Teen motherhood and women's later life outcomes: evidence from South Africa.

Godfred Anakpo & Umakrishnan Kollamparambil

School of Economic and Business Sciences,

University of the Witwatersrand, Johannesburg,

South Africa

Email: uma.kollamparambil@wits.ac.za

Abstract

Background: The pathway from teen motherhood to 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. Very few studies have however, looked beyond educational and economic outcomes.

Data source and methods: This paper uses pooled data from four waves of National Income Dynamic Study (NIDS) survey collected from 2008-2014 in South Africa to investigate the impacts of early motherhood on mothers' later life outcomes using propensity score matching and endogenous treatment techniques which controls for endogeneity. A total of 12203 mothers who have given birth at least once were selected to form the sample with information on their life outcomes, childhood poverty and other background precursors included. The study reveals that teen motherhood has significant negative effects on women's educational attainment (by -5.2years at 0.1% significance level), economic well-being (-19.9% at 0.1% significance level), psychological well-being (by increasing depression score by 5.2 at 0.1% significance level) and life satisfaction (by -1.24 at 0.1% significance level).

Results: 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.

Conclusions: The insignificant impact on health related outcomes is arguably because of the sample selection bias caused by the high rates of teenage maternal mortality.

Keywords: teen motherhood, early motherhood, later life outcomes, endogenous treatment regression, South Africa

Introduction

Teen motherhood and its later life consequences have received much 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, & Celia, 2015; Hobcraft & Kiernan, 2001; Ermisch, 2003). This critical stage of development is particularly critical for women in Africa where motherhood is viewed as the 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 (Benza & Liamputton, 2015; Ngum, 2012; Bledsoe & Cohen, 1993). Over the last decade, however, the prevalence and trend of early motherhood has taken different dimensions in the African environment.

In Africa, Niger tops with the highest rates of teenage pregnancy and child marriage with about 75% of girls given in to marriage and 51% giving birth to at least a child before turning 18years (Stuart, 2013). While in Mozambique, 41 % of women already have a baby by the time they reach 20 years of age, 47% and 55% of women have baby before they turn 18years in Chad and Mali respectively. This prevalence rate is closely similar to the occurrences recorded earlier in Nigeria, Libaria and other African countries including South Africa (Health and Demographic Survey, 1992).

Teenage pregnancy in South Africa over the past years has reached an alarming proportion (Samantha, 2013; Sibeko 2012; Karra & Lee, 2012; Makiwane et al., 2006). Statistics 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 the past years. Additionally, according to Nkwanyana (2011) among South African youth within 13-19 age group 37% of school-going learners (boys and girls) across the nation had initiated sexual activities while a quarter (24.4%) of school-going girls had become pregnant. Despite 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 becoming pregnant with only around one third of teenage girls returning to school following childbirth (Samantha, 2013).

Studies on the impact of early motherhood face the challenge of having to establish causality because teen pregnancy and early motherhood are observed to be more prevalent in poorer communities with low average educational achievements. Several attempts have been made in the developed country contexts to establish the causal effect of early motherhood on the later socio-economic status of mothers and their life-course development with different methodologies that account for the selection bias and endogeneity issues (Goodman, Kaplan, & Walker, 2004; Hobcraft & Kiernan, 2001, Watts, Liamputtong, & Mcmichael, 2015). Such studies in the context of developing countries are far more limited. It is pertinent to address the phenomenon in contexts where poverty and unemployment are higher while well-being in general is much lower compared to developed countries. South Africa is one such country with high levels of poverty and low life satisfaction levels.

The studies on the impacts of early motherhood in the South African context are limited to educational impact and are mainly descriptive in nature based on small restricted samples (Dlamini, 2016; Nkwanyana, 2011; Nothile, 2016; Panday et al., 2009; Malahlela, 2012). These studies do not address the issue of self-selection into teen pregnancy as it is women who have lower opportunity cost who opt for early motherhood (Becker, 1981). Therefore, a quantitative large sample study covering the nation and establishing a causal effect is highly relevant in the context of high teen pregnancy levels in South Africa. Moreover, all the South African studies have failed to consider the impacts of teen motherhood on other life outcomes such as life satisfaction, psychological and physical health remain to be addressed.

This study therefore has two-fold significance; (a) it goes beyond the education impact of early motherhood and looks at economic well-being, psychological well-being, life satisfaction and health outcomes of early motherhood; (b) this study strives to control for selection bias and establish causal impact through the use of propensity score matching techniques. It further accounts for endogeneity through the use of endogenous treatment analysis to account for endogeneity issues, which has thus far not been used in the context of early motherhood impact studies.

Theoretical framework

Various theoretical paradigms can be considered in evaluating the impact of early motherhood on later-life outcomes of women. We base the current study on the household production theory (Ribar & Wilhelm, 1999; Becker, 1965; Gronau, 1973) which postulates that early motherhood has a great potential of affecting mothers' socioeconomic and other life outcomes. The theory draws upon the trade-off between the responsibilities of raising children and job market participation which 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 productivity and could potentially limit them from getting certain kind of job with higher pay (Ribar, 1999). For instance, in his counterfactual analysis in the United State, Miller (2005) reported that women who delayed motherhood also delayed its accompanied home responsibilities, and are available to pursue their career path and land in economic fortune. Drawing from his conclusion, an increase of wage by 10% was recorded by the delayed mothers. Also, Ferre, Gerstenbluth, Rossi & Triunfo (2009) documented that the home responsibility that accompanies early childbearing disrupts women education attainment and hit them with economic agony in the long run.

