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**Working Paper**

## Empowering youth: The impact of comprehensive sex education on teenage pregnancy in Ecuador

WIDER Working Paper, No. 2023/107

**Provided in Cooperation with:**

United Nations University (UNU), World Institute for Development Economics Research (WIDER)

*Suggested Citation:* Aguirre, Kamila; Carrión-Yaguana, Vanessa D. (2023) : Empowering youth: The impact of comprehensive sex education on teenage pregnancy in Ecuador, WIDER Working Paper, No. 2023/107, ISBN 978-92-9267-415-1, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, <https://doi.org/10.35188/UNU-WIDER/2023/415-1>

This Version is available at:

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WIDER Working Paper 2023/107

# **Empowering youth: the impact of comprehensive sex education on teenage pregnancy in Ecuador**

Kamila Aguirre<sup>1</sup> and Vanessa D. Carrión-Yaguana<sup>2</sup>

August 2023

**Abstract:** This paper analyses the impact of comprehensive sex education on teenage pregnancy rates in Ecuador, specifically examining its implementation in schools. The inclusion of sex education as a mandatory cross-cutting theme in the updated and strengthened educational curriculum of 2010 provides a potential source of exogenous variation in access to comprehensive sex education. Using a difference-in-differences model, the study finds that the provision of comprehensive sex education in schools contributed to a reduction in teenage pregnancy rates in Ecuador. This research addresses a notable gap in the literature, as there is a scarcity of causal research studies conducted in Latin American countries focusing on this topic. The findings underscore the importance of the ongoing debate regarding the reintroduction of comprehensive sex education into the educational curriculum, and emphasize the need for coordinated efforts with parents to maximize the benefits of its implementation.

**Key words:** teenage pregnancy, sex education, difference-in-differences, educational curriculum, Ecuador

**JEL classification:** I14, I15, I18, I24, I25

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This study has been prepared within the UNU-WIDER project [Women's work – routes to social and economic empowerment](#).

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ISSN 1798-7237 ISBN 978-92-9267-415-1

<https://doi.org/10.35188/UNU-WIDER/2023/415-1>

Typescript prepared by Merl Fluin.

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The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

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# 1 Introduction

## 1.1 Teenage pregnancy

Teenagers possess the potential to bring about transformative changes in society through their curiosity, engagement, and innovative ideas (Kleinert and Horton 2016). While early childhood is recognized as a crucial stage in an individual's life cycle (Anderson et al. 2003), recent studies have underscored the significance of adolescence as a period of fundamental changes. This developmental stage is characterized by structural and functional transformations in the brain, affecting cognitive, emotional, social, and motivational processes, with potential long-term implications for adulthood (Dahl et al. 2018). Therefore, it is imperative to identify challenges that hinder the health and development of this age group, with teenage pregnancy being a notable concern for young women (Gurung et al. 2020).

Teenage pregnancy is a global public health issue, despite efforts by central governments and international organizations. Many countries, particularly developing nations, have struggled to make substantial progress in reducing teenage pregnancy rates. This rate is calculated by the number of births per 1,000 women aged between ten and 19 years (Black et al. 2012; World Health Organization 2004). Teenage pregnancy poses various challenges, having negative impacts on education, health, and labour market outcomes, and thereby limiting the capabilities and future opportunities of young women (Nussbaum 2000).

While teenage pregnancy rates have decreased worldwide, Latin America has not experienced a similar trend. Developing countries exhibit pregnancy rates ranging from 15 to 33 among women under the age of 20 (Black et al. 2012). Latin America and the Caribbean have the second-highest teenage pregnancy rates globally, surpassed only by sub-Saharan Africa (Pan American Health Organization et al. 2017). Statistics indicate that between 2010 and 2015, the fertility rate in Latin America and the Caribbean was 66.5 births per 1,000 teenagers, compared with 46 births per 1,000 teenagers in the rest of the world.

Teenage pregnancy is influenced by various risk factors in the personal, family, and environmental contexts of teenagers (Campero et al. 2021). Notably, the poverty experienced by young women and their families is a significant factor (South and Crowder 2010). This economic condition has an impact on their perception of future educational and financial opportunities, thereby reducing their perception of the potential costs associated with early motherhood (Oke 2010). Additionally, other household characteristics, such as single-parent families, low parental education levels, and a history of teenage pregnancy within the family, are also linked to a higher likelihood of teenage pregnancy (East et al. 2007; Morón-Duarte et al. 2014). It is important to acknowledge that parental dynamics, behaviour, and communication play a role in the occurrence of early pregnancy among daughters (Guijarro et al. 1999; Widman et al. 2016). According to Chiazor et al. (2017), parents often avoid discussing topics related to sexuality, which poses a risk.

