Social Sciences & Humanities Open 11 (2025) 101311

Contents lists available at ScienceDirect

Social Sciences & Humanities Open

journal homepage: www.sciencedirect.com/journal/social-sciences-and-humanities-open

Regular Article

Does free secondary education mitigate the impact of teen births on educational outcomes? Evidence from Ghana

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ARTICLE INFO

Keywords:
Teen childbirth
Educational attainment
Instrumental variable
Ghana
Free secondary education
Sub-saharan Africa

ABSTRACT

Teenage pregnancy and early childbirth have potential implications for human capital development that can transcend the teen mothers to their children. Using data from the latest demographic and health survey data from Ghana, this study set out to understand how teen births affect the educational attainment of the mother, and how a policy that reduces the financial cost of senior high school education could moderate this effect. We used instrumental variables to account for endogeneity of teen births. Our results show that teen birth has a negative impact on the educational attainment of the mother. Furthermore, a program that reduced the financial cost of senior secondary education helped attenuate this negative impact for girls in urban areas but had no such effect for girls in rural areas. Our findings emphasize the need to intensify efforts to provide support systems for teen mothers that will enable their reintegration into school after childbirth. They also point out the importance of targeting such interventions to ensure that they address groups of people with peculiar challenges including relatively poor infrastructure, economic conditions and cultural practices/beliefs that facilitate risky sexual behavior.

1. Introduction

Teenage pregnancy continues to pose major challenges to public health, especially across developing regions. It is estimated that as of 2019, about twenty-one million girls aged between 15 and 19 become pregnant annually in developing regions. Of these, it is estimated that about twelve million end up giving birth. (WHO and UNICEF, 2023).

Worldwide, adolescent birth rate (ABR)[1] has significantly declined over the past two decades, falling from 64.5 births per 1000 adolescent girls in 2000 to 41.3 births per 1000 adolescent girls in 2023 (WHO, 2023). Despite this observed progress, wide disparities exist between regions around the world. For instance, sub-Saharan Africa, with the highest rate globally, has an ABR of 97.9 births per 1000 - more than twice the global average, while the European region has a rate of 13.1 per 1000 (less than half the global average) (WHO, 2023).

Several factors have been identified to explain the high rates of teenage pregnancy across developing countries. Available evidence suggests that girls initiate sexual activity at a much younger age (Kassahun, 2019; Kyei-Arthur, Agyekum, & Kyei-Gyamfi, 2024). At that stage, there is little knowledge of avoiding unplanned pregnancies and sexually transmitted infections. The temptation to conform to peer pressure also increases the chances of early and unprotected sexual activity (Gyan, 2013; Chandra-Mouli et al., 2014; Gyesaw & Ankomah, 2013).

Teenage pregnancy and early childbirth have potential implications for human capital development that can transcend the young mothers to their children. This is evident in the high rate of school dropouts that result from teenage pregnancy and childbirth (Groves et al., 2022; Sobngwi-Tambekou et al., 2022). The high rate of dropout by teenage mothers suggests they are less likely to participate in the labor market, and if they do, their productivity may be relatively low. Consequently, teenage mothers who drop out of school stand a higher chance of being unemployed in the future due to their relatively low human capital development. In part, the school dropout of teenage mothers after

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[1] **Abbreviations**: ABR – Adolescent Birth Rate; DHS – Demographic and Health Surveys; FSHS – Free Senior High School; GDHS – Ghana Demographic and Health Surveys; GES – Ghana Education Service; GSS – Ghana Statistical Service; SHS – Senior High School.

https://doi.org/10.1016/j.ssaho.2025.101311
Received 11 November 2024; Received in revised form 15 January 2025; Accepted 20 January 2025
Available online 24 January 2025

pregnancy or childbirth is attributable to stigma they face in their communities and schools (Neal et al., 2020; Yakubu & Salisu, 2018).