Further, discrepancy theory, which explains women's psychological response to pregnancy and motherhood, provides other theoretical foundation for this study (Adam, 2015). The emotional and physical changes associated with early pregnancy and motherhood can potentially trigger psychological state from elevation to devastation (Mercer, 2004; Beck, 2002). The motherhood impacts on emotional and physical health of early mothers are explained through the difficulties experienced by teen mothers in coping with the pressure of pregnancy and care for the new baby causing some of them to be depressed, isolated, and filled with anxiety and loneliness (Richter, Norris and Ginsburg, 2006; Genobaga, 2004). When these psychological developments are not managed timely, the adverse consequences significantly affect their physical state (Jones and Battle, 1990). For instance, it was documented that, about 9-16% of women had higher depression score

following motherhood in the United State ,while up to 19% was recorded for women following motherhood worldwide (American Psychological Association, 2014; World Health Organization [WHO], 2008). Early mothers are also more likely to feel unsatisfied in life than non-early mothers because of their inability to return to school after delivering and becoming economically disadvantaged. The sense of unfulfilled dreams and dissatisfaction is further accentuated with relative peer comparison who make significant progress in life as compared to them (Jiang, Klein, & Saunders, 2015; Festinger, 1942; Festinger, 1954). Overall, early motherhood is therefore expected to negativly impact on life satisfaction.

Teenage pregnancy is associated with significant health risk to the young mother due to the tendency to hide the condition until it becomes obvious (Bullock, 1992). Studies 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 giving birth resulting in problems after child birth (Martin 2003; Genobaga, 2004). Similarly, young mothers in disadvantaged situations are more likely to be on poor nutritional diet which can affect not only the pregnancy but also cause deteriorating health in later life through weak bones (Nkwanyana, 2011).

Empirical findings in the existing literature

While early literature used cross-sectional data to study the impact of early pregnancy, this could not account for family heterogeneity. Geronimus & Korenman (1992) accounted for observed and unobserved family background heterogeneity by comparing sisters who have timed their first births at different ages. This study was followed by Bennett, Bloom & Miller, (1995), Hoffman, Foster, & Furstenberg, (1993) who used a similar approach. Other studies tried to address the issue through quasi-experimental technique (Hotz, McElroy, & Sanders, 1997; Bronars & Grogger, 1994; Olsen & Farkas, 1989), and instrumental variable approach (Klepinger, Lundberg, & Plotnick, 1995; Angrist & Evans, 1996; Ribar, 1996a; Ribar, 1994; Marini, 1984; Rindfuss, Bumpass, & John, 1980). More recently, studies have used propensity score matching approach to address selection bias (Levine & Painter, 2003; Viola & Jochen, 2015). Rigorous studies of this nature are largely restricted to developed country contexts.

In South Africa, the existing studies on the impacts of early motherhood are limited to women's schooling experiences and economic outcomes. Further, existing literature does not seek to address the issue of causality in analyzing the impact of early motherhood on later life outcomes for women. Panday, Makiwane, Ranchod, & Letsoalo (2009) in their descriptive analysis found that, teenage pregnancy disrupts teenagers' education. Using qualitative research methods, Maphothi (2014) investigates the impact of early motherhood on the educational outcomes of female learners in secondary school. He found that various experience of motherhood negatively affect the academic performance of the female mothers. Malahlela (2012) used descriptive statistics to examine how the educators perceive the impact of adolescent pregnancy on the behavior learners in some selected secondary school in Mankweng area of Limpopo. He found a negative relationship between teenage pregnancy and learners' school attendance and academic performance. Nothile (2016), through a qualitative study of teenagers' experience of motherhood in Kwa-Zulu Natal, found that mothers experience fear and sadness at the realization of pregnancy. 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 their joy.

The studies done in South Africa on the impacts of motherhood on life outcome are mainly descriptive and qualitative without rigorous econometric analysis and are mainly on educational effects with few descriptive studies on financial and emotional challenges of early motherhood. Further, these studies are not able to draw causal inferences due to the non-random nature of teen-pregnancy. Literature shows that teen-pregnancy is prevalent in poor communities with low education levels, therefore it is important to take this into account while drawing conclusion about the impact of teen pregnancy. The current study strives to derive causal impact of early motherhood on women's later life outcomes. One major issue, however, is the possible problem of selection bias, which is accounted for by matching techniques such as propensity score matching strategy. Further concerns of endogeneity are addressed through the endogenous regression analysis.