The environment in which young women grow up is also closely related to teenage pregnancy. Culturally in developing countries, early marriages persist, leading to teenage pregnancies (Papri et al. 2016). The neighbourhood in which teenagers reside also plays a role, as studies have shown that teenage pregnancy rates tend to be higher in poorer and disorganized neighbourhoods (Harding 2003). Another contributing factor in teenage pregnancy is the increasing number of sexual abuse cases involving children and teenagers. Research indicates that experiencing physical or sexual violence during childhood increases the probability of unwanted pregnancies (Fortin-

Langelier et al. 2019; Noll et al. 2009). Additional factors include peer pressure, influence from friends and social networks, and alcohol and drug consumption (Chiazor et al. 2017).

Teenage pregnancy is further associated with a lack of adequate and timely information about sexual and reproductive health. Sexual and reproductive health education aims to empower individuals to make informed decisions about their sexual behaviour, recognize associated risks, and overcome social and cultural influences (Williams and Davidson 2004). Insufficient knowledge in this area is one of the primary causes of teenage pregnancy, as young people are unaware of contraceptive methods and the risks associated with early sexual activity (Mmari and Sabherwal 2013).

Teenage pregnancy leads to consequences for teenage mothers and their children in the present and future. These consequences can be summarized in three main dimensions: health, education, and labour market outcomes. These dimensions individually and collectively limit the development and growth opportunities for these mothers and have negative impacts on the prospects for their children.

The repercussions for health affect both teenage mothers and their children. For teenage mothers, the impact is significant, as their physical and emotional development is still ongoing (Jeha et al. 2015). Consequently, teenage mothers have higher rates of anaemia compared with women who become mothers during adulthood (Oboro et al. 2003). They also face an increased risk of infections during pregnancy (Orish et al. 2012; Soula et al. 2006) as well as pre-eclampsia and eclampsia (Leppälahti et al. 2013; Trivedi and Pasrija 2007). Complications during delivery are more common due to immature physiological development, resulting in higher maternal mortality rates (Pan American Health Organization et al. 2017; Papri et al. 2016). Moreover, teenage mothers are at a higher risk of experiencing post-partum depression, anxiety, stress, and in some cases suicide (Hodgkinson et al. 2014; Pan American Health Organization et al. 2017).

These health-related issues also have a negative impact on newborns. One of the main consequences is an increased risk of preterm birth (Kafle et al. 2010; Scholl et al. 1994), which is associated with a higher likelihood of low birthweight (Gupta et al. 2008; Kumar et al. 2007) and the development of neonatal respiratory distress syndrome (Panduro-Baron et al. 2012). Furthermore, there is a higher neonatal mortality rate and an elevated risk of pervasive development disorders, which can lead to autism and other long-term consequences (Lampi et al. 2013; Papri et al. 2016).

Regarding the education of teenage mothers, a significant problem arising from teenage pregnancies is high dropout rates (Gyan 2013). Although efforts have been made by schools to avoid excluding pregnant students, these strategies prove ineffective when there is insufficient support and an environment of bullying towards pregnant girls emerges (Lall 2007). School dropouts often result in diminished future employment opportunities and hinder personal and professional development. There is a greater likelihood of unemployment or lower labour income for these young mothers, increasing the risk of poverty (Cook and Cameron 2015). Considering that poverty both influences and is influenced by teenage pregnancy, urgent implementation of programmes and strategies aimed at addressing this problem is necessary (Oke 2010).

## 1.2 The role of sex education in preventing teenage pregnancy

Countries have widely embraced sex education as a primary strategy to prevent unwanted pregnancies and sexually transmitted diseases (Schaalma et al. 2004). Oettinger's (1999) microeconomic model provides insights into the decision-making process of individuals when initiating sexual activity, emphasizing a cost-benefit analysis. The risk of teenage pregnancy is identified as a significant cost in this model. The effectiveness of sex education lies in its ability to influence behaviour by altering the perceived benefits and risks associated with sexual practices. Schaalma et al. (2004) emphasize that successful sex education should not only impart knowledge but also focus on bringing about behavioural change among adolescents. The model presents adolescents with a choice between abstinence, which offers utility through the absence of associated risks ( $V$ ), and sexual activity, which entails uncertain utility due to the risk of pregnancy ( $U_0$ ) or non-pregnancy ( $U_1$ ). Ultimately, a young person decides to engage in sexual activity when the expected utility of sexual activity surpasses the utility of abstinence (Equation 1).

$$pU_0 + (1 - p)U_1 > V \quad (1)$$

However, it is crucial to note that the aforementioned model fails to accurately predict the expected effect of sex education on teenage pregnancy, which depends on factors such as the timing, intensity, and focus of the education (Paton et al. 2020). Therefore, it is important to recognize that different types of sex education exist, and that the outcomes will vary depending on the specific approach employed. Oettinger (1999) distinguishes three types of sex education: (1) education that alters utility, focusing on increasing the utility of abstinence by highlighting the high costs and negative consequences of early parenthood; (2) education that modifies the risk of pregnancy by providing information on the menstrual cycle and the effectiveness of contraceptive methods; (3) education that facilitates risk disclosure by ensuring adolescents have adequate information to accurately assess the risks associated with pregnancy.