In Ghana, the ABR among girls aged 15–19 years was estimated to be 64 births per 1000 in 2021 (World Bank, 2024). While this is lower than the African average, it is still much higher than the global average. The 2022 Ghana Demographic and Health Survey (DHS) reports that pregnancy rate in girls aged 15 to 19 ranges from 6% to 8% in the Greater Accra and Ashanti regions respectively, to 24% and 26% in the North East and Savannah regions respectively. In terms of locality, 8% of girls (aged 15 to 19) living in urban areas and 14% of those living in rural areas had ever had a live birth. Given the potentially negative health and human capital implications of adolescent births, the government of Ghana has over the years developed policy frameworks towards curbing this phenomenon. For instance, in collaboration with the Ministry of Health and the United Nations Population Fund (UNFPA), Ghana's Ministry of Gender, Children, and Social Protection developed a five-year (2018–2022) strategic plan to address adolescent pregnancy in Ghana.[2] The Ghana Education Service (GES) also developed a set of guidelines aimed at preventing pregnancy among schoolgirls and facilitating re-entry for those who do get pregnant (Ghana Education Service, 2018). The documents and programs recognize both the potential of education to improve the future economic and social outcomes of adolescents and young girls in particular, and the adverse effect that early pregnancy can have on this potential.

The Free Senior High School (FSHS) policy was introduced in Ghana in 2017 with the aim of removing financial barriers and ensuring equity in the access of quality secondary education.[3] While the policy was not targeted specifically at promoting the education of adolescent mothers, the reduction of financial constraints can help adolescent mothers continue their education. Indeed, studies have shown that financial constraints associated with childbirth can contribute to school dropout among adolescent mothers (particularly those from low-income households), and that providing financial assistance to them can facilitate their re-entry into school (Baird et al., 2010; Barham et al., 2024). A recent study by Stenzel et al. (2024) focusing on schoolgirls in Ghana shows that the senior high school completion rate was higher among schoolgirls in districts where uptake of the FSHS policy was higher. Overall, for both boys and girls, completion rate was also higher in higher uptake districts.

In this study, we set out to understand the implications of teenage birth on the future educational attainment of the mother. A common problem in empirically estimating this relationship is the problem of endogeneity of teen birth. We address this issue by instrumenting for teen birth using variables that capture both a physiological characteristic and the environmental conditions that can influence teen births. Furthermore, we look into whether the FSHS policy moderates the impact of teen births on the educational attainment of young mothers. We then unpack the potential geographical differences in our objective by disaggregating our analysis for urban and rural localities where education access and exposure to teenage pregnancy vary significantly.

The remaining sections of the paper are organized as follows. Section two presents a review of the literature. In section three, we present the methods used in the analysis while the results and discussions are presented in section four. Section five presents the summary and conclusion of the paper.

2. Literature review

The focus of the current study is inspired by the human capital theory attributed to Becker (1964). In this theory, human capital is defined as knowledge, skill and related attributes that affect human capabilities to do productive work (Becker, 1964; Schultz, 1984). Contrary to the view that economic differences between countries and among people is associated with variations in physical capital, Becker (1964) explains that the differences are in the variations in the level of human capital. Investment in human capital may take the form of medical care, schooling, on-the-job training, and obtaining information about the economic system such that the physical and mental capabilities of people are improved, thereby raising the prospect of real income.

The theory emphasizes the relevance of education attainment to the wellbeing of an individual and community at large. This underscores the importance of the theory to the current study. Individuals with higher educational attainments are more likely to have better human capital that would improve economic outcomes. This implies that a teenage girl who drops out of school due to pregnancy or teen birth may have lower chances of improving their human capital and ultimately, their economic outcomes. For individuals from poor households, a girl's inability to complete education because of early childbirth may have an impoverishing effect, further perpetuating poverty cycle in the household.

Over the years there has been a growing interest in the empirical literature to understand the determinants and implications of teenage birth. In the United States, Klepinger et al. (1999), using an instrumental variable technique, did not find sufficient evidence to accept the hypothesis that teenage pregnancy had a negative impact on educational attainments. Contrary evidence was provided by Schulkind and Sandler (2019) who showed that in the United States of America, teen girls whose high school education was interrupted by pregnancy have considerably lower educational attainment. However, the early childbirth does not have any effect on their chance of working, their future earnings or the total income of their families. Ardington et al. (2014) showed that in rural South Africa, women who had their first birth in their teen years, were less likely to complete high school compared to women who had their first childbirth after their teenage years. The authors also showed that teen birth was associated with higher risk of mortality.

In Ghana, there have also been studies that used qualitative techniques to answer similar research questions. These studies largely used responses from interviews on the impact of teen birth on future economic outcomes. Gyan (2013) conducted a qualitative study on the causes of teenage childbearing and its effect on the educational attainment of the girl child at Chorkor, a district of Accra, Ghana. The study identified school dropout as a determinant and consequence of teenage birth. The study revealed that over 80% of interviewed girls dropped out of school due to pregnancy related issues. Biney and Nyarko (2017) assessed the relationship between adolescent births using the 2007 Ghana Maternal Health Survey. Using ANOVA and multivariate regressions, the authors found that adolescent births were associated with lower years of schooling. In a study conducted in the Volta region of Ghana, Morgan et al. (2022) also found that 79% of teenage mothers had dropped out of school.

