ORIGINAL RESEARCH

Teenage and youth pregnancy predictors in Ecuador: A multiple logistic regression model.

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Abstract

Introduction: Teenage pregnancy is a serious social problem with harmful consequences for the mother and the child. It is important to understand the factors related to this problem in order to develop adequate social policies. The present work identifies the predictive factors of adolescent pregnancy in Ecuador.

Methods: The 2018 National Health and Nutrition Survey (ENSANUT) of the National Institute of Statistics and Censuses of Ecuador is analyzed. The sample was probabilistic, women between 10 and 24 years old were selected. Descriptive statistics and a multivariate logistic regression analysis were used: the adolescent pregnancy variable is the dependent variable, the predictor variables are education, modern contraceptive use, socioeconomic status, marital status, age at first sexual intercourse. Odds ratio is reported.

Results: Women between 10 and 24 years of age were studied (22239 cases). There were 38 cases / 7587 (0.5%) cases of pregnancy in women aged 10 to 14 years, 714/6053 (11.8%) of pregnancies in women aged 15 to 18 years, and 1978/8599 (23%) cases of women ages 19 to 24 who had a teenage pregnancy. Afterwards, the analysis focused on those who have had sexual relations (8879 cases). It was found that the variables associated to teenage pregnancy are marital status "married or in a free union" OR = 2.53 (95% CI 2.50-2.56) P<0.001, sexual relations before the age of 14 OR 5.72 (95% CI 5.63-5.81) P<0.001, unsatisfied basic needs OR = 1.57 (95% CI 1.55-1.59), schooling OR = 0.87 (95% CI 0.866-0.87) P<0.001 and modern contraceptive use OR = 0.53 (95% CI 0.525-0.537) P<0.001. The prediction equation has an accuracy of 76.1%.

Conclusions: It is possible to determine factors associated to teenage pregnancy and to generate public policy to face this issue. Specifically, better sex education and campaigns to stop early unions are needed.

Key words: Pregnancy in Adolescence; Contraceptive Methods; Sexual Health, Sexual and Reproductive Health, Logistic Regression Analysis.

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Introduction

Every year, approximately 12 million adolescent women give birth in the world [1]. Teenage pregnancy is a particularly serious social problem in developing countries such as Ecuador where one in four children are born to an adolescent mother. The rates of teenage pregnancy have increased in the past two decades while global fertility has declined [2].

Furthermore, in Ecuador early pregnancies are associated with socioeconomic disadvantage, so early pregnancy accentuates gender and socioeconomic inequalities that can lead women into a circle of poverty [3]. Early pregnancies have detrimental consequences for both the mother and the child. For example, children born of adolescent mothers have a higher risk of neonatal mortality [4]. Young pregnancy affects the mother's education and job prospects, trapping her and her child in poverty [5].

In order to lower teenage pregnancy rates, social policies need to be designed with rigorous information. In this paper I will investigate the risk factors associated with teenage pregnancy and will also discuss the consequences of early motherhood.

In 2015, all United Nations Member States signed a declaration committing to 17 Sustainable Development Goals (SDGs) meant to improve people's living conditions around the world by 2030 (United Nations, 2015). The third SDG, to ensure everyone's good health and wellbeing, has as one of its objectives the decrease of teenage pregnancy rates worldwide. The Ecuadorian government built on the SDGs to design its National Plan "Plan toda una vida" which includes clear guidelines for the prevention of teenage pregnancy. Nevertheless, teenage pregnancy rates in Ecuador continue to be one of the highest in the region. It is, therefore, very important to understand the risk factors associated with early motherhood.

To begin to identify what factors could be associated with early pregnancies in Ecuador it is necessary to review similar studies in other developing countries. For many developing countries, National Demographic and Health Surveys are the best instruments to get reliable information and data on women's health and early pregnancies. For example, a study done in Rwanda used data from the Rwanda Demographic and Health Survey to analyze household factors associated with teenage pregnancy [6]. A study in Ethiopia [7], and another in the Philipines [8] explored a three-year trend in teenage pregnancy using their National Health Survey. All three studies used logistic regression models to find the statistically significant factors associated with teenage pregnancies. In Rwanda, marital status, education level, household size, and marital status of the household head predicted early pregnancies [6]. In the Philippines the risk factors were identified as education, wealth status, and contraceptive use [8]. And in Ethiopia the contributing factors were found to be the use of contraception, marriage status, media exposure, education status, and being sexually active before the age of 15 [7].

In these studies, the common factors that contribute to adolescent pregnancies are marital status (early marriage), education level, and socioeconomic level. It is important to explore these and other variables to understand why early pregnancy rates remain so high in Ecuador.