The first type of sex education mentioned above, referred to as abstinence-only sex education, is widely recognized in the literature. It promotes abstinence as the sole method to prevent unwanted pregnancies and emphasizes delaying sexual activity until marriage. However, it does not provide information on contraceptive methods (Kohler et al. 2008). On the other hand, comprehensive sex education encompasses both the second and third types mentioned above. It promotes abstinence as the safest option to avoid adolescent pregnancy, while also equipping teenagers with knowledge about the effectiveness and usage of contraceptive methods, as well as other pertinent information about sexuality (Kirby 2008).

## 1.3 Empirical evidence

Empirical evidence reveals varied outcomes depending on the focus of sex education interventions. Interventions that solely emphasize abstinence and delaying the onset of sexual activity (i.e. abstinence-only) generally fail to influence adolescent behaviour and in some cases have yielded results contrary to expectations. A recent study examining the impact of a policy shift towards abstinence-focused sex education in Ecuador found that teenage pregnancy rates increased, particularly among Indigenous women (Galárraga and Harris 2021).

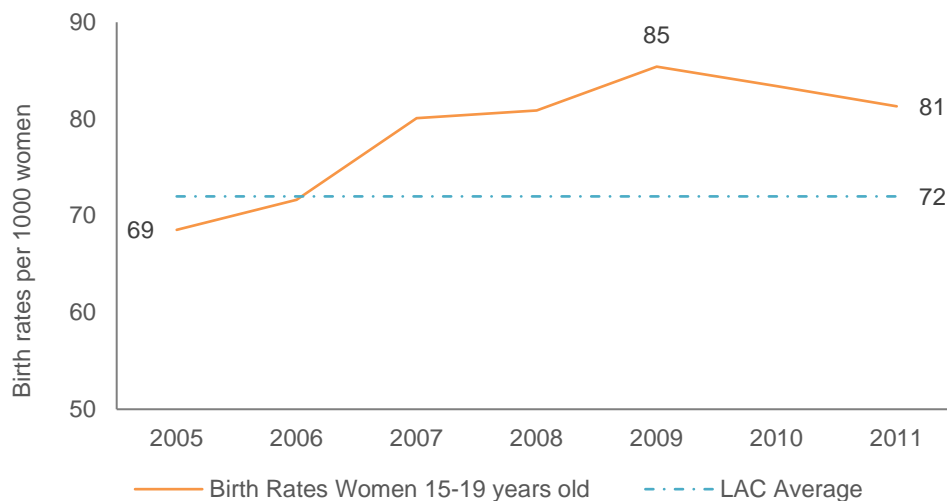
Conversely, empirical evidence demonstrates a different outcome when the effects of comprehensive sex education interventions are evaluated (Kohler et al. 2008). These studies indicate that comprehensive sex education is effective in delaying the age of first sexual intercourse and modifying adolescents' behaviour regarding sex. For instance, it is associated with a decrease in the frequency of sexual encounters and sexual partners, as well as an increase in the utilization of contraceptive methods such as condoms (Kirby 2008). Abstinence-only education fails to

positively influence the sexual behaviour of adolescents (Underhill et al. 2007), while comprehensive sex education enhances knowledge about sexuality, leading to changes in attitudes and skills related to this subject among adolescents (Denford et al. 2017).

## 2 The case of Ecuador

Among Latin American and Caribbean countries, Ecuador stands out with the second-highest teenage pregnancy rates. As depicted in Figure 1, these rates for the period 2005–11 surpass the regional average in Latin America and the Caribbean. Teenage pregnancies have been linked to lower educational achievements, health issues, and reduced wages and employment opportunities (Cook and Cameron 2015; Gyan 2013; Jeha et al. 2015). The consequences of this issue extend beyond the teenage mothers themselves, having an impact the Ecuadorian state, with an estimated cost of approximately 0.27% of gross domestic product (UNFPA 2020).

Figure 1: Teenage pregnancy rates, Ecuador and Latin America, 2005–11



Note: LAC: Latin America and Caribbean.