Two important issues emerge from the literature that justifies the need for the current study and hence its contribution to the literature. First, while the burden of teen birth is largest in sub-Saharan Africa, studies that investigate its impact and related pathways in the region are rather scant. Secondly, for the few studies that exist on Sub-Saharan Africa, the focus has been on qualitative techniques. Our study therefore stands out in the way we attempt to correct for potential endogeneity problems. This allows us to report robust estimates purged from endogeneity biases. We also disaggregate the analysis to identify various impact dynamics across geographical (rural/urban) locations in Ghana. We also assess how a national universal education policy (FSHS) could potentially mitigate the impact of teen birth on education outcomes through facilitating entry or re-entry into school for teen mothers.

3. Methodology

Our empirical model is based on previous theoretical model pro-

[2] https://ghana.unfpa.org/en/publications/five-year-strategic-plan-address-adolescent-pregnancy-ghana-2018-2022.

[3] https://freeshs.gov.gh/.

posed by Klepinger et al. (1999). The framework contrasts human capital investment decisions for women who had their first child in their teen age and those who did not have children in their teen age. Against this backdrop, we examined the impact of teenage childbearing on the mother's educational outcome by estimating the following equation

$$y_i = \alpha + \beta_1 Teenbirth + \beta_2 Residence + \beta_3 Wealth\ status + \gamma_i X_{iH} + \varepsilon_i \quad (1)$$

where y_{ij} is maternal educational outcome, *Teenbirth* is a dummy variable that equals one if the woman had a teenage birth and zero otherwise, *Residence* captures whether the woman lives in a rural or urban area, and *Wealth status* indicates the economic status of the woman's household. *X* is a vector of other household and location characteristics (region of residence, ethnicity, sex of household head).

To estimate how the FSHS policy mediates the impact of teen birth on the mother's education, we estimate the following model

$$y_{ij} = \alpha + \beta_1 Teenbirth + \beta_2 FSHS + \beta_3 Teebirth \times FSHS + \beta_4 Residence + \beta_5 Wealth\ status + \gamma_i X_{iH} + \varepsilon_{ij} \quad (2)$$

The primary parameter of interest in equation (2) is β_3. It captures the impact of teen birth on the educational outcomes of mothers who were exposed to the FSHS. If this parameter is not different from zero, then the impact of teen birth on educational outcomes is the same for both beneficiaries and non-beneficiaries. However, if it is positive and β_1 (the impact of teen birth) is negative, then the policy attenuates the impact of teen birth, and the overall impact of teen birth is given by $\beta_1 + \beta_3$.

3.1. Identification and estimation strategy

A potential threat to the validity of the estimates from equation (1) is the problem of endogeneity. The decision to have a child during a girl's teenage years may depend on several factors that could be peculiar to the girl. These factors may range from observables such as the socio-economic situation of the household or community to unobservable factors such as the girl's ambitions or motivation to delay childbirth. Where the factors are observable, they can be included in the model to capture their effects. The challenge arises where these factors are not observable. This means that there could be potential correlation with the error term, and this can bias our estimates from the OLS regression. Another possible source of endogeneity is the problem of reverse causality. This occurs where the dependent variable (education outcome) has a feedback effect on the key explanatory variable (teen birth). However, in this study, we do not envisage the latter source of endogeneity. This is because of the time lag in the two variables. While teen birth may influence future education outcomes, we cannot expect future education outcomes to influence teen birth. Against this backdrop, we rule out this source of endogeneity in the current study.