A woman's first sexual experience is an important moment that influences teenage pregnancy trends [9]. Therefore, I will also explore the use of contraception and information on the first sexual encounter. Like these studies, I will use data from the latest Ecuadorian National Health and Nutrition Survey done in 2018 to construct a logistic regression model and identify the most significant risk factors.

Population and methodology

Design of the Study
This is a statistical analysis of a national health database.

Venue and Study Period
The study was carried out at the Barnard College, Columbia University Department of Mathematics, between the dates of January 1, 2021 to May 28, 2021.

Sample Size
The database used is the National Health and Nutrition Survey (ENSANUT) from the year 2018 [10], carried out by the National Institute of Statistics and Census (INEC), a governmental entity in Ecuador. The sample was probabilistic. The registries that met the criteria were selected and a simple size of 22239 cases of women

aged 10 to 24 years was obtained. For the multivariate analysis, only those who had had at least one sexual experience were considered. This sample has 8574 cases.

Participants

Women aged 10 to 24 years were selected. The population of interest were those who had had at least one sexual relation.

Variables

Variables such as reproductive history, sexual relations, pregnancy before reaching 18 years of age, contraceptive use   were recorded.

Data Sources and Measurements

The data source was requested from INEC to provide the complete database from the ENSANUT -2018 study, which were sent in Excel CSV format. The definitive list of cases was made using the statistical program "R".

Bias Avoidance

There was an approved protocol for this study. The information was always taken by the main researcher, the data was curated and validated. A single computer was assigned with a password administered only by the main researcher.

Statistical Methods

Descriptive statistics were used for the description of the population characteristics. A multiple logistic regression model was used to analyze the predictors of teenage pregnancy in Ecuador. The binary dependent variable was teenage pregnancy, the predictors were education, use of modern contraceptives, socioeconomic status, marital status, and age of the first sexual relation. The Odds ratio and the predictors are reported when the P value is less than 0.05.

Results

The total sample had 22239 cases from the ENSANUT survey. There are 7587 cases of women aged 10 to 14 years, 6053 cases of women aged 15 to 18 years, and 8599 cases of women aged 19 to 24 years. Figure 1 shows women's reproductive history. 99.2% of women ages 10 to 14 has not had sexual relations. Almost all
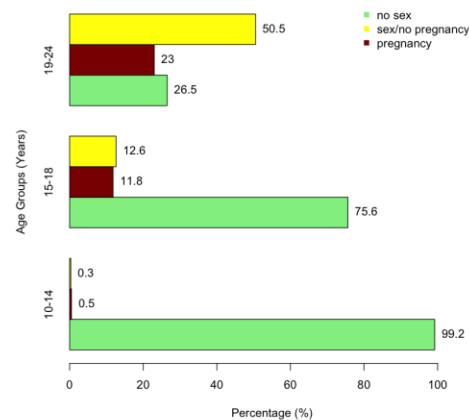

Fig. 1 Percentage of age groups. There are 7587 cases of women ages 10 to 14 years, 6053 of women ages 15 to 18 years, and 8599 cases of women ages 19 to 24 years.
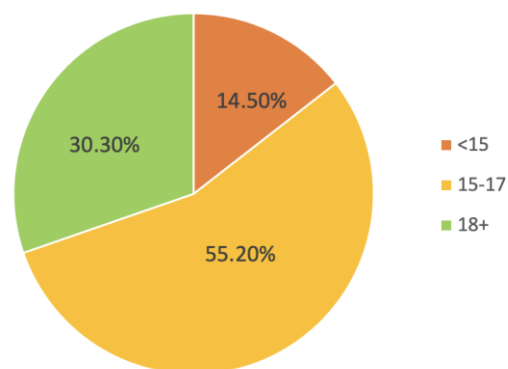

Fig. 2 Age of the First Sexual Experience.

younger teenagers (10 to 14 years old) and older teenagers (15 to 18 years old) have not had sexual relations. On the other hand, the group of women ages 19 to 24 years have had sexual relations and more than 50% of them have been pregnant.

Figure 2 shows the age of the first sexual experience for the women who have had sex (8879 cases). Most of these women had their first sexual encounter between ages 15 to 17.

The most important factors related to teenage pregnancy in the bivariate analysis are presented in table 1. They are married/union, first sexual experience before the age of 14, no use of modern contraceptive methods, and less education.

