.018	0.015	0.248**	0.111	0.241**	0.111
Grandparent-headed household	-0.077**	0.013	-0.079**	0.027	0.538**	0.224	0.555**	0.228
Intact Married household	0.085**	0.033	0.083**	0.033	-0.295	0.237	-0.637	0.591
Out-of-wedlock household	-0.069**	0.018	-0.069**	0.019	2.034**	0.145	-0.023	0.393
Divorce/separate	-0.018	0.012	-0.020	0.012	-0.386	0.471	-0.717	0.697
Household size	-0.042	0.053	-0.043	0.053	-0.039	0.061	-0.040	0.073
Log household income	0.022**	0.078	0.044**	0.035	0.618**	0.209	0.723***	0.217
Child support grant	0.076**	0.023	0.075**	0.023	1.276**	0.153	1.293**	0.157
Age	-0.017	0.029	-0.018	0.021	-0.345*	0.064	-0.348*	0.072
Gender of the child	-0.027	0.024	-0.024	0.025	0.068	0.309	0.049	0.333
Toilet	0.016	0.035	0.015	0.035	0.138	0.864	-0.107	0.519
Sanitation water	0.022*	0.013	0.023*	0.014	-0.317	0.340	-0.297	0.458
Education of Mother	0.005	0.001	-0.005	0.001	0.067**	0.028	0.056***	0.021
Geography: Rural	0.008	0.010	0.007	0.011	-0.539	0.887	-0.595	0.525
Employment status: Unemployed	-0.011	0.010	-0.011	0.010	-0.277**	0.303	0.3210	0.368
African race	0.069*	0.017	-0.068*	0.017	-1.567*	0.445	1.503***	0.574
Asia	0.025	-	0.157	0.105	-0.544**	0.234	3.627	3.652
Mixed race	0.155	0.104	0.099*	0.051	-	-	-	-
Constant	-	-	-	-	6.022***	1.628	8.016***	1.961
Likelihood ratio chi²	135.83		-		-		-	
Pseudo R^2	0.0197		-		-		-	
Wald chi²	-		122.44***		-		-	
R^2	-		-		0.240		-	
Adjusted R^2	-		-		0.215		-	
F test	-		-		6.69		2.28	
$> F$	-		-		0.0000		0.0044	
Number of observation	11710		11710		11605		11605	

Source: Authors' estimation from NIDS, Wave 1–4 (2008, 2010, 2012, 2014)

OLS, Ordinary least squares.

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

TABLE 4a: Propensity scores and summary result of matching assessment.

Propensity score	Teen mothers	Non-teen mothers	Total
Propensity scores for teen and non-teen mothers			
0.0555	28	175	203
0.1	29	331	360
0.15	519	2395	2914
0.2	93	331	424
0.25	1352	3245	4596
0.3	1020	2362	3382
0.35	122	201	323
Total	**3162**	**9040**	**12 202**

Source: Authors' estimation from NIDS, Wave 1–4 (2008, 2010, 2012, 2014)

for ATE and ATET, respectively. The table also documents that being a teen mother predicts a significant increase in children's grade repetition by an average of 0.058 and 0.048 for ATE and ATET, respectively

Sensitivity analysis results are also reported in Table 5 to show how biases might alter influences. 'It does not, however, indicate whether biases are present or to what degree or magnitude are plausible' (Aakvik 2001). The significant level of $\Gamma = 1$ prob(1) recorded under economic and educational outcomes shows that the results are robust to selection bias, hence not sensitive to possible deviation from unconfoundness assumption, even under $\Gamma = 1.5$ prob(1) and $\Gamma = 2$ prob(1). However, the insignificant level (greater than 5% significant level) recorded under health and BMI shows the sensitivity of health estimates, which may be attributed to the selection bias, highlighted earlier and must be interpreted with caution.

The PSM analysis results show that the children of teenage mothers have a significantly higher probability of dependency on the meagre CSG from government. This further reduces the prospects of transitioning from poverty because the CSG amount in South Africa is lower than the food poverty line. Therefore, although the grant may ensure sustenance and survival, it is barely minimum and insufficient to provide the child with a fair opportunity in life. This is reflected in the educational outcomes, where the children of teenage mothers are found to have a higher probability of repeating grades. This is not surprising given the established fact that the strongest predictor of a child's educational attainment is the mother's education (Abuya et al. 2013, 2018) and that two-third of teenage mothers in South Africa do not return to the

TABLE 4b: Propensity scores and summary result of matching assessment.