To address the challenge of endogeneity, we used two instrumental variables (IVs). Ideally, the IVs should be variables that are correlated with teen birth but only correlated with maternal education through teen birth. The first instrument we use is age at menarche, following Ribar (1994). We created a dummy variable that assigns a value of one to all women who had their first menstrual period before the median age at menarche, and zero otherwise. The intuition is that age at menarche is a predictor of the timing of fecundity and socio-sexual behavior (Presser, 1978; Ribar, 1994). Therefore, among sexually active girls, those with earlier age at menarche may be more likely to be pregnant and give birth in their teenage years. We also did not envisage any direct relationship with a woman's future education outcomes except through teenage pregnancy and birth. Indeed, the age at menarche is a natural occurrence and is therefore largely exogenous. The second instrument is the proportion of teen births in a cluster. This is the mean of the teen birth dummy variable for that cluster. A number of African studies such as Were (2007) and Mkhwanazi (2010) highlight the fact that social norms and pressures can predispose girls to teenage pregnancy. This instrumental variable therefore captures the predisposition to teenage pregnancy as a result of the girl's social environment. While the IVs are intuitively appealing, we further test the strength and validity of the instrument using various statistical techniques. Specifically, we use the Kleibergen-Paap rk Lagrange Multiplier test for underidentification, which accounts for heteroscedasticity, the Kleibergen-Paap rk F test for weak identification, and the Hansen J statistic to test for overidentification.

The null hypothesis of the Sargan-Hansen test of overidentifying restrictions is that the instruments are valid, that is, they are uncorrelated with the error term. Underidentification tests are conducted to determine whether the instruments provide sufficient information to identify the endogenous variable. If there is underidentification, the model cannot be estimated. The null hypothesis of the Kleibergen-Paap rk Lagrange Multiplier test is that the model is underidentified. We have weak identification when, even though the instruments are valid, they are only weakly correlated with the endogenous regressor. The Kleibergen-Paap rk F test is compared to critical values provided by Stock and Yogo (2005). A high test statistic (relative to the Stock-Yogo critical values) suggests that the instrument is weak.

Taking the above into account, the IV estimation in this study is done using a two-stage process. The first stage estimates the following model:

$$Teenbirth_i = \alpha + \beta_1 Z + \gamma_i X_{iH} + \varepsilon_i \quad (3)$$

Where *Z* is made up of the two instruments (age at menarche and proportion of teen births) and *X* is a vector of other household and location characteristics. In the second stage, the predicted values of *Teenbirth* from (3) are used to estimate models (1) and (2).

3.2. Data and variables

In this paper we use data from the most recent round of the Ghana Demographic and Health Survey (GDHS) conducted in 2022 by the Ghana Statistical Service (GSS). The GDHS, is a nationally representative survey conducted in Ghana within five (5) year intervals starting from 1988. The survey was designed to analyze, gather and publicize information on household characteristics, marriage, fertility, family planning, reproductive health, child health, nutrition, mortality, contraception etc.

In all, 618 clusters were selected for the 2022 GDHS. The sampling frame used was the updated frame prepared by the GSS based on the 2021 Population and Housing Census. In total, 18,450 households were selected for the survey, resulting in 15,014 interviewed women aged 15–49.

For the purpose of this study, a total of 4091 women were sampled. This sample was obtained by first restricting the total sample to women who had ever given birth. In order to assess the impact of the FSHS policy, the sample was further restricted to women who were 30 years or younger at the time of the survey. In the Ghana Youth Survey by Duflo et al. (2021), the minimum baseline age for students about to enter senior high school (SHS) was 13, with 80% being 18 and below, and 91% aged 19 and below. The 2012/2013 SHS Census report from the GSS also surveyed students between 15 and 18 (Ministry of Education, 2013). Based on these statistics, we estimated the average senior high school starting age to vary between 13 and 18 years. Women who fit this criterion (18 years old and below when the policy was introduced) were categorized as those exposed to the policy. These women would be 23 years old or below at the time of the 2022 GDHS.

The women who were not exposed to policy are those who were already too old at the time of the introduction of the policy to have been beneficiaries. To ensure that these women were not too far removed from the policy, we limit the comparison group to those who are above 23 but at most 30 years old at the time of the 2022 GDHS. These women generally would have completed their senior high school studies prior to the implementation of the policy. Restricting it to this age range is

therefore intended to help designate a more relevant comparison group for women who were potential beneficiaries of the FSHS policy (see Table 1).

4. Results

4.1. Summary statistics

Summary statistics for key variables are presented in Table 2. The average number of years of education in the sample is about 8.6 years, with a maximum of 18 years of education, and some women having no education. Also, about 49.7% of the women in the sample reported having their first child in their teenage years. Thus, half of the women aged 30 or less who had ever given birth had their first child as teenagers. Women dwelling in rural areas form a majority of the sample (57.5%). The proportion of women from poor households was 54.8% of the sample, with those from rich households accounting for about 24.7%. About 42% of the women in the sample had their first menses when they were less than 15 years old (15 is the median age at menarche in the sample). Women who were potential beneficiaries of the FSHS policy form 33% of the sample.

