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Adolescent parenthood associated with adverse socioeconomic outcomes at age 30 years in women and men of the Pelotas, Brazil: 1982 Birth Cohort Study.

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ABSTRACT

Objective To investigate the potential long-term effects of adolescent parenthood on completed education and income.

Design Population-based birth cohort study.

Setting All live births in 1982, whose mothers lived in the urban area from Pelotas, southern Brazil.

Sample A total of 3,701 participants; 1914 women and 1787 men at age 30 years.

Methods Questionnaires were completed by the mothers in early phases of this study and by the cohort members in adolescence and adulthood. Linear regression models and g-computation were used in the analyses.

Main outcome measures Educational attainment and income at age 30 years.

Results In women, adolescent parenthood was associated with lower attained education, by -2.8 years (95%CI -3.2 to -2.3) if first birth was at ages 16 to 19, and by -4.4 years (-5.5 to -3.3) at ages 11 to 15 years, compared to women without adolescent maternity. These effects were greater among women who had three or more children. Women with adolescent parenthood also had 49% or 33% lower

income at age 30 if their first child was born when aged 16 to 19 or 11 to 15, respectively. In men, the negative effect of adolescent parenthood on education appeared to be mediated by higher number of children, and there was no effect of adolescent paternity on income at age 30 years.

Conclusion These findings suggest lasting socioeconomic disadvantages of adolescent parenthood with larger effects apparent in women than in men.

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Key words Adolescent, parents, education, income, and cohort studies.

Tweetable abstract Adolescent parenthood has an adverse effect on educational attainment later in life, and on household income among women.

INTRODUCTION

Birth rates among adolescents have declined worldwide since 1990. However, maternal mortality among women who had a child between 15 and 19 years of age is double that of mothers over 20 years of age, and is five times higher in mothers under 15 years of age. In addition, mortality and low birth weight are higher among the offspring of adolescent mothers¹.

About 11% of all births worldwide are by adolescent mothers¹. In Brazil, this proportion is 18%, in spite of a decrease of 17% (114,761 fewer births) in 2015 compared to 2014².

The strong association between low childhood socioeconomic position and adolescent maternity has been well documented^{3,4}, including findings from the 1982 Pelotas Birth Cohort⁵. Low socioeconomic position might contribute to adverse effects of adolescent pregnancy on offspring health⁶, and also to the association between young maternal age with lower offspring education, which was reported by a collaborative study with pooled data from five cohorts from low- and middle-income countries⁷.

The long-term socioeconomic consequences of adolescent parenthood on the parents have been reported in cohorts from high-income countries⁸⁻¹¹. The results have consistently shown that adolescent mothers are disadvantaged compared with other women, taking into account at least one of the following outcomes: educational attainment, employment opportunity, labour market experience, wage or income. By contrast, in men the effects of early paternity on education, employment and income are inconsistent¹¹⁻¹⁴.

These associations have been less investigated in low- and middle-income countries. In longitudinal studies conducted in South Africa, adolescent parenthood is clearly associated with poorer educational outcomes in early adulthood¹⁵⁻¹⁷. The evidence from Latin-American countries are mainly from cross-sectional studies in women¹⁸⁻²³ while to our knowledge, in this setting no study has examined the potential socioeconomic consequences of adolescent paternity.

Independent of the effect of lower socioeconomic position on the early maternal age at first birth, we hypothesised that adolescent parenthood has adverse effects on attained education and income at age 30 years.