Source: authors' illustration based on data from Azevedo et al. (2012) and INEC.

In terms of the impact on educational attainment, young pregnant women face significantly high dropout rates. Approximately 6,900 teenagers in Ecuador discontinued their education due to pregnancy in 2015 (Ministry of Education 2015). While economic constraints remained the primary reason for non-attendance, around 3% of the population aged 15–17 attributed their absence from school to their pregnancy situation. A United Nations Population Fund study conducted for Ecuador reveals that women who become mothers during adolescence have a 6–11% lower likelihood of completing primary, secondary, or higher education compared with those who delay motherhood. It is worth noting that future labour market outcomes are closely tied to years of schooling or the highest level of education attained (Edgerton et al. 2012; Ionescu 2012; UNFPA 2020).

In terms of health, both the mother and the newborn experience negative consequences. Adolescent pregnancy has been associated with increased maternal mortality rates, as well as a lower frequency of prenatal check-ups compared with pregnancies outside adolescence (UNFPA 2020). This has implications for the newborns, who are more likely to have low birthweight (Alexander and Korenbrot 1995). Furthermore, higher rates of infant mortality and long-term

health repercussions have been observed among children born to teenage mothers (Papri et al. 2016).

Moreover, there are adverse effects on the labour market outcomes of these women. According to the findings of the UNFPA study, Ecuadorian teenage mothers face significantly higher rates of inactivity (10.26%) and unemployment (92%) compared with mothers who have children in adulthood. Consequently, this impacts their labour income and contributes to an income gap of approximately US\$1,200 per year between teenage mothers and those who have their children in adulthood. On average, the income of teenage mothers is 23% lower than that of adult mothers (UNFPA 2020).

Given that schools serve as the primary sources of information on sexuality in Ecuador—80% of individuals acquire their knowledge through this avenue, according to the National Health and Nutrition Survey (INEC 2018)—sex education delivered in these institutions could play a crucial role in reducing teenage pregnancy rates.

The above findings emphasize the crucial role of schools in preventing teenage pregnancy and highlight the importance of comprehensive sex education as a protective measure against this issue. This research is conducted to investigate the impact of comprehensive sex education provided in schools on teenage pregnancy rates in Ecuador, aligning with its mandatory inclusion in the educational curriculum since 2010. The study aims to assess the effectiveness of comprehensive sex education in reducing teenage pregnancy rates. By providing empirical evidence on the effect of comprehensive sex education in a Latin American country, this study fills a gap in the existing literature, which lacks sufficient causal research studies on this topic.

In Ecuador, the inclusion of sex education in the educational curriculum dates back to 1996, when it primarily focused on topics related to the human body. However, more comprehensive and advanced aspects of sexuality were not adequately addressed. It was not until 2010—following the enactment of the 2008 Constitution, which emphasized the importance of ensuring access to sex education from a rights-based perspective—that the Ministry of Education designed and implemented an updated and strengthened educational curriculum. This curriculum mandated the integration of sex education as a cross-cutting theme in all schools across the country, regardless of their public or private status (Manzano and Jerves 2015).

Initially, the curriculum prioritized providing in-depth knowledge about the body and its functions, building upon existing information from the 1996 curriculum. Subsequently, more advanced topics related to sexuality, such as unwanted pregnancy and sexually transmitted diseases, were addressed in later years. The curriculum covered essential areas such as the menstrual cycle, contraceptive methods, unwanted pregnancies, and sexually transmitted diseases, aligning with the principles of comprehensive sex education.

This marked a significant advancement, as the inclusion of sexuality-related issues became mandatory for all educational institutions nationwide. Although there is no official analysis of compliance with the curriculum, it is worth noting that the government at that time possessed the necessary enforcement capacity. However, in 2016 a new curriculum change occurred, resulting in the removal of sex education as a cross-cutting theme. Instead, it was left to the discretion of individual educational institutions to determine the focus and inclusion of this type of education within their curriculums.



### 3 Methodology

#### 3.1 Data

Data on birth rates was obtained from the National Institute of Statistics and Census (Instituto Nacional de Estadísticas y Censos, INEC). The study utilizes data from the birth register spanning 2009–13, as well as population projections estimated by the same institute. The data consists of 2,210 observations aggregated at the cantonal level.

Due to the absence of an official and publicly available register of pregnancy numbers in the country, the live birth rate is used as a proxy for the pregnancy rate. However, it should be acknowledged that this approach has limitations, as it may underestimate the issue of teenage pregnancy (e.g., cases of abortion or pregnancy loss for various reasons may not be captured).