4.2. Teen birth and maternal education

Table 3 shows the OLS and IV estimates for the effect of teen birth on maternal education. The OLS estimates are shown in columns (1) and (3), while the IV estimates are shown in columns (2) and (4). The stars on the Kleibergen-Paap rk Lagrange Multiplier test statistic for underidentification indicates that the p-value is less than 0.001, and therefore we reject the null hypothesis of underidentification. The stars on the Kleibergen-Paap rk F weak identification test statistic for underidentification indicates that it is higher than the Stock-Yogo critical values. The Hansen J statistic has no stars, indicating that it has a p-value greater than 0.10, and thus we do not reject the null hypothesis that the instruments are valid. These interpretations apply to subsequent results tables.

The IV estimates for the coefficient of teen birth and that of the interaction term are both higher compared to the OLS estimates. This gives some indication that using the OLS would have underestimated the effect of teen birth on the maternal education outcome. We see from the results that women who had their first child in their teenage years have significantly lower years of education compared to their counterparts who had their first child later, all other things equal. Specifically, we see from the IV regression in column (3) that women who had their first child as teenagers had about 2.4 less years of education compared to those who had their first child later. The positive and statistically significant coefficient on the interaction between teen birth and being exposed to the FSHS policy also offers indication that the policy helps to attenuate the negative impact of teen birth on maternal education. On the average, women who had teen births but were exposed to the FSHS policy had 1.5 (3.175–1.707) years lower education compared to women who had no teen births. However, those who had teen births but were not exposed to the policy had 3.2 years less education, on average, compared to those who had no teen births.

Other important factors associated with educational outcomes of the women in the sample include household wealth, sex of the household head, and the type of residence. Specifically, we find that women from rich and middle-class households tend have more years of education compared to their counterparts from poor households, all else equal. Also, women from male-headed households had lower years of education compared to those from female-headed households, and women from rural households tend to have lower years of education compared to women living in urban areas, all other things equal. We found no statistically significant difference in years of education between Akan women and Ga/Dangme and Ewe women. However, our results showed

Table 1
Variable description.

Variable names	Description
Maternal Education	Education in single years measured as completed years of schooling
Teen birth	Women who had their first birth at age 19 or below were assigned a value of 1 to mean "yes", while women who had their first child after age 19 were given a value of 0 to mean "no" category.
Age at menarche	The age at which a woman had her first menstruation.
Cluster teen birth average	The proportion of women in a cluster who are assigned 1 for the teen birth variable
FSHS exposure	Women who were below 24 years at the time of the survey were considered potential beneficiaries and assigned a value of 1. Those aged 24–30 years were assigned a value of 0.
Wealth	The wealth index is an ordinal variable coded into five groups: poorest, poorer, middle, richer and richest. The study, however, re-classifies this variable into three groups representing poor, middle and rich respectively.
Residence	The variable captures whether the respondent was interviewed in a rural or urban location. 0 represents urban, while 1 represents rural.
Region	Woman's administrative region of residence
Ethnicity	Woman's ethnicity
Sex of household head	Equals 1 if male, 0 if female

Source: Authors

Table 2
Descriptive statistics.

Variable	*N*	Mean	Std. Dev.	Min	Max
Education in single years	4091	8.559	5.143	0	18
Teen birth	4091	0.497	0.500	0	1
FSHS exposure	4091	0.330	0.470	0	1
Age	4091	25.1	3.607	15	30
Early menarche	4091	0.417	0.493	0	1
Cluster teen birth	4091	0.4974	0.2207	0	1
Wealth category					
Poor	4091	0.548	0.498	0	1
Middle	4091	0.205	0.404	0	1
Rich	4091	0.247	0.432	0	1
Ethnicity					
Akan	4091	0.307	0.461	0	1
Ga/Dangme	4091	0.035	0.185	0	1
Ewe	4091	0.088	0.284	0	1
Mole-Dagbani	4091	0.299	0.458	0	1
Gurma	4091	0.123	0.329	0	1
Others	4091	0.147	0.354	0	1
Residence					
Urban	4091	0.425	0.494	0	1
Rural	4091	0.575	0.494	0	1
Region					
Western	4091	0.052	0.223	0	1
Central	4091	0.059	0.236	0	1
Greater Accra	4091	0.044	0.205	0	1
Volta	4091	0.039	0.193	0	1
Eastern	4091	0.050	0.218	0	1
Ashanti	4091	0.066	0.249	0	1
Western North	4091	0.052	0.222	0	1
Ahafo	4091	0.055	0.228	0	1
Bono	4091	0.051	0.219	0	1
Bono East	4091	0.069	0.253	0	1
Oti	4091	0.068	0.252	0	1
Northern	4091	0.088	0.284	0	1
Savannah	4091	0.081	0.273	0	1
North East	4091	0.089	0.285	0	1
Upper East	4091	0.078	0.268	0	1
Upper West	4091	0.059	0.236	0	1

Source: Authors' computation

Table 3
Effect of teen birth on education of teen mothers.