METHODS

Study design and participants

Adolescent parenthood was investigated among women and men who were on average at age 30 years and who belonged to a birth cohort that initiated in 1982. During this year, all hospitals in Pelotas, a city in Southern Brazil, were visited daily and women who gave birth were approached for interview. All 5,914 live births representing 99.2% of all births, whose mothers lived in the urban area from Pelotas were included in a birth cohort study. This cohort was followed several times and the last follow up was carried out in 2012-13 when the members were aged 30 years. Further details of the 1982 Pelotas Birth Cohort are described elsewhere²⁴⁻²⁶. The Ethical Committee of the Federal University of Pelotas approved the study protocol. Verbal informed consent was obtained in the early

phases of the study, and written consent was obtained in the more recent waves. The Wellcome Trust supported these recent waves and a researcher grant came from the Brazilian Coordination of Improvement of Higher Education Personnel (CAPES). As a population-based observational study patients were not involved and a relevant core outcome set was not identified.

Variables

Age at birth of each cohort member's first child was recalled using a standard questionnaire for all women and men belonged to the 1982 birth cohort who attended a research clinic at age 30 years. Additionally, it was assessed at age 23 in all members, and at age 19 in all women, as part of a study of childbearing in adolescence⁵. Here, data on age at first birth were aggregated giving priority to positive responses from the earlier waves of data collection. Adolescent parenthood was defined as having a first live born child before age 20¹, and the age at first birth was stratified as 11 to 15 or 16 to 19 years.

The outcomes considered here were collected at age 30 years. Years of formal education successfully completed were recalled by questionnaire. Household income was calculated as the sum of the reported monthly incomes of all working persons who lived at the same household of the cohort member, including own income. The amount earned in the previous month was collected in *Real* (R\$); one *Real* corresponded to approximately US\$2, in 2012.

Pre-adolescent socioeconomic variables, collected in previous waves of this cohort study, were considered as potential confounders. The interviewer rated maternal skin colour in the perinatal study and participant's skin colour was self-reported in the follow up at age 23 years according to the categories proposed by the Brazilian Institute of Geography and Statistics. Skin colour used here aggregates both sources of information. "Black" (*preto*) and "mixed" (*pardo*) responses were re-categorised here as "black or mixed". Data on Asian and Indian individuals were excluded from this analysis, as they comprised only 3% of the sample at age 30 years. Household income in 1982 was collected in multiples of the minimum wage in five categories (<1.1; 1.1–3; 3.1–6; 6.1–10; >10) and

the corresponding proportions of the sample in each category were 21.9%; 47.4%; 18.5%; 6.5% and 5.7%, respectively. As information on income as a continuous variable was not collected in 1982, a principal components analysis was carried out using four variables—delivery payment mode (out-of-pocket, public free or private health insurance) and mother's education, height and skin colour, all of which were strongly related to socioeconomic position. The first component was used to derive a score that was then used to rank individuals who were classified into tertiles of household groups²⁷.

Own parents' education was defined as the highest grade of education successfully completed, based on paternal education measured in 1984, and maternal education measured (twice) in 1982 and 1984 waves. Household assets index in childhood was based on the ownership of household goods and estimated using factor analysis.

Additional potential confounders measured in the perinatal follow-up of the cohort were: own mother's age; maternal body mass index (pre-pregnancy weight was based on information from antenatal care records or—when not available—by recall and height was measured by the research team) expressed as weight in kilograms divided by height in square meters – kg/m^2); participant's gestational age at birth (in full weeks, based on the date of the last menstrual period); own mother's smoking during pregnancy (at least one cigarette a day in any part of pregnancy); own type of delivery (vaginal or caesarean delivery), and own birthweight in grams (measured using calibrated paediatric scales). Duration of own breastfeeding was obtained in 1984 and 1986. As exclusive breastfeeding was rare, information on age at introduction of other foods was also used. We also considered as potential confounders, own duration of predominant breastfeeding in months, own age when introduced water or teas, or breastmilk, and age at menarche, which was collected in 1997 and 2001 for sub-samples, and in 2004-05 for all. We used the information obtained, in the following order, at ages 15, 19 or 23 years, when the first was not available. For cohort members who had a child, we calculated 'number of children' as all live births for each woman or man, before age 30 years.