Sample	Ps R^2	chi^2	$p > chi^2$	MeanBias	MedBias	B	R	% var
Summary results of matching assessment								
Unmatched	0.019	266.67	0	4.8	4.1	21.5	0.68	0
Matched	0.0001	2.78	0.997	0.8	0.6	4.2	1.3	0

Source: Authors' estimation from NIDS, Wave 1–4 (2008, 2010, 2012, 2014)
LR, Likelihood ratio.

TABLE 5: Results from propensity score matching model: Effects of teen motherhood on child outcomes.

Parameters	Economic effect		Educational effect		Health effect		Body mass	
	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors	Coefficients	Standard errors
Propensity score matching								
ATE	0.167**	0.080	0.058**	0.023	0.009	0.013	0.013	0.015
ATET	0.175**	0.078	0.048**	0.024	0.082	0.008	0.011	0.011
$\Gamma = 1$ prob(1)	0.031082		0.018953		0.243951		0.256044	
$\Gamma = 1.5$ prob(1)	0.0169		0.001670		0.304600		0.227894	
$\Gamma = 2$ prob(1)	0.001767		0.000117		0.33698		0.216473	
Observation	7237		7358		7358		7358	

Source: Authors' estimation from NIDS, Wave 1–4 (2008, 2010, 2012, 2014)
ATE, Average treatment effect; ATET, Average treatment effect on the treated.
Standard errors in parentheses ***, $p < 0.01$; **, $p < 0.05$; *, $p < 0.1$.

schooling system post-pregnancy (Willan 2013). The results confirm our hypothesis that children of teenage mothers have more adverse outcomes with regard to education and economic circumstances. However, the PSM analysis does not establish a similar finding for health outcomes and BMI.

Conclusion and recommendation

It is well-documented that the life outcomes of children are partly linked to prenatal and maternal conditions such as mother's age at birth. Thus, the issue of early motherhood has received considerable attention from researchers and policymakers because of its potential implications not just for the mother but also for the next generation. The high prevalence of early motherhood in South Africa has placed a compelling challenge on researchers to investigate the possible consequences and future implications. The existing literature on effects of teenage motherhood on children are either limited to child birthweight or are descriptive studies that do not account for selection bias associated with teenage mothers and their deprived environment resulting in their children also being brought up in similar environment. Hence, based on the NIDS data, this article examined the effects of teenage motherhood on children outcomes, especially on children's economic well-being, education, health outcomes and BMI using, pooled regression, random effects model and PSM technique. The study confirms that the latter estimation strategy (PSM method) is more robust to selection bias than the pooled regression and logit panel models. The findings from this study thus reveal that teen motherhood significantly increases child grade repetition and economic dependency. Furthermore, teenage motherhood association with child health and BMI is, however, insignificant.

Based on the findings from the study, it is recommended that the Department of Education's Policy on measures for the prevention and management of learner pregnancy should be implemented in full scale (at all schools as stated) to minimise teenage pregnancy prevalence along with the enforcement of the SASA (RSA 1996a, 1996b) that guarantees education for all learners irrespective of their situation to ensure that learners (who mistakenly become pregnant) return to school after delivery to increase the chance of better future for themselves and the children. Policy intervention targeted (1) to increase provision of childcare programmes especially to the disadvantaged children (2) to provide regular health programmes such as family planning services to young and teenage mothers who are at the high risk of having bigger families. Other proactive measures include: Firstly, sex education and family life policy and programmes for the teenagers covering key areas such as value choices analysis, decision-making and analysis skills and teaching that touches 'life choice' and behavioural change programmes designed to help teenagers. There should also be a programme to encourage parents' involvement with children to foster healthy academic morale and discipline to the children. There should 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, welfare programmes should be designed within the framework of the development policy keeping in mind the need to avoid the perverse incentive of increased fertility to access the CSG (Kollamparambil 2019; Oyenubi & Kollamparambil 2020) but at the same time enable a fair chance in transitioning from poverty. A basic income grant can be seen as a possible solution to this challenge.