	OLS		IV	
	(1)	(2)	(3)	(4)
Teen birth	−1.516***	−2.166***	−2.361***	−3.175***
	(0.136)	(0.171)	(0.316)	(0.403)
FSHS		0.064		0.125
		(0.228)		(0.442)
Teen birth * FSHS		1.391***		1.707**
		(0.293)		(0.669)
Wealth				
Middle	1.494***	1.573***	1.440***	1.539***
	(0.194)	(0.193)	(0.197)	(0.195)
Rich	3.167***	3.284***	2.985***	3.134***
	(0.204)	(0.204)	(0.212)	(0.210)
Male household head	−0.626***	−0.598***	−0.616***	−0.580***
	(0.146)	(0.145)	(0.146)	(0.146)
Ethnicity				
Ga/Dangme	−0.220	−0.234	−0.265	−0.285
	(0.342)	(0.343)	(0.346)	(0.348)
Ewe	−0.381	−0.352	−0.413	−0.378
	(0.265)	(0.262)	(0.266)	(0.264)
Mole-Dagbani	−1.574***	−1.529***	−1.594***	−1.538***
	(0.240)	(0.239)	(0.239)	(0.239)
Gurma	−2.524***	−2.519***	−2.572***	−2.564***
	(0.311)	(0.308)	(0.313)	(0.309)
Others	−1.336***	−1.267***	−1.353***	−1.265***
	(0.257)	(0.257)	(0.257)	(0.258)
Rural	−0.757***	−0.727***	−0.728***	−0.690***
	(0.161)	(0.160)	(0.161)	(0.160)
Constant	10.257***	10.083***	10.806***	10.582***
	(0.303)	(0.306)	(0.359)	(0.353)
N	4091	4091	4091	4091
R-Squared	0.302	0.312	0.296	0.305
Adjusted R-Squared	0.298	0.308	0.292	0.300
Underidentification			696.843***	388.341***
Weak identification			649.580***	164.909***
Overidentification			0.001	0.794

*p < 0.10, **p < 0.05, ***p < 0.01. All regressions include region dummies. Robust standard errors in parentheses.

that women from the Mole-Dagbani, Gurma, and other northern ethnic groups tend to have lower years of education compared to Akans.

Table 4 shows disaggregated results for teen mothers across types of residence (rural or urban). The disaggregation was necessary as girls face different social and economic conditions across these locations. The results largely reflect the evidence in Table 3 that teen births are associated with lower years of education, and being a potential FSHS beneficiary helps to reduce the negative impact. However, the coefficient of the interaction term is not statistically significant for the rural sample. In the context of this study, this implies that all other things equal, in rural areas, exposure to the FSHS policy makes no difference as far as the educational outcomes of teenage mothers are concerned.

5. Discussion and conclusion

Teen births are a critical issue that has significant implications for the future of young girls, particularly in developing countries. This study set out to understand how teen births affect the educational attainment of the mother using the latest DHS data from Ghana. We further examined whether and how a policy that reduces the financial cost of senior high school education could moderate the effect of teen birth on educational attainment. Finally, we disaggregate our analysis based on location to study how the effect of the policy could depend on respondent's place of residence.

Our findings highlight the negative impact of teen births on educational attainment for girls in Ghana. This corroborates the findings of several studies both in developing countries in Africa and in parts of the developed world (Kane et al., 2013; Kassahun et al., 2019; Sobngwi-Tambekou et al., 2022). Furthermore, it highlights the fact that teenage pregnancy remains an important issue requiring renewed and sustained efforts from policymakers in order to solve. The 2022 GDHS report reveals that 15% of women aged 15–19 years had ever been pregnant, and 11% had had a live birth (GSS and ICF, 2024). This shows the need for further strategic action to protect adolescent girls from early pregnancy and its potentially devastating effects.