Methodology

Propensity score matching (PSM)

Propensity Score Matching (PSM) analysis was first introduced by Rosenbaum and Rubin, (1893). PSA includes forming matched sets of treated (in this context, early mothers) and untreated subjects (delayed or non-early mothers). Details of propensity estimator can be found many papers including Austin,

(2011) and (Sabine & Marco, 2005). Nevertheless the important assumptions behind the technique can be highlighted as (a) conditional independence assumption (This implies that after observable covariates are controlled, the potential outcomes are independent of treatment assignment) (b) common support (that is the joint support or overlap condition, thus, it rules out the phenomenon of perfect predictability of treatment given the observable covariates) (c) partial equilibrium (that is, no general equilibrium effect implying that treatment does not indirectly affect the control observation) and (d)observable covariates. The covariates were selected based on the potential effects on treatment assignment based on theoretical recommendation and empirical review. To obtain causal estimates, five major steps were taken such as estimating propensity scores, using the propensity scores to adjust for confounding using matching, achieving balance property assumption (that is, high degree of post-match balance across covariates), estimating the propensity score-adjusted treatments effects and sensitivity analysis. These analyses were executed with Stata 14.

The analysis began with the use of probit model for propensity score estimation for treatment group using nearest neighbor 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), $D=0$ otherwise (control group). Thus, the probit model, for the treatment is further specified below:

$$D_i = \beta_0 + \beta_i X_i + \Upsilon_i K_j + \varepsilon_i \qquad [1]$$

Where D denotes teen motherhood and X are the factors that influence teen motherhood such as childhood poverty, provinces, and parental education and life status; and K is the control variables, which include race, availability of health care, and contraceptives.

$$y = \begin{cases} y_1 \; if \; D=1 \\ y_0 \; if \; D=0 \end{cases} \qquad ATE = E(y_1 - y_0) \qquad [2]$$

Where y is the vector of teen mothers' later life outcomes and socio-economic status such that y_1 denotes the outcome of teen mothers, and y_0 denotes the outcome of delayed mothers.

The average treatment effect on the treated *(ATET)* is the mean of the difference $(y_1 - y_0)$, which is the counterfactual mean, of the teen mothers.

$$(ATET = E(y_1 - y_0 \mid t=1) \qquad [3]$$

Following Caliendo & Kopeinig (2008), we assess the balance the balance property assumption and further undertake sensitivity analysis.

The presence of treatment endogeneity weakens the suitability of propensity score matching technique (Christopher 2013, Sabine & Marco 2005 and; Spermann 2009). The endogenous-treatment is a robust technique to solve this weakness and produces finer estimates by controlling for unobservables, which in the present study, may have effect on the probability of being a teen mother and later life outcomes. While endogenous treatment generally solves the problems of endogeneity across all outcome variables (such as binary and continous outcomes), endogenous linear regression is a special technique of endogenous treatment which is mainly used for linear outcome variables. In this paper, the endogenous linear regression is applied to all linear outcomes variables such as education, economic well-being,psychological effects, life satisfaction and body mass index while endogenous technique with probit outcome model is applied to perceived health which is binary outcome.

Endogenous treatment-regression

The endogenous treatment-regression model is specified according to Heckman (1976, 1978) below. Formally, this model comprises an equation for the outcome variable Y_j and equation for the endogenous treatment, which in this case is teen motherhood T_j. There are series of variables collectively defined as X_j used to model the outcome. In the absence of the interactions between T_j and X_j, the equation is expressed as

The generalized model can be specified as

$$Y_{0j} = X_j\beta_0 + \delta T_j + U_{0j} \qquad [4a]$$

$$Y_{1j} = X_j\beta_1 + \delta T_j + U_{1j} \qquad [4b]$$

$$T_j = \begin{cases} 1; \text{ if } \; W_j\gamma + \varepsilon_j \\ 0, \; otherwise \end{cases}$$

Where Y_{0j} is a vector of outcomes for delayed mothers such as educational attainment, economic

well-being, psychological well-being, life satisfaction status) if subject j selects 0 (non teen mother) , and Y_{1j} is a vector of outcomes for teen or early mothers which include educational outcome, economic well-being, psychological well-being, life satisfaction and health if subject j selects 1 (teen mother) . where W_j is denoted as the covariates used for the treatment assignment model. Both error terms (U_j and ε_j) are bivariate normal with mean zero and covariance matrix. It is assumed that Y_{0j} and Y_{1j} were never observed simultaneously, only one or the other. Hence, one observes:

$$Y_j = T_j Y_1 + (1 - T_j) Y_{0j} \quad [5]$$

Data

The analysis conducted in this study uses pooled data from four waves of National Income Dynamics Survey (NIDS) collected from 2008-2014. The NIDS is conducted by the South African Research and Labor Research Unit (SALDRU), University of Cape Town, South Africa. A total of 12 203 mothers who have given birth at least once form the sample for this study. The data contain information on life outcomes such as, education, economic well-being, psychological outcomes, life satisfaction, perceived health status and body mass index including childhood poverty and other background precursors. NIDS data set in general contains designed and panel weights to account for national representativeness and counter possible bias caused by attrition. The current study restricts its sample to women who have given birth at least once and as such, the matter of randomness and national representativeness, which sample weights aim to achieve, is not of primary importance in this current study.