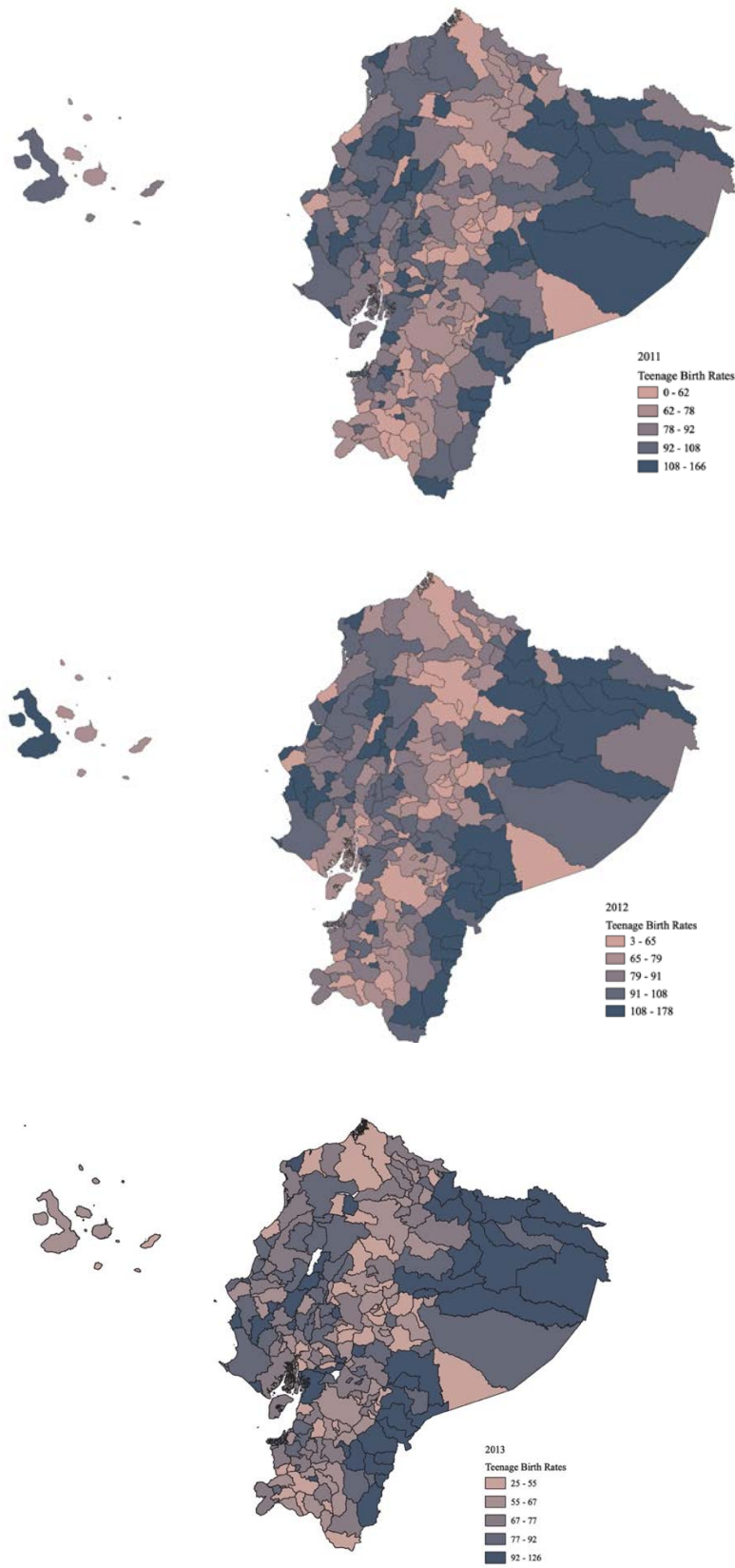
The birth rates for two age ranges are examined: teenagers (15–19 years old) and women aged 25–29. These rates are defined as the number of live births per 1,000 women within those specific age groups. Information on the number of births is derived from the birth register, aggregated at the cantonal level and by age range. Disaggregated population data by canton, sex, and age was obtained from the population projections provided by INEC.

Figure 2 presents a heatmap visualization illustrating teenage birth rates for the last three years under study (2011–13). The map reveals geographical heterogeneity, with distinct hot spots characterized by significantly high teenage birth rates in the Ecuadorian Coast and Amazon regions. Notably, the highest birth rates in the country's cantons experience a slight decline between 2011 and 2013.