Table 1 Demographic and clinic characteristics of the patients of the study

Variable	Teenage Pregnancy N=3539	No Teenage Pregnancy N=5340	P
Married/Union	(71.0%)	(43.0%)	<0.0001
First SE before the age of 14	(31.0%)	(5%)	<0.0001
Insatisfaced Basic Needs	(41.0%)	(22.0%)	<0.0001
No Modern Contraception	(74.0%)	(51.0%)	<0.0001
Less than High School Education	(54.0%)	(21.0%)	<0.0001

SE: sexual experience

Teenage Pregnancy: pregnancy before the age of 18

No Teenage Pregnancy: no pregnancy or a pregnancy after the age of 18

Fig. 3 Percentage of pregnant women classified by age and whether they used a modern contraceptive method during their first experience. There are 38 cases ages 10 to 14, 714 cases ages 15 to 18, and 1978 cases ages 19 to 24.

The use of modern contraceptive methods during the first sexual relation are presented in figure 3. The most common reasons for women not to use contraception during their first experience are presented in figure 4, the most common one being that the encounter was "unexpected." An important consequence of teenage pregnancy was the interruption of their studies in more than 50% of cases (Figure 5).

In the multivariate analysis, a predictive model was obtained with the variables proposed. This model is presented in table 2, in which log (P/1-P) = predictive model.

Model Validation

To determine the accuracy of the logistic model I cross-validated it. Essentially, I ran the model 20 times in training data and then checked it against testing data. (Each time different subsets of the database). Then I created a confusion matrix, shown in Table 3, which displays how many false positives and false negatives are predicted.

This matrix shows the model has more false positives (1,472) than false negatives (636). It also indicates that it has better specificity (0.89) than sensitivity (0.44). There were 6,771 correctly predicted cases out of 9,574. As a whole, the model was 76.1 per cent accurate.
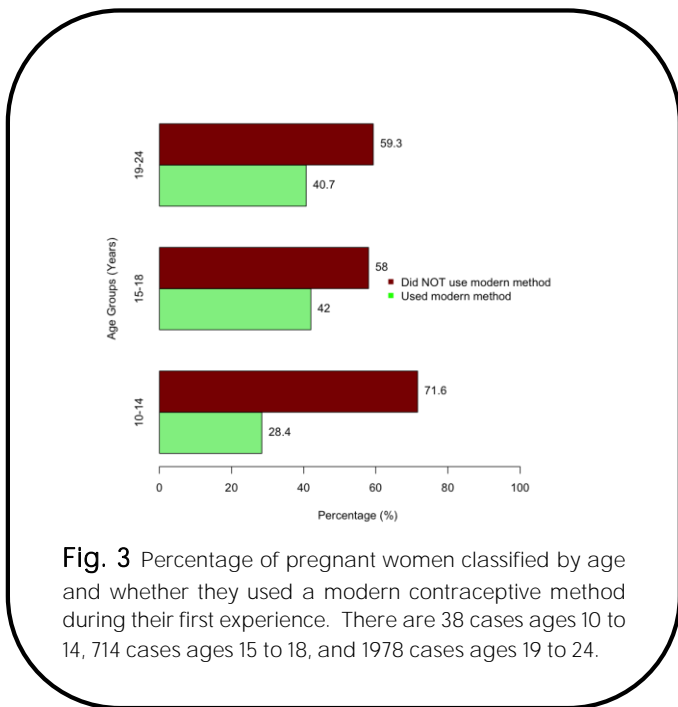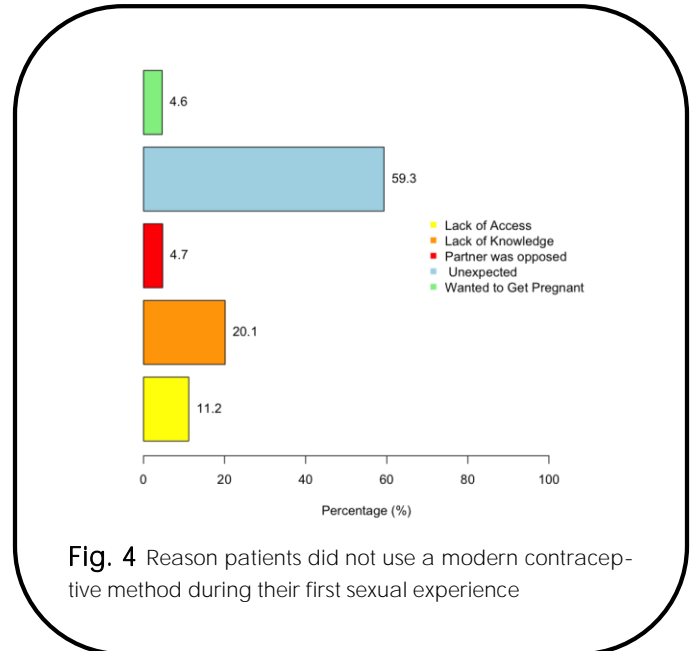