Lastly, given the finding that intact married consistently predicts better children outcomes, it is recommended that marital education programme be instituted with particular focus on the existing couples and those preparing for the institution of marriage to support healthy marriages to minimise divorce and its associated problems. This will greatly help the existing couples and prepare the prospective couples for married life, and to be aware of some of the typical

marital challenges and ways to resolve them and this will also go a long way to provide complementary economic support and congenial environment for better children outcomes.

Study limitation

Firstly, the finding from teenage motherhood effects on children outcomes is not to be generalised to all the children in South Africa. The findings only reflect teenage mothers as contained in the data used in the analysis and the effects on the outcomes of children born to them. 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 PSM does not deal with the problem of unobservable characteristics; however, the analysis uses the rich information available in the data and performs sensitivity checks to ensure the reliability of results.

Acknowledgements

The authors acknowledge the University of the Witwatersrand.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

G.A. was responsible for conceptualisation, methodology, formal analysis, investigation and original draft writing. U.K. was involved in supervision, writing reviews and editing and suggestions that enhance the conceptualisation, methodology and write-up.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

Funding information

The support of the DST-NRF Centre of Excellence in Human Development and African Economic Research Consortium towards this research/activity is hereby acknowledged.

Data availability

Data can be accessed via http://www.nids.uct.ac.za/nids-data/data-access.

Disclaimer

Opinions expressed and conclusions arrived at, are those of the authors and are not necessarily to be attributed to any of the two institutions, DST-NRF Centre of Excellence in Human Development and African Economic Research Consortium.

References

Aakvik, A., 2001, 'Bounding a matching estimator: The case of a Norwegian training program', *Oxford Bulletin of Economics and Statistics* 63(1), 115–143. https://doi.org/10.1111/1468-0084.00211

Abuya, B.A., Mumah, J., Austrian, K., Mutisya, M. & Kabiru, C., 2018, 'Mothers' education and girls' Achievement in Kibera: The link with self-efficacy', *SAGE Open* 8(1). https://doi.org/10.1177/2158244018765608

Abuya, B.A., Oketch, M., Mutisya, M., Ngware, M. & Ciera, J., 2013, 'Influence of mothers' education on children's maths achievement in Kenya', *Education 3–13*, 41(6), 633–646. https://doi.org/10.1080/03004279.2011.631562

Addo, F.R., Sassler, S. &Williams, K., 2016, 'A reexamining the association of maternal age and marital status at first birth With youth educational attainment', *Journal of Marriage and Family* 78(5), 1252–1268. https://doi.org/10.1111/jomf.12360

Anakpo, G. & Kollamparambil, U., 2019, 'Teen motherhood and women's later life outcomes: Evidence from South Africa', *Journal of African Population Studies* 33(1), 4823–4824. https://doi.org/10.11564/33-1-1379

Anakpo, G. & Kollamparambil, U., 2021, 'Family structure and household well-being: Evidence from South Africa'. *Development Southern Africa* 1–19. https://doi.org/10.1080/0376835X.2021.1954883

Anderson, J., 2014, 'The impact of family structure on the health of children: Effects of divorce', *The Linacre Quarterly* 81(4), 378–387. https://doi.org/10.1179/0024363914Z.00000000087

Austin, P.C., 2009, 'Using the standardized difference to compare the prevalence of a binary variable between two groups in observational research', *Journal of Communications in Statistics – Stimulation and Computation* 38(6), 1228–1234. https://doi.org/10.1080/03610910902859574

Augustine, J., Prickett, K., Kendig, S. & Crosnoe, R., 2015, 'Maternal education and the link between birth timing and children's school readiness', *Social Science Journal* 96(4), 970–984. https://doi.org/10.1111/ssqu.12150

Becker, G., 1965, 'A theory of the allocation of time', *Economic Journal* 3(75), 493–517. https://doi.org/10.2307/2228949

Bempechat, J., 1992, 'The role of parent involvement in children's academic achievement', *The School Community Journal* 2(2), 31–41.

Beukes, R., Jansen, A., Moses, M. & Yu, D., 2017, 'Exploring the eligibility criteria of the child support grant and its impact on poverty', *Social Indicators Research* 134(2), 511–529. https://doi.org/10.1007/s11205-016-1433-z

Booth, A.L. & Kee, H.J., 2009, 'Birth order matters: The effect of family size and birth order on educational attainment', *Journal of Population Economics* 22(2), 367–397. https://doi.org/10.1007/s00148-007-0181-4

Bradbury, B., 2011, *Young motherhood and child outcomes*, Social Policy Research Centre, University of New South Wales, Sydney.