It is important to note that the definition of teenage mothers in this study excludes girls aged ten to 14 years. According to the Social Observatory of Ecuador (2018), teenage pregnancy among individuals aged 15 and above is primarily attributed to sexual activity, whereas for girls aged ten to 14 years, sexual violence is identified as the main cause of pregnancy. This exclusion may have an impact on the estimations, as these pregnancies occur without consent, suggesting that the influence of sex education provided in schools may be limited in preventing such cases.

Descriptive statistics are presented in Table 1. In general, it is observed that birth rates tend to be higher among women aged 25–29 compared with women aged 15–19. However, there are cantons where the opposite trend is observed. Regarding the characteristics of teenage mothers, the majority (approximately 90%) have attained basic or secondary education, identify as Mestiza (81%), and reside in urban areas (70%).

Figure 2: Heat maps: teenage birth rates by canton and year



Source: authors' illustration based on data from INEC.

Table 1: Descriptive statistics, 2011–13

Variable	Obs.	Mean	Std dev.	Min.	Max.
Panel A: population					
Female population (15–19)	1,105	3,294	10,895	70	116,891
Female population (25–29)	1,105	2,922	10,799	54	117,893
Panel B: birth rates <sup>a</sup>					
Female 15–19	1,105	90	36	8	401
Female 25–29	1,105	103	29	32	277
Difference <sup>b</sup>	1,105	13	32	-265	135
Panel C: teen mothers' characteristics					
<i>Level of education</i>					
None	1,105	0.01	0.02	0	0.23
Literacy centre	1,105	0.05	0.01	0	0.22
Basic	1,105	0.48	0.14	0	0.91
Secondary	1,105	0.48	0.14	0.06	1
Higher	1,105	0.02	0.02	0	0.20
<i>Ethnic self-identification</i>					
Mestiza	1,105	0.82	0.24	0	1
Indigenous	1,105	0.13	0.23	0	1
Afro-Ecuadorian	1,105	0.02	0.07	0	0.58
Other	1,105	0.02	0.03	0	0.28
<i>Area of residence</i>					
Urban	1,105	0.71	0.23	0	1

Note: <sup>a</sup>birth rates per 1,000 women in each age group; <sup>b</sup>difference in birth rates of mothers aged 25–29 compared with those aged 15–19.

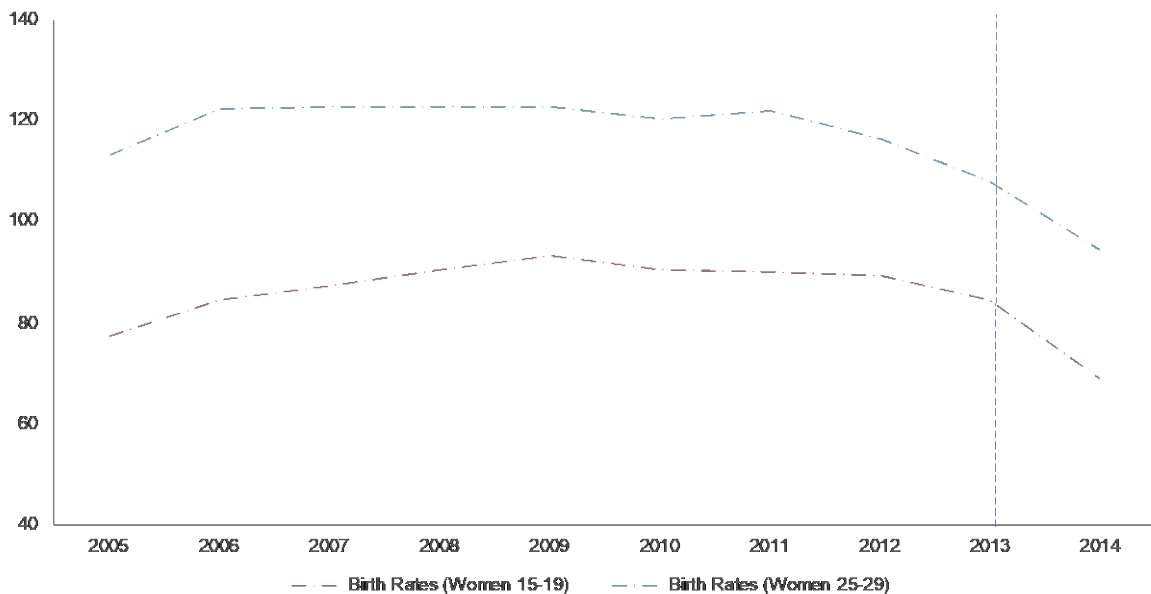
Source: authors' calculations based on data from INEC.