We also find that the FSHS policy attenuates the negative impact of teen birth on the educational attainment of mothers. This finding has interesting implications. Generally, it highlights the importance of removing or reducing obstacles to the entry or re-entry of teenage mothers into school. However, it is critical to note that this finding points to the fact that the FSHS policy helps to reduce the financial barrier to entry or re-entry into secondary education for teen mothers but does not eliminate it. Teen mothers, particularly those from less economically endowed homes, may still need to prioritize contributing to household income in order to care for their child (Morgan et al., 2023). A household's economic burden increases with a teen mother and an additional child. Adding the cost of reintegrating the teen mother to school could be a difficult financial decision. In this regard, our findings suggest that the FSHS policy could provide cushion for such households and encourages school reintegration for the mother.

In addition to financial barriers, there are other factors such as social stigma, a lack of child-care facilities and support for the young mothers. Addressing these socioeconomic challenges are therefore crucial for ensuring that teen mothers are still able to pursue and achieve their educational goals and aspirations. The GES's 'Guidelines for Prevention of Pregnancy among School Girls and Facilitation of Re-entry into School after Childbirth' provides a useful framework for addressing the educational challenges of teen mothers. The Guidelines emphasize creating awareness and providing social and psychological support to teen mothers as the primary ways of facilitating re-entry. Between the 2017/2018 and the 2019/2020 academic year, this policy helped 10,869 out of 22,147 pregnant girls (49.1%) in public schools to return to school (Africa Education Watch, 2022). This shows that while the guidelines can be helpful, there remains more to be done. The guidelines still face implementation challenges, including staffing deficits, inadequate funding, and the absence of a policy framework for providing material support for the young mothers (Africa Education Watch, 2022). Ensuring adequate and dedicated budgetary allocation will therefore be crucial going forward.

Our evidence also confirms the need for policies like the re-entry program to be targeted for specific populations. For instance, we found that for girls in rural areas, the FSHS policy was not immediately effective in mitigating the impact of teen birth on education. This may be due to a number of reasons. Educational attainment among Ghana's rural populace is generally low, and especially so for females. According to the 2021 Population and Housing Census, about 35% of females aged 6 and older in rural areas had never attended school, compared to the national average of 24.5%. Furthermore, about 45% of females aged 6 and older in rural areas were not literate, as compared to the national average of 34.4% (GSS, 2023). Given this and the fact that the policy is relatively young, it may be difficult to find significant impact in rural areas. Another reason could be the implementation challenges faced by the FSHS program. Gruijters et al. (2024) and Casely-Hayford et al. (2024) provide excellent review of free secondary policies in sub-Saharan Africa, highlighting various challenges in formulating as well as implementing such policies, including fiscal sustainability and infrastructural challenges. Some of these issues are prevalent in Ghana's case. There are concerns such as increased workload for existing teachers, inadequate classroom infrastructure, lack of teaching/learning materials, and delay in the supply of funds contribute to exacerbating

Table 4
Effect of teen birth on maternal education (by locality).