Mothers in the sample are categorized into teen mothers (less than 20 years at the time when they first gave birth) and non-teen mothers (mothers from and health (body mass index and perceived health 20 years and above at the time when they first gave birth). Furthermore, socio-demographic and economic features of mothers is collected. This includes information on their economic or poverty level while in teenage, marital status, number of children, age, average period gap, provinces, and parental information including their educational level, occupational level, and whether parents were alive during their teenage.

While the educational levels of mothers were measured as the number of years at which mothers completed education, log of net monthly income was used as a proxy for measuring the economic level (measured in South African rands) of mothers. 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 and is measured in ordinal scale as None=1, sometimes=2, quite often=3, all the time=4. Responses to the questions as indicated above were summed and scores form a linear scale that ranges from 4 (never depressed) to 40 (always depressed) which may be considered to be a quantitative variable. The scale shows a high internal consistency (α =.830). This is based on (Radloff, 1977) who constructed a scale for psychological impact analysis. 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. With respect to mothers' perceived health status, respondent were asked to indicate their physical health status from a given range of rate: Excellent=1, Very good=2, Good=3, Fair=4, Poor=5. This category was collapsed into good health (1, 2 and 3), not in good health (4 and 5), thus dummy was created, 1 for good health and zero, otherwise. Lastly, body mass index was measured as kilogram per meter square.

Table 1: Summary statistics: percentages, means and standard deviations

	Age at first birth	
Variables	**Under 20 years**	**20years and above**
Driver and Outcomes		
Childhood poverty (%)	92.5	85.2
Economic /Net monthly income* (Rands)	2646.35	3936.67
	(3046.66)	(5040.10)
Education (Average years)	8	9
	(4.15)	(5.39)
Satisfaction (scale:1-10)*	4.81	5.23
	(2.39)	(2.41)

Psychological wellbeing (scale 4-40)	11.1	14.4
	(3.66)	(3.69)
Health (%)		
Excellent health	30.3	24.9
Very good health	30.5	26.9
Good health	27.3	29.3
Fair health	7.3	12.8
Poor health	4.6	6.1
Binary for Good health	88.1	81.1
Body mass index	26.94	27.201
	(4.037)	(3.894)
Background		
Average period gap (year)*	16.8	18.4
	(14.27)	(14.46)
Average age*	32.26	41.95
	(13.94)	(15.58)
Average number of children*	3.0	4.0
	(1.78)	(2.25)
Parents deceased (%)	2.0	3.4
Parents with no schooling	79.2	77.1
At least one parent with job (%)	57.1	48.7
Marital status (%)		
Married	24.3	37.1
Divorce/separation	2.13	3.22
Living with partner	15.45	11.45
Out-of-wedlock	51.6	34.26
Widow	6.4	13.9
Province (%)		
Western Cape	6.9	8.9
Eastern Cape	17.11	17.5
Northern Cape	6.35	6.56
Free State	6.91	7.62
KZN	24.9	24.4
North West	6.02	6.5
Gauteng	9.6	8.5
Mpumalanga	8.53	6.5
Limpopo	11.25	11
Non-South African (nonRSA)	1.95	2.3
Observation	3,162	9,041

Variables with asterisk * are measured as mean and standard deviation (in parentheses)

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 is created for each component of the marital status of the mothers, so 1 is assigned if a mother is in intact married, living with partner, divorce, and out-of-wedlock 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 for the mothers are 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 their educational level which is dummy variable, measured as 1 for at least one parent completing higher education (diploma, certificate degree), 0 otherwise; similarly, occupation, was measured as 1 if at least one parent gainfully employed and finally 1 for at least if one of the parent was alive while in teenage. Finally dummy variable was created for each of the following as follows; 1 if a mother is of any religious faith, smoke, drink alcohol and 0 if otherwise. The descriptive statistics of the sample is provided in Table 1.

Estimation and results

This section presents the results from PSM first and then followed by the endogenous treatment effects estimation in the second part.

PSM estimations

The results from the probit model used to estimate propensity score is given in table A1 and the propensity score matching of teen and non-teen mothers is provided in table A2.

The quality of kernel density matching was assessed as proposed by Leuven & Sianesi (2012). The full results in appendix A4 compare both the unmatched with the matched sample. Results from the analysis show a significant rate of reduction in bias associated with each variable. The summary results from this analysis are reported in Table 2.The estimates of pseudo R-square which shows the fitness of regressors in explaining the probability of being assigned into the treatment (motherhood) group (Karishma, 2017; Leuven & Sianesi, 2012). After matching was done, the distribution of the covariates between the teen motherhood and non-teen mother should not exhibit any systematic difference. Therefore, it is expected that the pseudo R-square be low (Caliendo & Kopenig, 2008). Table 2 also documents that the likelihood-ratio test, which check the null hypothesis of joint insignificance of all variables (regressors) fitted in probit regression model, has a p-value of 0.997. This shows that one cannot reject the null hypothesis of joint insignificance. Furthermore, the mean and median percentage bias is 0.8 % and 0.6% respectively, which is below the maximum tolerable level of 5%. This confirms a good match. Furthermore, Rubin's B and R statistics are other key areas of ensuring sufficient balance of treatment (teen motherhood) and control group (non-teen mothers). Rubin (2001) recommended that the B value should be less than 25 while that of R should be between 0.5 and 2. The B statistic of 4.2 and R statistics of 1.3 in this study shows sufficient balance of both groups. To validate the results, post estimation analysis was conducted to ascertain the overlap condition for the propensity score-matching model (Table A3).