Statistical analysis

Descriptive data were summarized as proportions or means, and their respective confidence intervals, according to age at parenthood. Unadjusted trends and between-group differences were tested by linear trend Chi Square and ANOVA. The effects of adolescent parenthood on outcomes at age 30 years were estimated through linear regression in a) crude models; b) models including possible pre-adolescent confounders (skin colour; household income in 1982; maternal education in 1982 and 1984; own father's education; own childhood asset index; own mother's age; own mother's pre-pregnancy BMI; own mother's smoking; own gestational age; own type of delivery; own birthweight; own breastfeeding and age at menarche in women); c) additionally, number of children at age 30 years, considered as a potential mediator. The potential modifying role of the number of children was also tested for the outcomes by introducing an interaction term.

To estimate the direct and indirect effects of the main exposure on the outcomes we used G-computation²⁸. The natural direct effect (NDE) represents the effect of the age at first birth on the outcome that is not captured by the mediator, whilst the natural indirect effect (NIE) considers the effect captured by the mediator, number of children. Considering the sum of NDE and NIE would be the total effect; the division of NIE by the total effect represents the percentage of the effect that is captured by the mediator. In these analyses, socioeconomic and biological variables collected during infancy and childhood were considered base confounders, and those collected at age 23 years were post confounders.

As income was not normally distributed, log-transformed variables were included in the linear regression models. The resulting beta values represent symmetric percentage differences in the adolescent parenthood groups compared to those without adolescent parenthood²⁹.

RESULTS

3,701 members of the 1982 Pelotas Birth Cohort were interviewed in 2012-13, representing a follow-up rate of 68.1% (including 325 cohort members known to have died). Women were more likely than men to have a child: 64% of women and 50% of men were parents at age 30 years. These differences are even greater for adolescent parenthood (before age 20), which were reported by one in four women compared to fewer than one in ten men. Although the follow up rate in 2012-13 was slightly higher in women than men²⁶, there was no difference in the frequency of adolescent parenthood for women and men (respectively 27.7% and 9.9% in 2012-13) when comparing the current sample to those interviewed at age 23 years (28.4% for women and 10.9% for men in 2004-05; p-values 0.49 and 0.10, respectively).

Age at first parenthood

Inverse associations were observed between age at first parenthood and all pre-adolescent socioeconomic variables, and adolescent parenthood was more frequent among black or mixed subjects and in those from families in lower socioeconomic position (Supplementary Tables 1 and 2). Adolescent parenthood was also more frequent among women and men who were themselves born of an adolescent mother.

Educational attainment, household income and own income at age 30 years are summarised by age at first parenthood in Table 1. There was missing information for outcomes at age 30 years, mainly for household income with 6.6% missing among women and 5.3% for men. Income variables did not follow a normal distribution and 686 (18.7%) cohort members did not have any own income.

Therefore household income was considered to be the co-primary outcome, alongside years of education. Highest mean values of both outcomes were observed among cohort members without children at age 30 years; the lowest values were observed among members who had been adolescent parents. There were strong positive associations of age at first parenthood with years of education and household income (Table 1). For participant's own income, a relationship with age at first birth was observed in women but not in men.

Adolescent parenthood and educational attainment

In women, the association between adolescent parenthood and education remained after adjusting for potential confounders (skin colour; own parents' income in 1982; own mother's education in 1982 and 1984; own father's education; own parents' asset index; own mother's age; own mother's pre-pregnancy BMI; own mother's smoking; own gestational age; own type of delivery; own birthweight; own breastfeeding and own age at menarche). Mothers with adolescent parenthood at ages 11 to 15 had on average 4.4 (95%CI: -5.5 to -3.3) years less education compared to women who have not experienced adolescent parenthood. In addition, women who were 16 to 19 years at first birth had on average 2.8 years (95%CI: -3.2 to -2.3) less education (Table 2). A significant interaction was observed between age at first birth and number of children ($p=0.04$). The detrimental effect of having three or more children on attained education at age 30 years was greater among those women who reported adolescent parenthood (Figure 1).