Fig. 4 Reason patients did not use a modern contraceptive method during their first sexual experience

Table 2 Prediction model for teenage pregnancy

	Estimate (B)	Exp (B)	IC95% for exp (B)		P
M/U	0.927	2.53	2.497	2.555	<0.0001
Education	-0.141	0.87	0.866	0.87	<0.0001
PV14	1.744	5.72	5.629	5.814	<0.0001
AMPV	-0.633	0.53	0.525	0.537	<0.0001
NBIS	0.45	1.57	1.55	1.588	<0.0001
Intercept	0.286	1.331			<0.0001

M/U: Married/Union PV14: first sexual experience before the age of 14 years. AMPV: Use of contraceptive method during the first sexual experience. NBIS: Unmet basic needs

Table 3 Confusion matrix model

		Reference	
		0	1
Prediction	0	1140	636
	1	1472	5631

Fig. 5 Percentage of women who either did or did not interrupt their studies after their pregnancy.
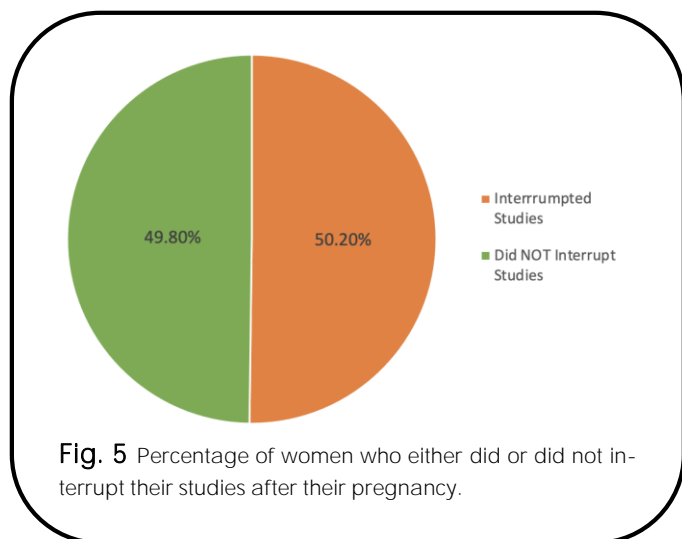
Discussion

Main Findings
This study establishes that the risk factors for teenage pregnancy are to be married or in a union OR=2.53 (IC95% 2.50-2.56), to have had sexual relations before the age of 14 OR 5.72 (IC95% 5.63-5.81), and to have unmet basic needs OR = 1.57 (IC95% 1.55-1.59). It establishes the predictor factors to be a lower education OR=0.87 (IC95% 0.866-0.87) and the lack of use of modern contraceptive methods OR=0.53 (IC95% 0.525-0.537). With these variables, a predictive model of teenage pregnancy was constructed which had more specificity than sensibility but with an acceptable accuracy of 76.1%.

Implications for clinical practice
In pediatric consultaitons, doctors should keep in mind the the medical records regarding the sexual history of children and teenagers, explicitlely askung the factors studied in this analysis. Moreover, unmet needs should be recorded in the section regarding social and economic conditions of the records.

Implications for public health
These findings enfatize the need to strengthen pediatric care in hospitals and health centers in Ecuador. Reducing teenage and youth pregnancy is important because of the many repercussions young mothers face. Many experience fear, guilt, and a sense of failure and are rejected by their families, especially by their male relatives. One of the most serious consequences of a young pregnancy is the risk of interrupting their schooling. According to the survey data, around half of all women who were students when they got pregnant interrupted their studies. Figure 5 shows that about half of them interrupted their studies after the birth of their child, deepening their disenfranchisement and perpetuating the cycle of poverty. Those who stay in school must face new responsibilities which endanger their permanence and their academic success. Schooling and education are essential for young women to gain and develop knowledge and tools for the labor market. Teenage pregnancy interrupts this foundational moment in the lives of women and affects their employment prospects due to the birth of their child. It is estimated that women who were teenage mothers are almost twice as affected by unemployment than others [5].

Strength of the study
This was a study with a large sample size that was nationally representative, which determines greater statistical strength.

Limitations fo the study
It does not include some variables such as questions on media exposure or other early pregnancies in the household. While national health surveys are very useful sources of data to study teenage pregnancy, they do not cover all the reasons why young women engage in risky sexual behavior and the meaning of some variables can be unclear.