Table 2: Summary results of matching assessment

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
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

Results of the propensity score matching technique are reported in Table 3. Propensity in the present context estimates the average treatment effect (ATE) by means of matching each subject to a single subject with the opposite treatment (motherhood) with the closest propensity score. Thus, estimating ATE involves finding similar scores or matches for both the teen motherhood and non-teen motherhood. The estimation of the ATET, however, only requires finding similar propensity scores for the teen motherhood. From the table, teen motherhood has a significant negative impact on mothers' educational outcome, economic well-being and life satisfaction. The positive impact on depression scores indicates that teen motherhood has a negative impact on psychological well-being as well. While these results are in line with expectations, the positive and significant effect on health is not. This may be due to unobserved selection bias and potential problem of endogeneity as confirmed in Table A5.

Furthermore, the results of the propensity score matching from the sensitivity analysis is reported as $\Gamma=1$ prob(1) in the table3. The significant level of $\Gamma=1$ prob(1) recorded under educational, economic, psychological and life satisfaction outcomes shows that the results are not sensitive to possible deviation from unconfoundness assumption. However, the insignificant level recorded under health (body mass index and perceived health status as 0.115 and 0.454 respectively) shows a sensitivity of the health estimate and must therefore be interpreted with caution.

Table 3 shows Results from propensity score matching models: effects of teen motherhood on women's later life outcomes

	Educational Effect	Economic Effect	Psychological effects (Depression Score)	Life Satisfaction	Body mass Index	Perceived health Effects
	Propensity SM					
ATE	-0.279**	-0.327***	0.075***	-0.055***	0.025**	0.032***
	(0.122)	(0.091)	(0.008)	(0.014)	(0.033)	(0.010)
ATET	-0.308**	-0.343***	0.081***	-0.055***	0.546**	(0.026***
	(0 124)	(0.093)	(0.008)	(0.014)	(0.020)	(0.010))
Γ=1 prob(1)	0.00001	0.00001	0.00001	0.00001	0.1151	0.4542
Observation	7,237	7,358	7,358	7,358	7,240	7,358

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

Endogenous treatment regression results

Endogeneity problem is confirmed by the endogeneity test in all results hence the estimates from the endogenous treatment effect models are used for interpretation purposes. Some factors that affect teen motherhood and the outcome variables of interest are common as shown in the table 3. These include childhood poverty, educational level of parents of the teen mothers, whether they were deceased or alive and the provinces in which the teenagers live. The need to account for endogeneity is thus beyond doubt. The results further suggest that teenagers whose parents were alive at the age of 15 years significantly negatively related to teen motherhood. The results also show that, teenagers whose parents had no formal education are more likely to experience teen pregnancy.

Endogenous treatment results show that teen motherhood is significantly negatively associated with education and economic well-being (Table 4). The results show that on average, being a teen mother reduces women's educational attainment by 5.2 years at 0.1% significant level. Furthermore, being a teen mother predicts a significant reduction in economic well-being of teen mothers by 19.9% at 1% significant level.

The analysis controls for the time differences between the first birth and time of data collection known as average period gap, and also control for age, the average number of children and other background factors. The more children a teen mother has, the lower educational level and economic well-being she achieves. Further, Intact married has significant positive relationship with educational level and economic well-being by 2.2 years and 3.9% respectively. Out-of-wedlock family significantly lower educational level and economic well-being by 3.3years and 12% respectively. The table further shows that age has significant positive effect on education and economic well-being by 0.15years and 0.7% respectively. Education, as expected has a significant positive impact on economic wellbeing by 13.5%.

Table 4: Results from endogenous treatment regression model: effect of early motherhood on mothers' educational and economic outcomes

Variables	Education	Economics
Teen motherhood	-5.197***	0.199**
	(0.178)	(0.083)
Childhood poverty	-1.425***	0.418***
	(0.164)	(0.135)
No. of children	-0.027**	0.030***
	(0.012)	(0.001)
Average period gap	0.016	0.003

	(0.017)	(0.002)
Age	0.159***	0.007***
	(0.003)	(0.0004)
		0.135***
Education		(0.026)
Married	2.181***	0.039**
	(0.168)	(0.0178)
Living with partner	-0.008	-0.001
	(0.039)	(0.005)
Divorce/separate	0.010	0.001
	(0.019)	(0.002)
Out-of-wedlock	-3.302**	-0.120**
	(0.256)	(0.022)
African	-6.160***	-0.394***
	(0.218)	(0.026)
Coloured	-6.287***	-0.291***
	(0.237)	(0.028)
Asian/Indian	3.301***	0.300***
	(0.455)	(0.055)
Western Cape	1.168***	0.097**
	(0.241)	(0.028)
Eastern Cape	0.016	-0.001
	(0.038)	(0.005)
Northern Cape	-0.489**	0.034
	(0.216)	(0.027)
Free state	1.142***	0.060**
	(0.239)	(0.024)
KZN	-0.291**	-0.002**
	(0.117)	(0.005)
Northwest	1.009***	0.027**
	(0.094)	(0.013)
Gauteng	1.506***	0.048**
	(0.221)	(0.014)
Mpumalanga	-0.025	0.012
	(0.247)	(0.012)
Constant	-11.441***	0.699***
	0.610	(0.086)
First stage regression outcomes of teen motherhood on covariates		
Teen motherhood		
Childhood poverty	0.169***	0.172**
	(0.042)	(0.062)
Both parents alive at age 15	-0.549***	-0.361**
	(0.046)	(0.066)
Unemployed parents	0.263***	0.290**
	(0.025)	(0.037)
Uneducated parents	0.067**	0.068**
	(0.040)	(0.051)
Gauteng	0.046	0.170**
	(0.055)	(0.072)
Northwest	-0.072	-0.020
	(0.065)	(0.087)
Western Cape	-0.103*	-0.026
	(0.059)	(0.087)
Mpumalanga	0.153**	0.238**
	(0.059)	(0.078)