Branson, N., Ardington, C. & Leibbrandt, M., 2015, 'Health outcomes for children born to teen mothers in Cape Town, South Africa', *Journal of Economic Development and Cultural Change* 63(3), 589–616. https://doi.org/10.1086/679737

Bullock, L., 1992, *Exceptionalities in children and youth*, Allyn and Bacon, Boston, MA.

Burchinal, M.R., Vernon-Feagans, L. & Cox, M., 2008, 'Cumulative social risk, parenting, and infant development in rural low-income communities', *Parenting: Science and Practice* 8, 41–69. https://doi.org/10.1080/15295190701830672

Cabrera, N.J., Fagan, J., Wight, V. & Schadler, C., 2011, 'Influence of mother, father, and child risk on parenting and children's cognitive and social behaviors', *Child Development* 82(6), 1985–2005. https://doi.org/10.1111/j.1467-8624.2011.01667.x

Cáceres-Delpiano, J., 2006, 'The impacts of family size on investment in child quality', *Journal of Human Resources* 41(4), 738–754. https://doi.org/10.3368/jhr.XLI.4.738

Caliendo, M. & Kopeinig, S., 2008, 'Some practical guidance for the implementation of propensity score matching', *Journal of economic surveys* 22(1), 31–72.

Center on the Developing Child at Harvard University (CDCHU), 2017, *Three principles to improve outcomes for children and families*, viewed from http://www.developingchild.harvard.edu.

Chigona, A. & Chetty, R., 2008, 'Teen mothers and schooling: Lacunae and challenges', *South African Journal of Education* 28(2), 261–282. https://doi.org/10.15700/saje.v28n2a174

Coley, R.L. & Hernandez, D.C., 2006, 'Predictors of paternal involvement for resident and nonresident low-income fathers', *Developmental Psychology* 42, 1041–1056. https://doi.org/10.1037/0012-1649.42.6.1041

Cox, M.J. & Paley, B.,1997, 'Families as systems', *Annual Review of Psychology* 48, 243–267. https://doi.org/10.1146/annurev.psych.48.1.243

Department of Education, 2010, *Education for all: Country report*, Pretoria, viewed from https://unesdoc.unesco.org/ark:/48223/pf0000221801.

Duflo, E., 2003, 'Grandmothers and granddaughters: Old age pensions and intrahousehold allocation in South Africa', *The World Bank Economic Review* 17(1), 1–25. https://doi.org/10.1093/wber/lhg013

Excell, L., 2016, 'Interrogating quality in early childhood development: Working towards a South African perspective', *South African Journal of Childhood Education* 6(1), 406. https://doi.org/10.4102/sajce.v6i1.406

Flury, B.K. & Riedwyl, H., 1986, 'Standard distance in univariate and multivariate analysis', *The American Statistician* 40(3), 249–251. https://doi.org/10.1080/00031305.1986.10475403

Francis, D. & Webster, E., 2019, 'Poverty and inequality in South Africa: Critical reflections', *Development Southern Africa* 36(6), 788–802. https://doi.org/10.1080/0376835X.2019.1666703

Genobaga, J., 2004, *Teenage girl: What I want to know without asking*, Signs publishing company, Warburton, VIC.

Geronimus, A. & Korenman, S., 1993, 'The socioeconomic effects of teen childbearing', *Quarterly Journal of Economics* 107(4), 1187–1214. https://doi.org/10.2307/2118385

Geronimus, A.T., Korenman, S. & Hillemeier, M.M., 1994, 'Does young maternal age adversely affect child development? Evidence from comparisons in the United States', *Journal of Population and Development Review* 20(3), 585–609. https://doi.org/10.2307/2137602

Gibson-Davis, C.M. & Brooks-Gunn, J., 2007, 'The association of couples' relationship status and quality with breastfeeding initiation', *Journal of Marriage and Family* 69, 1107–1117. https://doi.org/10.1111/j.1741-3737.2007.00435.x

Gronau, R., 1973, 'The effect of children on the housewife's value of time', *Journal of Political Economic* 81(4), 168–199. https://doi.org/10.1086/260160