Conclusions
This study showed that an early union or marriage, lower education level, lower socioeconomic status, sexual encounters at a young age, and especially not using a modern contraceptive method in the first sexual experience are all associated with early pregnancy. With these variables, 76.1% can predict which teenagers are at risk of pregnancy and public policies must be implemented to face this social issue.

Abbreviations

95% CI: 95% confidence interval of the population.
OR: Odds Ratio for a regression equation the Beta Exponent is constituted.

Authors' contributions

María Laura Jijón: Conceptualization, Methodology, Data preservation, Formal analysis, Acquisition of funds, Research, Resources, Software, Writing - original draft, Writing: review and editing, Project management, Supervision, Validation, Visualization.

Authors' information

María Laura Jijón graduated from the Department of Mathematics, Barnard College, Columbia University, New York.

Availability of data and materials

The data sets generated and / or analyzed during the current study are not publicly available due to the confidentiality of the participants, but are available through the corresponding author upon reasonable academic request.

Ethical statements
Protection of people

The authors declare that the procedures followed were in accordance with the ethical standards of the responsible human experimentation committee and in accordance with the World Medical Association and the Singapore Declaration.

Data confidentiality

The authors declare that they have followed the protocols of their work center on the publication of patient data without identification.

Publication consent

It is not required for retrospective studies and databases, the protocol was approved and the institution does not require it for a study of medical records as a primary source.

Conflicts of interest

The author declares that she has no conflicts of interest.

References

1. Sundaram A, Vlassoff M, Bankole A, Remez L, Gebrehiwot Y. Benefits of meeting the contraceptive needs of Ethiopian women. Issues Brief (Alan Guttmacher Inst). 2010 Jul;(1):1-8. PMID: 20653093.

2. Rodriguez J. La reproducción en la adolescencia y sus desigualdades en América Latina. Introducción al análisis demográfico, con énfasis en el uso de microdatos censales de la ronda de 2010. Repositorio de CEPAL 2014;(6) SU: cepal/36853

3. Espinel-Flores V, Gotsens M, Puig-Barrachina V, León-Gómez BB, Peralta A, Pérez G. Trends in teenage motherhood in Ecuador: challenges and inequalities. Int J Public Health. 2020 Dec;65(9):1647-1655. doi: 10.1007/s00038-020-01517-w. Epub 2020 Nov 3. PMID: 33145658; PMCID: PMC7608400.

4. Neal S, Channon AA, Chintsanya J. The impact of young maternal age at birth on neonatal mortality: Evidence from 45 low and middle income countries. PLoS One. 2018 May 23;13(5):e0195731. doi: 10.1371/journal.pone.0195731. PMID: 29791441; PMCID: PMC5965834.

5. UNFPA Ecuador, UNICEF Ecuador, UNFPA LAC, Ministerio de Salud Pública. (2020). Consecuencias socioeconómicas del embarazo en la adolescencia en Ecuador" - Implementación de la metodología para estimar el impacto socioeconómico del embarazo y la maternidad adolescentes en países de América Latina y el Caribe – Milena 1.0. Repositorio UNICEF 2020:3-58. SU: unicef/5606.

6. Uwizeye D, Muhayiteto R, Kantarama E, Wiehler S, Murangwa Y. Prevalence of teenage pregnancy and the associated contextual correlates in Rwanda. Heliyon. 2020 Oct 8;6(10):e05037. doi: 10.1016/j.heliyon.2020.e05037. PMID: 33083588; PMCID: PMC7550904.

7. Birhanu BE, Kebede DL, Kahsay AB, Belachew AB. Predictors of teenage pregnancy in Ethiopia: a multilevel analysis. BMC Public Health. 2019 May 17;19(1):601. doi: 10.1186/s12889-019-6845-7. PMID: 31101101; PMCID: PMC6525551.

8. Habito CM, Vaughan C, Morgan A. Adolescent sexual initiation and pregnancy: what more can be learned through further analysis of the demographic and health surveys in the Philippines? BMC Public Health. 2019 Aug 20;19(1):1142. doi: 10.1186/s12889-019-7451-4. PMID: 31429733; PMCID: PMC6701073.

9. Manlove J, Ikramullah E, Mincieli L, Holcombe E, Danish S. Trends in sexual experience, contraceptive use, and teenage childbearing: 1992-2002. J Adolesc Health. 2009 May;44(5):413-23. doi: 10.1016/j.jadohealth.2008.09.006. Epub 2008 Nov 13. PMID: 19380087

10. Instituto Nacional de Estadísticas y Censos (INEC). (2018). Encuesta Nacional de Salud y Nutrición (ENSANUT). SU: Ensanut-2018.

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