Among men, adverse effects of adolescent parenthood on education were also found, but these were smaller than those found in women (Table 2). Fathers had on average 2.4 (95%CI: -5.0 to -0.2) or 1.3 (95%CI: -2.0 to -0.6) years less education, respectively, if they had their first child at age 11 to 15 or 16 to 19, compared to men without adolescent parenthood. There was no interaction with number of children ($p=0.86$).

Adolescent parenthood and income

In adjusted models, women who had a child at ages 11 to 15 or 16 to 19 had 49% or 33%, respectively, lower income compared to those without adolescent parenthood. Similar findings were seen for participant's own income (Supplementary Table 3). By contrast, in men, a modest crude negative effect of adolescent parenthood on the household income was attenuated on adjustment for potential confounders (Table 2).

Number of children as mediator

Direct and indirect effects of adolescent parenthood on education and income, considering the number of children at age 30 years as a mediator are presented in the Table 3. Number of children explained 57% of the estimated effect of adolescent parenthood on educational attainment among women and 44% among men. Number of children also explained 38% of the association between adolescent parenthood and income among women.

DISCUSSION

Main findings

The findings here indicate likely negative effects of adolescent parenthood on education later in life in a prospective cohort followed since birth in a Southern city from Brazil. Whilst the negative effect of adolescent parenthood on household income was also observed among women, we found no effect of adolescent paternity on income at age 30 years and the apparent adverse impact of adolescent parenthood on education was smaller in men than in women. In addition, the number of children modified the effect of age at birth of the first child on education at age 30 years, among women.

Strengths and Limitations

To our knowledge, this is the first cohort study from a Latin American country that addressed the effects of adolescent parenthood on socioeconomic variables later in life. In addition, early paternity was not considered in studies conducted in these countries. However, some limitations must be considered. Although socioeconomic background, biological characteristics from the children and their mothers, including maternal age when the cohort member was born, were considered as important confounders, some unmeasured variables during infancy or childhood as intelligence quotient, for instance, may have been relevant and residual confounding should not be excluded. Besides the number of children, the impact of other potential mediators such as social and familiar support was not considered in this analysis. Information about miscarriage or abortion were

unavailable from this cohort and there was not enough data to compare sisters who had or had not a child during adolescence in order to perform within-family analyses. However, early childbearing may also have important negative consequences on the other family members that could not be adequately addressed in studies including this comparison group. In addition, studies comparing women who had a child during adolescence with those who had a miscarriage or abortion, when conducted in countries where abortion is illegal, as in Brazil, may result in overestimated negative effects of bearing a child, taking into account that adolescents who had an abortion are likely to come from more favoured backgrounds.

Taking into account the well-established associations of low socioeconomic position, maternal age at the participant's birth, and age at menarche with adolescent parenthood, our analyses were controlled for socioeconomic background and biological characteristics measured prospectively in this birth cohort study. In addition, we hypothesised that there would be a possible interaction between the effect of adolescent parenthood and the number of children. This last variable may be considered as a possible mechanism to explain the effects of adolescent parenthood on human capital later in life, but has not always been considered in the previous studies. Among women, we found an interaction between adolescent parenthood and number of children and the effects on socioeconomic position were mediated for number of children, however this variable has not been considered as mediator in previous studies, even those showing that adolescent mothers and fathers had more children compared to those who were later parents⁹.

Interpretation

Our findings are consistent with evidence from cohort studies from high-income countries^{9-11, 13}. Men and women who graduated from Wisconsin high schools in 1957 were followed up to age 50 years and adolescents who were parents completed less education and had less prestigious jobs compared to other participants, in analyses adjusted for parents socioeconomic status and respondent's intelligence quotient⁹.

The disadvantages of early paternity on socioeconomic outcomes later in life have been shown in most cohort studies in which adolescent paternity has been studied^{8, 9, 12-14, 30}, except in one from a socially disadvantaged community in Chicago¹¹.