Free state	-0.068	-0.025
	(0.061)	(0.078)
Eastern Cape	-0.141	-0.145
	(0.095)	(0.143)
KZN	-0.006	-0.009
	(0.009)	(0.016)
Northern Cape	0.174***	0.066
	(0.041)	(0.064)
Constant	-0.915***	-0.998***
	(0.109)	(0.178)
Wald chi2(20)	5789.22	2856.32
Prob > chi2	0.0000	0.0000
Rho	0.765**	0.231**
	(0.012)	(0.110)
Observation	12,013	7,237

Standard error abbreviated; *** p<0.01, ** p<0.05, * p<0.1;

The impacts of early motherhood on psychological outcome, life satisfaction and health (BMI and perceived health status) are reported in Table 5. In this table, being a teen mother predicts a significant increase in depression score by 5.4 after controlling for background factors. The results also show that mothers who are in intact family are in better psychological condition than the broken home. The educational level, religion, and income predict significant declines in the depression score by 0.043, 0.207, and 0.54 respectively. Table 5 further displays results of life satisfaction effect of early motherhood. The results show that teen motherhood predicts a significant decrease in life satisfaction score by 1.24 at 1% significance level after controlling for background factors. The estimates from this analysis further show that economic well-being and educational level significantly affect life satisfaction level. Results shows that economic level and educational attainment predict a significant increase in life satisfaction score by 1.86 and 0.81 respectively. The results on health outcomes (BMI and perceived health status) are however, insignificant. Factors that significantly affect health include economic factors, education and childhood poverty. The table also shows that alcohol intake and smoking significantly reduce mothers' health by 0.033 and 0.009 respectively.

Table 5: Results from endogenous treatment regression model: effect of early motherhood on mothers' Psychological outcome (Depression Score), life satisfaction and health outcomes (BMI and perceived health status)

Variables	Psychology	Life satisfaction	Body mass index (BMI)	Perceived health#
Teen motherhood	5.405***	-1.244**	0.576*	0.423
	(0.173)	(0.279)	(0.460)	(0.142)
	-0.043***	0.814***	-0.042**	
Education	(0.007)	(0.008)	(0.096)	
	0.008	-0.007	-0.003	
Child number	(0.010)	(0.011)	(0.008)	
	0.004	0.010	0.006	
Child birth gap	(0.015)	(0.016)	(0.012)	
Age	-0.018***	0.001	0.0003	
	(0.003)	(0.003)	(0.002)	
Log Income	-0.540**	1.862***	0.412**	
	(0.213)	(0.189)	(0.152)	
Married	-0.154**	0.094**	-0.078*	
	(0.141)	(0.126)	(0.101)	
Living with partner	0.008	0.026	-0.016	
	(0.032)	(0.035)	(0.027)	
Divorce/ separate	0.005	-0.002	-0.005	
	(0.016)	(0.0171)	(0.013)	

Out-of-wedlock	0.159**	-0.586**	-0.399**
	(0.218)	(0.235)	(0.148)
Smoking			-0.039**
			(0.100)
Alcohol			-0.296**
			(0.119)
Childhood poverty			-0347**
			(0.201)
Religion	-0.207**	1.593***	
	(0.281)	(0.302)	
Africa	-1.226	-1.164***	0.174
	(0.186)	(0.194)	(0.150)
Coloured	-0.541**	-0.419**	0.289*
	(0.203)	(0.212)	(0.162)
Asian	-0.635*	0.653**	0.129
	(0.378)	(0.395)	(0.311)
Western Cape	-0.408**	0.781**	-0.126
	(0.201)	(0.183)	(0.143)
Eastern Cape	-0.041	-0.025	-0.012
	(0.032)	(0.034)	(0.026)
Northern Cape	0.074	0.431**	0.277*
	(0.181)	(0.193)	(0.151)
Free state	-0.349*	-1.661**	0.042
	(0.199)	(0.176)	(0.138)
KZN	-0.149	-1.290**	-0.073
	(0.099)	(0.105)	(0.083)
Northwest	0.064	0.335**	-0.092
	(0.079)	(0.084)	(0.068)
Gauteng	-0.219	-1.543**	0.123
	(0.185)	(0.164)	(0.128)
Mpumalanga	-0.771***	1.800**	-0.003
	(0.206)	(0.183)	(0.144)
Constant	11.182***	2.409**	26.753
	(0.563)	(0.565)	(0.428)