Harknett, K., 2009, 'Why are children with married parents healthier? The case of pediatric asthma', *Population Research and Policy Review* 28, 347–365. https://doi.org/10.1007/s11113-008-9102-9

Hofferth, S. & Reid, L., 2003, 'Early childbearing and children's achievement and behavior over time', *Journal of Peer-Reviewed Research* 34(1), 41–49. https://doi.org/10.2307/3030231

Hoque, M. & Hoque, S., 2010, 'A comparison of obstetrics and perinatal outcomes of teenagers and older women: Experiences from Rural South Africa: Original research', *Family Medicine* 2(1), 1–5. https://doi.org/10.4102/phcfm.v2i1.171

Hoque, M., Towobola, O., Mashamba, T. & Monokoane, T., 2014, 'Comparison of adverse pregnancy outcome between teenage and adult women at a tertiary hospital in South Africa', *Biomedical Research* 25(2), 167–172.

Irwin, G., Siddiqi, A. & Hertzman, C., 2007, 'Early childhood development: A powerful equalizer', Report for the World Health Organisation's Commission on the Social Determinants of Health, Human Early Learning Partnership, Vancouver.

Ismail, Z. & Kollamparambil, U., 2015, 'Youth unemployment duration and competing exit states: What hides behind long spells of black youth unemployment in South Africa?', *African Development Review* 28(1), 301–314. https://doi.org/10.1111/1467-8268.12150

Kingdon, G. & Knight, J., 2006, 'Subjective well-being poverty vs. income poverty and capabilities poverty?', *Journal of Development Studies* 42(7), 1199–1224. https://doi.org/10.1080/00220380600884167

Kirchengast, S. & Hartmann, B., 2003, 'Impact of maternal age and maternal somatic characteristics on newborn size', *American Journal of Human Biology* 15(2), 220–228. https://doi.org/10.1002/ajhb.10139

Kollamparambil, U., 2019, 'Child support grant and child-bearing in South Africa: Is there a perverse incentive?', in *proceedings of the 2019 African review of economics and finance conference*, Johannesburg, viewed 15 March 2020, from https://www.arefconference.com/Proceedings_AREF_2019_Conference.pdf.

Kropf, N.P. & Robinson, M.M., 2004, 'Pathways into caregiving for rural custodial grandparents', *Journal of Intergenerational Relationships* 2(1), 63–77. https://doi.org/10.1300/J194v02n01_05

Lanier, P. & Zolotor, A., 2014, *Early childhood intervention and teen pregnancy prevention white paper,* viewed 13 January 2020, form http://www.healthyhighpoint.org/wp-content/uploads/2015/11/Foundation-for-a-Healthy-High-Point-Early-Intervention-Teen-Pregnancy-Wh....pdf.

LeGrand, T. & Mbacke, C.M., 1993, 'Teenage pregnancy and child health in the urban Sahel', *Journal of Family Planning* 24(3), 137–149. https://doi.org/10.2307/2939229

Leuven, E. & Sianesi, S., 2003, *PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariates imbalance testing*, viewed from https://scinapse.io/papers/1601517327.

López Turley, R.N., 2003, 'Are children of young mothers disadvantaged because of their mother's age or family background?.' *Child development* 74(2), 465–474. https://doi.org/10.1111/1467-8624.7402010

Macleod, C., 1999, 'Teenage pregnancy and its negative consequences: Review of South African research'. *South African Journal of Psychology* 29(1), 1–7. https://doi.org/10.1177/008124639902900101

Makiwane, M., 2011, *The older persons and their relationship with younger generations in South Africa*, viewed 20, June 2019, from http://repository.hsrc.ac.za/bitstream/handle/20.500.11910/3429/7250.pdf?sequence=1&isAllowed=y.

McLoyd, V., 1990, 'The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development', *Child Development* 61, 311–346. https://doi.org/10.1111/j.1467-8624.1990.tb02781.x

Ndagurwa, P., 2013, *The impact of family structure on schooling outcomes for children in South Africa*, Uniersity of KwaZulu Natal, Durban.

Nkwanyana, T.R., 2011, *A study of the high rate of teenage pregnancy in high schools in the ILembe district of South Africa*, viewed from http://hdl.handle.net/10500/6809.