### 3.2 Econometric analysis

As discussed above, the educational curriculum in Ecuador underwent an update and strengthening process in 2010, which introduced sex education as a transversal component. This reform was implemented in schools in September 2010 for the Sierra regime and in April 2011 for the Coast regime. To evaluate the impact of this curriculum update, a difference-in-differences model is proposed. The treatment group consists of women aged 15–19 years, while the control group comprises women aged 25–29 years. The policy implemented in schools serves as the plausibly exogenous source of variation. It is assumed that the curriculum update does not affect the sexual behaviour and decisions of the control group. The key identifying assumption is that changes in birth rates among women aged 25–29 can serve as a reliable counterfactual for changes in birth rates among those aged 15–19 in the absence of the educational curriculum update and strengthening.

To establish the post-treatment period, several factors are taken into consideration. Firstly, it is important to note that births are observed, rather than pregnancies; hence, the results can be observed approximately nine months after the onset of pregnancy. Additionally, it is expected that sex education will not significantly influence teenagers' decisions if they have received only a few classes. Therefore, it is assumed that the effects may become noticeable after the conclusion of the school year, which is in 2012 for the Coast regime. Lastly, the proper implementation of sex education as a cross-cutting component of the curriculum may face some delays depending on each school. Thus, it is anticipated that the effects may start to be observed in the birth registers for 2013.

Figure 3: Parallel trends: birth rates by mothers' age group



Source: authors' illustration based on data from INEC.

Figure 3 illustrates the trends in pregnancy rates for these two groups of women. The trends exhibit similarity during the pre-treatment period, providing confidence that the data align with the aforementioned assumption. The identification strategy is represented by Equation 2:

$$E_{jt} = \delta T_j + \gamma T_j * Post_t + \mathbf{X}'_{jt} \omega + \alpha_{1j} + \alpha_{2t} + \mu_{jt} \quad (2)$$

The birth rates of canton  $j$  in year  $t$  are represented by  $E_{jt}$ . The variable  $T_j$  is a dummy variable that equals one if the observation corresponds to women aged 15–19 years, and zero otherwise. The dummy variable  $Post_t$  takes the value of one during the post-treatment period (2013). The parameter of interest in this analysis is  $\gamma$ . To account for other relevant factors, a vector  $\mathbf{X}$  of time-varying sociodemographic variables is included at the cantonal level, such as educational level, ethnicity, and literacy rate. Additionally, cantonal-level information regarding schools, such as the percentage of public schools and the number of schools per 10,000 inhabitants, is considered. Time fixed effects are also included to control for time-specific shocks affecting all cantons, and canton fixed effects are incorporated to account for time-invariant characteristics of each canton.

To assess whether there are statistically significant differences in the observable characteristics between the two groups, a comparison of means is conducted. Education-related variables are not considered in this analysis, as it is expected that they will differ significantly due to the age composition of the two groups. Instead, the analysis focuses on ethnic composition and the geographical area (urban or rural) in which the individuals are located. The results, presented in Table 2, show no statistically significant differences between the groups.

Table 2: Analysis of group means

	15–19 years old	25–29 years old	Difference
<i>Ethnic composition</i>			
Indigenous	0.137	0.142	-0.005 (0.01)
Afro-Ecuadorian	0.025	0.025	0.000 (0.01)
Mestiza	0.811	0.806	0.005 (0.011)
Other	0.019	0.021	-0.002 (0.002)
<i>Area of residence</i>			
Urban	0.7107873	0.722801	-0.012 (0.01)

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: authors' calculations based on data from INEC.

## 4 Results

Table 3 presents the results of the main model specification, incorporating canton and time fixed effects. Standard errors are clustered at the cantonal level to account for potential correlations. In column 2, the model includes time-varying control variables. The findings indicate a statistically significant effect on teenage birth rates. Specifically, there is a notable decrease of seven births per 1,000 women in the 15–19-year-old group compared with the birth rates of women aged 25–29 years. These results suggest that the inclusion of sex education as a transversal axis in the educational curriculum has a positive impact on reducing teenage pregnancy rates in Ecuador.

As a robustness check, the previous section's estimation is repeated with a placebo treatment year (2010). This is done to assess whether the curriculum update has any effect on the groups in the years prior to the actual treatment. It is anticipated that the effect obtained during this period will be statistically insignificant or close to zero. The results confirm this expectation, indicating no significant effect when 2010 is considered as the treatment year. Table 4 presents these results.

In a second robustness check, the group of mothers aged 35–39 is used as the placebo treatment group, while mothers aged 30–34 years serve as the control group (Table 5). Similarly to the previous test, no statistically significant effect is expected, as the educational curriculum update should not have an impact on the behaviour and decisions regarding sex of these two groups.