First stage regression outcomes of teen motherhood on covariates

Teen motherhood			
Childhood poverty	0.124***	0.147***	0.138***
	(0.033)	(0.044)	(0.045)
Both parents alive at age 15	-0.329***	-0.442***	-0.457***
	(0.047)	(0.057)	(0.056)
Unemployed parents	0.298***	0.391***	0.378***
	(0.026)	(0.031)	(0.031)
Uneducated parents	0.047**	0.022**	0.027**
	(0.040)	(0.042)	(0.042)
Gauteng	0.086	0.062	0.083
	(0.054)	(0.057)	(0.056)
Northwest	-0.059	-0.073	-0.057
	(0.064)	(0.068)	(0.067)
Western Cape	-0.082	-0.101*	-0.095
	(0.058)	(0.062)	(0.061)
Mpumalanga	0.115**	0.132**	0.155**
	(0.061)	(0.063)	(0.062)
Free state	-0.058	-0.044	-0.026
	(0.061)	(0.006)	(0.063)

Eastern Cape	-0.053	-0.075	-0.067
	(0.093)	(0.118)	(0.118)
KZN	0.006	0.006	0.007
	(0.009)	(0.013)	(0.012)
Northern Cape	-0.014	-0.059	0.035
	(0.042)	(0.056)	(0.051)
Constant	-1.003***	-1.106***	-1.114***
	(0.108)	(0.135)	(0.134)
Wald chi2(20)	1282.17	15149.2	12.02
Prob > chi2	0.0000	0.0000	0.000
Rho	-0.744	0.158***	-0.128**
	(0.015)	(0.041)	(0.089)
Observation	12,013	12,013	12,013

Standard error abbreviated; *** p<0.01, ** p<0.05, * p<0.1;

#The endogenous treatment linear regression provides estimates for covariates of continuous outcome variables but for Binary outcomes (perceived health), the endogenous treatment does not provide the estimates for the covariates.

Discussion of findings

This study uses propensity score matching (PSM) techniques and endogenous treatment analysis to investigate the effects of early motherhood on women's later life outcomes. Following the theoretical and empirical belief that PSM is weak in the presence of potential endogeneity, diagnostic analysis for possible detection of endogeneity was performed and this was confirmed for health outcome variables. These results are in line with that of Wellings, Wadsworth, Johnson, Field, & Macdowall (1999) who documented that teen mothers are likely to have certain background characteristics (for instance coming from a poor home) which may have adverse consequences for their life outcomes in the future, whether they are pregnant or not. Consequently, endogenous treatment analysis was performed.

Endogenous treatment results show that teen motherhood is significantly negatively associated with education and economic well-being. This inverse relationship with education is explained by household production theory, which states that fertility of teen women not only takes their time but also increases their household responsibilities, which distract them from schooling (Becker, 1965; Gronau, 1973). Pitso, Kheswa, Nekhwevha, & Sibanda (2014) also revealed that pregnant teenager is more likely to drop out of secondary and tertiary education. They also established that normally, about half of teen mothers do not complete schools. Also, the significant negative association of early motherhood with women's economic outcome is in line with expectations as 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; Becker 1965).

Furthermore, the significant increase in depression score for early mothers reinforces findings by Pitso, Kheswa, Nekhwevha, & Sibanda (2014) 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 & Hoffman, 2013).

With regard to life satisfaction which is significantly negative, 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. Further, Jiang, Klein, & 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.

Furthermore, the insignificant relationships with health related outcomes goes against the commonly accepted fact that teen mothers generally experience more difficulties and complications and are more likely to experience adverse health consequences (Pitso, Kheswa, Nekhwevha, & Sibanda, 2014). This discrepancy can be attributed to two main reasons: Firstly, there may be a sample selection bias due to the higher teenage maternal death rates Nteboheleng (2013). Similarly, Don, Audrey, Lucie, Catherine, & Helen (2006) documented that the incidence of parental death in South Africa was recorded as 27.3% for all the youth within 15-24 years; 7.9% of this was maternal death, a situation that may leave more mothers with better health outcomes in the study than those with poorer health. This selection bias could affect the health outcome and for that matter, the estimated effect which may not be reliable.

The second reason maybe time differential element, which makes it possible for a teen mother to regain health by the passage of time. This assertion is also confirmed by the fact documented in table 1, which shows that the average time from birth until the time of data collection was 16.8 years. Other factors that significantly affect health include economic factors, education and childhood poverty. Marmot (2002) disclosed that income earning and health are directly related and that as one income level rises, ability to make better options and subject to medical service is more affordable. This could be accountable for the significant difference after controlling for the background characteristics. The table also shows that alcohol intake and smoking significantly reduce mothers' health by 0.033 and 0.009 respectively.