Operario, D., Pettifor, A., Cluver, L., Macphail, C. & Rees, H., 2007, 'Prevalence of parental death among young people in South Africa and risk for HIV infection', *Journal of Acquired Immune Deficiency Syndrome* 44(1), 93–98. https://doi.org/10.1097/01.qai.0000243126.75153.3c

O'Reilly, A. (ed.), 2007, *Maternal theory: Essential readings*, Demeter Press, Bradford.

Oyenubi, A. & Kollamparambil, U., 2020, *Does Child Support Grant incentivise childbirth in South Africa? (No. 836)*, Economic Research Southern Africa.

Pearson, J. & Stone, D.H., 2009, 'Pattern of injury mortality by age-group in children aged 0–14 years in Scotland, 2002–2006, and its implications for prevention', *BMC Pediatrics* 9, 26. https://doi.org/10.1186/1471-2431-9-26

Peralta, M., 2008, 'Quality: Children's right to appropriate and relevant education', *Early Childhood Education Matters* 110, 3–22.

Pitso, T., Kheswa, J., Nekhwevha, F. & Sibanda, M., 2014, The psycho-social wellbeing of the teenage mothers', *Journal of Social Sciences* 4(10), 39–40. https://doi.org/10.5901/mjss.2014.v5n10p610

Republic of South Africa (RSA), 1996a, *Constitution of the Republic of South Africa Act 108 of 1996*, Government Printer, Pretoria.

Republic of South Africa (RSA), 1996b, *South African Schools Act 84 of 1996*, Government Printer, Pretoria.

Ribar, D. & Wilhelm, M., 1999, 'The demand for welfare generosity', *Journal of Economics and Statistics* 81(5), 96–108. https://doi.org/10.1162/003465399767923854

Rubin, D.B., 2001, 'Using propensity scores to help design observational studies: Application to the tobacco litigation', *Journal of Health Science* 2(4), 169–188.

Save the Children Organisation, 2015, *Children*, viewed February 2020, from http://www.savethechildren.org.uk.

Shrestha, S., Adachi, K., A Petrini, M. & Shrestha, S., 2019, 'Maternal role: A concept analysis', *Journal of Midwifery and Reproductive Health* 7(3), 1732–1741.

Sibanda, A., 2005, 'Who drops out of school in South Africa? The influence of individual and household characteristicsi', *African Population Studies* 19(1), 99–117.

Statistics of South Africa, 2011, Gen*eral household survey,* viewed 20 January 2020, from http://beta2.statssa.gov.za/publications/P0318/P03182011.pdf.

Social Work Policy Institute, 2011, *Supervision: The safety net for front-line child welfare practice,* National Association of Social Workers, Washington, DC, viewed 8 January 2020, from https://ncwwi.org/files/Supervision__Perf_Management/Supervision_-_The_Safety_Net_for_Front-line_CW_Practice.pdf.

Tough, S.C., Siever, J.E., Benzies, K., Leew, S. & Johnston, D.W., 2010, 'Maternal well-being and its association to risk of developmental problems in children at school entry', *BMC Pediatrics* 10, 19. https://doi.org/10.1186/1471-2431-10-19

Tshotetsi, L., Dzikiti, L., Hajison, P. & Feresu, S., 2019, 'Maternal factors contributing to low birth weight deliveries in Tshwane District, South Africa', *PLoS One* 14(3), e0213058. https://doi.org/10.1371/journal.pone.0213058

Willan, S., 2013, *A review of teenage pregnancy in South Africa – Experiences of schooling, and knowledge and access to sexual & reproductive health services*, viewed 28 February 2020, from https://www.hst.org.za/publications/NonHST%20Publications/Teenage%20Pregnancy%20in%20South%20Africa%20Final%2010%20May%202013.pdf.

Woolard, I. & Klasen, S., 2005, 'Determinants of income mobility and household poverty dynamics in South Africa', *Journal of Development Studies* 41(5), 865–897. https://doi.org/10.1080/00220380500145313

World Bank, 2018, *Overcoming poverty and inequality in South Africa: An assessment of drivers, constraints and opportunities,* International Bank for Reconstruction and Development/The World Bank, Washington, DC, viewed 15 December 2019, from https://www.tralac.org/images/docs/12929/overcoming-poverty-and-inequality-in-south-africa-world-bank-march-2018.pdf.

World Health Organization (WHO), 2016, *Early child development*, viewed, 02 March 2020, from https://www.who.int/topics/early-child-development.