Table 3: Estimation results

	(1)	(2)
Teenage births (t = 2013)	-7.878*** (2.079)	-7.801*** (2.142)
Indigenous		52.189** (24.507)
Afro-Ecuadorian		62.437** (28.001)
Mestiza		57.355*** (21.696)
Other		41.522 (35.518)
Mother's education		-5.03 (18.797)
Urban area		0.492 (6.710)
Public schools		-0.234 (4.859)
Number of schools		0.713*** (0.175)
N	2210	2141
R sq.	0.649	0.66

Note: Clustered standard errors at cantonal level in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: authors' calculations based on data from INEC.

Table 4: Placebo treatment year (post=2010)

	(1)	(2)
Teenage births (t = 2010)	-0.822 (1.966)	-0.331 (1.998)
Indigenous		65.556 (55.866)
Afro-Ecuadorian		82.272 (63.759)
Mestiza		80.627 (54.239)
Other		35.499 (72.749)
Mother's education		-18.874 (42.490)
Urban area		9.103 (15.526)
Public schools		-4.447 (4.600)
Number of schools		1.302*** (0.362)
N	884	855
R sq.	0.723	0.733

Note: Clustered standard errors at cantonal level in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: authors' calculations based on data from INEC.

Table 5: Placebo treatment group (35–39 years old)

	(1)	(2)
Birth rates	1.47	1.928
(t = 2013)	(1.288)	(1.400)
Indigenous		34.685**
		(13.853)
Afro-Ecuadorian		30.393**
		(14.098)
Mestiza		22.818*
		(13.131)
Other		-1.437
		(13.208)
Mother's education		1.247
		(12.438)
Urban area		-1.567
		(4.232)
Public schools		9.780**
		(4.522)
Number of schools		0.375**
		(0.175)
N	2204	2121
R sq.	0.795	0.809

Note: Clustered standard errors at cantonal level in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: authors' calculations based on data from INEC.

## 5 Conclusions

In conclusion, the implementation of comprehensive sex education in schools has been found to significantly reduce teenage pregnancy rates in Ecuador. These findings remain consistent even after one accounts for control variables and conducts placebo tests.

The implications of these results are significant in terms of the approach to sex education. This study strongly advocates that authorities should evaluate the inclusion of comprehensive sex education as a mandatory component of the educational curriculum. Furthermore, it emphasizes the need to develop communication strategies that involve parents, teachers, and authorities, fostering collaborative efforts to address the alarming rates of teenage pregnancy in the country. Most importantly, comprehensive sex education equips teenagers with crucial knowledge about sexuality, enabling them to make informed decisions and potentially preventing other issues such as sexually transmitted diseases.

## 6 Discussion

These research findings provide evidence that comprehensive sex education effectively reduces teenage pregnancy rates in Ecuador. This enables an insightful comparison with the results of a recent study conducted by Galárraga and Harris (2021), which evaluated an abstinence-based sex education policy. Their findings indicated that this approach was ineffective in reducing teenage pregnancy rates in the country, with more pronounced negative consequences observed in cantons with higher proportions of Indigenous women. In contrast, the integration of comprehensive sex

education into the educational curriculum of schools yielded positive results in terms of decreased teenage pregnancy rates.

It is important to recognize that this study assesses the initial endeavour of implementing comprehensive sex education, and there remains significant potential for enhancing and refining such programmes. For instance, it would be beneficial to have dedicated classes specifically addressing this topic, for which teachers should receive comprehensive training in sexuality, encompassing both knowledge and effective communication techniques. This would enable them to communicate and convey these sensitive topics more efficiently to teenagers. Additionally, it is crucial to understand that due to the prevailing conservatism in many Ecuadorian families, there may be resistance and opposition to discussing these topics in schools. There is a possibility of misunderstanding whereby discussions on sexuality may be misconstrued as encouraging early sexual activity. Therefore, the active involvement of families is necessary to implement coordinated actions between schools, colleges, and families, which may be more effective in addressing the issue of teenage pregnancy in the country. This collaborative effort represents a significant challenge, requiring effective communication about the objectives and purposes of comprehensive sex education to overcome potential negative responses from families. Indeed, families should be the ones promoting and contributing to these types of initiatives in educational settings.

It should be noted that the studied intervention (i.e. the updating and strengthening of the educational curriculum) had a short duration and was swiftly replaced by an abstentionist approach. Consequently, there is a need to revise educational policies related to sex education to reinstate a comprehensive approach, which has been proven to be the most effective in addressing the issue of teenage pregnancy. Finally, it is essential to recognize that comprehensive sex education is not only necessary for reducing teenage pregnancy rates but also serves as a protective factor in identifying signs of child sexual abuse, countering another problem that unfortunately continues to grow more prevalent in the country.

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