Limitation of the Study

Before drawing conclusion to this study, it is necessary to acknowledge some limitations encountered in this study. Firstly, the findings from early motherhood effects on later life outcomes is based on a sample of teen mothers in South Africa as included in the NIDS survey. Secondly, there is a potential bias with respect to the selection of more healthy women as seen in the health outcomes. The study however, employs robust econometric techniques to arrive at reliable estimates to measure the impacts of early motherhood on women's later life outcomes with the existing data.

Conclusion and recommendations

This paper analyses the impacts of early motherhood on women's later life outcomes such as educational outcome, economic well-being, psychological well-being, life satisfaction and health outcomes (BMI and perceived health status) in the South African context. The study further uses robust econometric methodologies to account for endogeneity between early motherhood and outcome variables. The study thus reveals that teen motherhood has significant negative effects on women's educational outcome, economic well-being, psychological well-being and life satisfaction but insignificant effect on health. This study however conceded that the results on health outcomes could be biased due to sample selection issues.

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. Urgent proactive interventions to prevent child poverty and teenage pregnancy in general is underscored by the study. Reactive measures to care for pregnant adolescents should include a collaborative effort with various family involvement strategies, working directly with the adolescent's family, in order to maximize their support. Lastly, post-active policy efforts must be made (a) to increase and enhance child care programs that help the young mothers return to school for better education; (b) to provide services such as family planning to young mothers with the greater tendency of having bigger size subsequently; and (c) to provide additional training including job training and counselling and capacity building to young mothers.

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Appendix

Table A1 Results from probit model: covariates on teen motherhood

Variables	Effect
Childhood poverty	0.138** (0.044)
Both parents alive at age 15	-0.455*** (0.057)
Unemployed parents	0.379*** (0.031)
Uneducated parents	0.026** (0.042)
Gauteng	0.083 (0.057)
Northwest	-0.058 (0.067)
Western Cape	-0.096 (0.062)
Mpumalanga	0.155** (0.062)
Free state	-0.028 (0.063)
Eastern Cape	-0.063 (0.118)
KZN	0.007 (0.013)
Northern Cape	0.033 (0.052)
Constant	-1.109*** (0.135)
Observation	12,203
LR chi2(13)	271.85
Prob>chi2	0.0000
Pseudo R2	0.020

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

Table A2: Propensity scores and matching of teen and non-teen mothers

Propensity Score	Non teen mothers	Teen mothers	Total
0.055503	175	28	**203**
0.1	331	29	**360**
0.15	2,395	519	**2,914**
0.2	331	93	**424**
0.25	3,245	1,352	**4,596**
0.3	2,362	1,020	**3,382**
0.35	201	122	**323**
Total	**9,040**	**3,162**	**12,202**

Table A3: Post estimation; Overlap Estimation for Teen Motherhood

	Percentiles	Propensity Score
		Smallest
1%	.0867325	.0555025
5%	.1559731	.0596151
10%	.1659342	.0648024
25%	.18477	.0662128
50%	0.296959	
		Largest
75%	.3008238	.3687252
90%	.3094698	.3691572
95%	.3269438	.369965
99%	.3573198	.3710984
Observation	12,202	

Table A4: Further assessment of propensity matching and bias level

		Mean				t-test
Variable	Unmatched Matched	Treated	Control	%bias	%reduct bias	t p>t
Childhood poverty	U	.92112	.90021	7.3		3.45 0.001
	M	.92109	.92078	0.1	98.5	0.05 0.963
Both parents live15	U	.03499	.07464	-17.5		-7.81 0.000
	M	.035	.03373	0.6	96.8	0.28 0.782
Unemployed parents	U	.82665	.7091	28.1		13.00 0.000
	M	.8266	.82437	0.5	98.1	0.23 0.816
Uneducated parent	U	.11069	.08998	6.9		3.40 0.001
	M	.1104	.10722	1.1	84.6	0.40 0.686
Gauteng	U	.05375	.04939	2		0.96 0.337
	M	.05377	.05377	0	100	-0.00 1.000
Northwest	U	.0334	.03743	-2.2		-1.04 0.299
	M	.03341	.03182	0.9	60.6	0.35 0.723
Western Cape	U	.03849	.0504	-5.8		-2.71 0.007
	M	.0385	.03977	-0.6	89.3	-0.26 0.795
Mpumalanga	U	.04771	.03653	5.6		2.77 0.006
	M	.04741	.049	-0.8	85.8	-0.29 0.768
Free state	U	.0388	.04352	-2.4		-1.13 0.259
	M	.03882	.04168	-1.4	39.3	-0.58 0.564
Eastern Cape	U	.01018	.01297	-2.6		-1.22 0.222
	M	.01018	.007	3	-14.1	1.37 0.172

KZN	U	10.01	10.002	0.8		0.41 0.684
	M	10.009	10.014	-0.4	47.1	-0.18 0.859
Northern Cape	U	.06234	.06156	0.3		0.16 0.876
	M	.06236	.06363	-0.5	-63.5	-0.21 0.836

Table A5: Results for test of endogeneity of treatment variable (Early motherhood)

	Educational outcome	Economic wellbeing	Psychological well being	Life Satisfaction	Body Mass Index	Health outcome
Chi2(2)	47.10	43.62	11.60	5.92	6.79	1.54
Prob>chi2	0.0580	0.061	0.0527	0.0700	0.049	0.0012