	OLS				IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Teen birth	−1.040***	−2.181***	−1.774***	−2.628***	−2.105***	−2.668***	−2.645***	−3.442***
	(0.187)	(0.194)	(0.233)	(0.250)	(0.479)	(0.433)	(0.612)	(0.553)
FSHS			0.491	−0.227			1.212*	−0.476
			(0.315)	(0.312)			(0.621)	(0.604)
Teen birth * FSHS			1.307***	1.154***			0.607	1.895**
			(0.395)	(0.423)			(0.930)	(0.947)
Wealth								
Middle	1.398***	1.391***	1.443***	1.466***	1.321***	1.368***	1.365***	1.477***
	(0.263)	(0.302)	(0.260)	(0.303)	(0.268)	(0.303)	(0.264)	(0.302)
Rich	2.776***	3.311***	2.912***	3.394***	2.525***	3.216***	2.713***	3.321***
	(0.316)	(0.290)	(0.318)	(0.291)	(0.334)	(0.299)	(0.333)	(0.295)
Male household head	−0.697***	−0.639***	−0.643***	−0.625***	−0.695***	−0.631***	−0.627***	−0.608***
	(0.204)	(0.203)	(0.203)	(0.202)	(0.204)	(0.202)	(0.202)	(0.202)
Ethnicity								
Ga/Dangme	−0.438	0.065	−0.576	0.114	−0.627	0.099	−0.781	0.184
	(0.529)	(0.424)	(0.527)	(0.428)	(0.542)	(0.424)	(0.543)	(0.432)
Ewe	−0.502	−0.412	−0.533	−0.355	−0.554	−0.446	−0.593*	−0.365
	(0.350)	(0.393)	(0.345)	(0.392)	(0.352)	(0.394)	(0.347)	(0.392)
Mole-Dagbani	−1.913***	−1.796***	−1.873***	−1.770***	−1.984***	−1.782***	−1.943***	−1.737***
	(0.323)	(0.375)	(0.321)	(0.375)	(0.321)	(0.372)	(0.320)	(0.373)
Gurma	−2.531***	−2.188***	−2.532***	−2.203***	−2.636***	−2.222***	−2.628***	−2.254***
	(0.407)	(0.495)	(0.402)	(0.493)	(0.410)	(0.494)	(0.405)	(0.492)
Others	−1.629***	−1.398***	−1.558***	−1.362***	−1.698***	−1.398***	−1.609***	−1.345***
	(0.368)	(0.357)	(0.367)	(0.358)	(0.369)	(0.356)	(0.367)	(0.359)
Constant	10.242***	9.882***	9.990***	9.800***	10.924***	10.218***	10.476***	10.162***
	(0.404)	(0.382)	(0.404)	(0.389)	(0.491)	(0.473)	(0.485)	(0.461)
N	2353	1738	2353	1738	2353	1738	2353	1738
R-Squared	0.284	0.259	0.300	0.263	0.274	0.256	0.289	0.258
Adjusted R-Squared	0.276	0.248	0.292	0.252	0.266	0.246	0.281	0.247
Under identification					341.366***	328.291***	310.705***	190.978***
Weak identification					280.751***	344.286***	125.081***	88.394***
Over identification					0.066	0.522	0.821	0.907

*p < 0.10, **p < 0.05, ***p < 0.01. All regressions include region dummies. Robust standard errors in parentheses.

the already difficult circumstance that senior high schools in rural areas in Ghana face (Chanimbe & Dankwah, 2021). This calls for carefully tailored interventions for these groups of people with peculiar challenges including relatively poor infrastructure, economic conditions and cultural practices/beliefs that facilitate risky sexual behavior.

While our study addresses an important social concern in developing countries including Ghana, it also has some limitations worth mentioning. First, the FSHS policy is only a few years old. Therefore, the full scale of impact or its mitigating effect may be yet to be fully realized. There is also the empirical issue of clearly identifying a counterfactual given the absence of a randomized control trial (RCT), widely considered to be 'gold standard'. Since the policy was universally implemented by the government, such data is not available. Stenzel (2024) used uptake intensity from the Educational Management Information System by the Ministry of Education. However, this data is no longer publicly available. While we do our best to find a sufficiently appropriate comparison group, we acknowledge that RCT data would have provided a more precise estimate of the impact of teen birth and of the FSHS policy. It is also important to recognize that the FSHS variable we use measures exposure and not actual uptake of the policy. Our findings are, however, relevant in the several ways they contribute to the already scant literature on the subject matter as earlier indicated. Finally, we acknowledge that there may be disparities within rural and urban settings, the exploration of which would provide even further insight into the effect of teen birth on educational outcomes and the mediating role of education. The data we use for this study is however limited in this regard. Exploring these within-locality differences would be a useful starting point for future studies in this area.

6. Conclusion

Teen births pose significant challenges to the educational attainment of girls and subsequently affects other aspects such as labor market outcomes and economic empowerment. The results of this study provide empirical evidence of how reducing the financial barriers can lessen the negative effect of teen birth on the educational attainment of girls in Ghana. It also highlights how the peculiar circumstances of rural areas in Ghana can immune them from the benefits of otherwise useful policies. This study therefore emphasizes the need to bolster efforts to further reduce all kinds of barriers to the re-entry of teen mothers into school by facilitating the proper implementation of the existing guidelines, as well as implementing additional measures that are tailored to the peculiar needs of rural areas.

CRediT authorship contribution statement

Kwasi Gyabaa Tabiri: Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Conceptualization. **Muniratu Tahiru:** Writing – original draft, Methodology, Conceptualization. **Yaw Boateng Atakorah:** Writing – original draft, Methodology. **Jacob Novignon:** Writing – review & editing, Writing – original draft.

Data availability

The data used in the study was obtained from the Demographic and Health Surveys. The data are publicly available at https://www.dhsprogram.com.

Funding declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We are grateful to the Ghana Statistical Service and the DHS program for providing access to the data used in the study.

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