In Latin America, the potential impact of adolescent motherhood on socioeconomic outcomes later in life has been investigated previously in cross-sectional but not prospective studies^{18, 20-23}. A cross-sectional survey conducted in Mexico²¹, including adults aged between 25 and 64 years old, reported negative effects of adolescent maternity on education in both short-term and long-term analysis models, and on household income, which is consistent with our findings. However, inference regarding causal effects of adolescent parenting needs to consider the strong possibility of potential confounding by factors that make adolescents susceptible to early sexual behaviours and pregnancy. Another cross-sectional study, also conducted in Mexico, therefore chose as the comparator group women who reported an adolescent miscarriage and found a converse positive effect of adolescent maternity on education, employment and income²⁰.

The impact of very early maternity (adolescents who had a child between ages 13 and 15 years old) on socioeconomic outcomes was also studied in Chile through a propensity score matching methodology comparing women aged 24 years who were similar along several characteristics, except on their adolescent mother status. Whilst a stronger negative effect was also observed on education, the impact on own income by age 24 years found in Chilean women living in non-poor households was not different whether maternity occurs in early or later adolescence²³. By contrast to those approaches, our study design allowed for prospective measurement of detailed information on pre-adolescent socio-demographic factors, which were controlled for in the analysis models.

CONCLUSION

Our results, in a middle-income setting, contribute to the evidence on the adverse consequences of adolescent parenthood on the socioeconomic outcomes later in life, mainly on educational attainment and with larger effects in women than in men. Consequently, these findings have social and economic

implications throughout adulthood and for the next generations. Beyond the impact on intergenerational inequities, these findings have important policy implications. In Brazil, there was an expansion of the number of schools, between 1996 and 2009, besides declining teenage childbearing³¹. The national conditional cash transfer program increased school attendance among teenagers, mainly from rural areas³² and decreased fertility rates among eligible girls from urban areas, within five years of program implementation³³. Programs should be a priority in public policies to prevent teenage pregnancy among adolescents or to support young mothers in order to achieving better education, employment and economic opportunities throughout their life and for the next generation. Data from US National Longitudinal Survey of Youth suggest that women completed their education after the transition to maternity and mothers who pursued schooling were more disadvantaged, more often poor, younger and had greater job instability but higher cognitive test scores³⁴. As a marker of social and economic disadvantage, childbearing in adolescence can be a cause of further disadvantage and health problems. Public policies to avoid adolescent pregnancies or to support young mothers to achieve better education, employment and economic opportunities should have both health and socioeconomic benefits.

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DISCLOSURE OF INTERESTS

There is no conflict of interest. Completed disclosure of interest forms are available to view online as supporting information.

CONTRIBUTION TO AUTHORSHIP

Conceptualization and design of the work DPG BLH FCB KKO; acquisition of data for the work DPG GVAF NPL JVSM HG BLH FCB; analysis and interpretation DPG GVAF ELR BLH KKO; writing, revising and editing DPG KKO; all authors approved the version to be published.

DETAILS OF ETHICS APPROVAL

The Ethical Committee of the Medicine Faculty from Federal University of Pelotas approved the study protocol under the number 16/12 on 8th March 2012. Verbal informed consent was obtained in the early phases of the study, and written consent was obtained in the more recent waves.

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Figure 1. Adjusted means of education according to age at birth of the first child and number of children among women.

Table 1. Means and confidence interval (95% CI) of educational attainment and income at age 30 years according to age at maternity and paternity. Pelotas, Brazil, 1982 to 2012.

Age at birth of first child (years)	Education (years) Mean (95%CI)	Income (R\$ ¹)	
		Household Mean (95%CI)	Own Mean (95%CI)
Women	<i>n=1853; p<0.001</i>	<i>n=1759; p<0.001</i>	<i>n=1367; p<0.001</i>
11 to 15	7.4 (6.5 to 8.4)	1456 (1165 to 1747)	540 (416 to 664)
16 to 19	9.0 (8.7 to 9.4)	2099 (1843 to 2355)	643 (549 to 737)
20 to 30	11.4 (11.2 to 11.7)	2891 (2599 to 3184)	917 (794 to 1041)
No child	14.3 (14.0 to 14.5)	4345 (4012 to 4677)	1725 (1564 to 1887)
Men	<i>n=1752; p<0.001</i>	<i>n=1694; p<0.001</i>	<i>n=1592; p=0.52</i>
11 to 15	7.8 (6.3 to 9.3)	2805 (1687 to 3924)	2221 (1169 to 3273)
16 to 19	8.8 (8.3 to 9.3)	2706 (2357 to 3056)	1752 (1473 to 2031)
20 to 30	10.0 (9.8 to 10.3)	3288 (2957 to 3620)	2100 (1885 to 2314)
No child	12.0 (11.7 to 12.3)	4073 (3711 to 4435)	2101 (1904 to 2297)

1: R\$ - Real (corresponded to approximately US\$2, in 2012); monthly income

Table 2. Estimated effect of adolescent parenthood on educational attainment and income at age 30 years. Pelotas, Brazil, 1982 to 2012.

Age at birth of first child in adolescence (years)	Education (years)		Income (R\$)	
	Crude	Adjusted ¹	Crude	Adjusted ¹
Women	n=1853	n=1059	n=1759	n=1014
11 to 15	-5.42 (-6.30 to -4.53)	-4.44 (-5.53 to -3.34)	-0.77 (-0.99 to -0.56)	-0.49 (-0.79 to -0.20)
16 to 19	-3.85 (-4.27 to -3.44)	-2.75 (-3.23 to -2.27)	-0.52 (-0.61 to -0.42)	-0.33 (-0.46 to -0.21)
<i>p value</i>	<0.001	<0.001	<0.001	<0.001
<i>R</i> ²	0.19	0.40	0.07	0.24
Men	n=1752	n=1074	n=1694	n=1041
11 to 15	-3.34 (-5.92 to -0.76)	-2.39 (-5.00 to 0.21)	-0.02 (-0.56 to 0.51)	0.35 (-0.26 to 0.97)
16 to 19	-2.37 (-3.00 to -1.73)	-1.29 (-2.01 to -0.56)	-0.17 (-0.31 to 0.04)	0.02 (-0.15 to 0.19)
<i>p value</i>	<0.001	<0.001	0.04	0.52
<i>R</i> ²	0.03	0.33	0.00	0.20

*Reference group: women or men who had child at ages 20 to 30 years or with no child

¹: adjusted for skin colour; household income in 1982; maternal schooling in 1982 and 1984; paternal schooling; asset index; maternal age; prepregnancy BMI; maternal smoking; gestational age; type of delivery; birthweight; breastfeeding and menarche (for women).

Table 3. Estimated direct and indirect effects of adolescent parenthood on educational attainment and income at age 30 years mediated through number of children. Pelotas, Southern Brazil, 1982 to 2012.

Effect of adolescent parenthood	Total effect (95%CI)	Direct effect (95%CI)	*Indirect effect (95%CI)
Education			
Women	-2.26 (-2.73 to -1.79)	-0.98 (-1.46 to -0.50)	-1.28 (-1.65 to -0.90)
Men	-0.26 (-0.38 to -0.13)	-0.16 (-0.30 to -0.03)	-0.10 (-0.18 to -0.01)
Income			
Women	-1.23 (-1.81 to -0.66)	-0.69 (-1.29 to -0.10)	-0.54 (-0.95 to -0.13)
Men	0.10 (-0.04 to 0.24)	0.12 (-0.03 to 0.27)	-0.02 (-0.11 to 0.07)

*Mediated by number of children

