Adolescent and youth fertility and social inequality in Latin America and the Caribbean: what role has education played?

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Abstract
According to the MDG monitoring system, Latin America and the Caribbean is the region that presents the highest adolescent and youth fertility rate (for women aged 15-19), only behind Sub-Saharan Africa, and during the 1990’s several countries had an increase in this rate. Besides presenting high level and resistance to the decline, youth fertility was at concern due to the large social inequality associated with it, since the probability of becoming a mother between ages of 15-19 years old in the poorest quintile was threefold or more compared to the wealthiest quintile. Over the last decade a number of countries have shown a decline in fertility and motherhood at young ages. The objective of this paper is to present a systematic inquiry regarding the trends of fertility and motherhood at adolescent and young ages and its social inequality in Latin American countries. Additionally, given the theoretical and political importance of education in adolescent reproduction, it aims to determine whether the decreases in fertility rates are due to direct and indirect impacts (“composition effect”) of the advance in education. The results allow for a better prediction of the future of fertility indicators and its inequalities in the region that are invaluable for promoting public policies based on rights.

Introduction
According to the MDG monitoring system, Latin America and the Caribbean is the region that presents the highest adolescent and youth fertility rates, only behind Sub-Saharan Africa. A number of researchers has called attention about the increase on fertility and motherhood for young women in several countries in the region in the mid-1980’s and beginning of the 2000’s (Rodriguez, 2011a; Varela and Fostik, 2011; Rodriguez, 2009; Ali and Cleland, 2005; Berquó and Cavenaghi, 2005; Florez and Nuñez, 2003; Florez and Nuñez, 2001). Until recently, besides presenting high level and resistance to the decline, youth fertility was at concern due to the large social inequality associated with it, since the probability of becoming a mother between ages of 15-19 years old in the poorest quintile was

threefold or more compared to the wealthiest quintile. Even more worrisome, since the mid-1980’s to the beginning of the 2000’s the difference in age specific fertility rates for these women increased among socioeconomic groups (CEPAL, 2005).

However, specialized surveys carried out in the 2000’s, especially those completed after 2005\(^2\) and the demographic censuses of the 2010 round (CEPAL, 2013) suggest a change in the previous scenario, since a number of countries show a decline in fertility and motherhood at young ages, although the levels are still very high in several countries. Regarding inequality among groups, this is still very strong, but apparently it no longer increases, although the trend is critically dependent on socioeconomic groups and the type of inequality measures used.

Hence, a systematic inquiry regarding the trends of fertility and motherhood at young ages and its social inequality are key to feed the public debate and to adopt policies and actions in Latin America on this issue. This inquiry, though, entails consideration of the direct and indirect impacts (“composition effect”) of the advance in education in these trends, given the theoretical and political importance of education in adolescent reproduction and the changes in the coverage of education the region has undergone through last decades.

This paper aims to contribute to the discussion about the effect of education on the evolution of adolescent and youth fertility in Latin America by decomposing the effect of educational change of adolescent population on teenager motherhood. In order to accomplish that we apply direct standardization procedures for countries that presented decline in fertility of young women over the last years\(^3\), focusing on women aged 15-19. Additionally, we examine trends in the differences of fertility by educational groups in order to establish whether the region is following a convergence or polarized pattern of fertility decline at young ages.

**The effects of Education on fertility**

The trend of fertility for women aged 15-19 in Latin America until the early XXI century challenged the hegemonic theory because its resistance to decline occurred in conjunction with an intense and sustained decline in total fertility in all socioeconomic groups, a delay (rather light) of the union and an expansion of primary and secondary education. From a demographic point of view, it has been shown that increased sexual activity during adolescence, only partially offset by an increase in contraceptive use, is the key intermediate variable to explain this trend (Ali and Cleland, 2005).

However, several authors downplayed this resistance to fertility decrease at young ages confident that sooner or later the advancement of education would be imposed and would begin to have a dampening effect on early fertility (Madeira, 2006; Carvalho, 2009; Rios-

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\(^2\) Available at www.measuredhs.com.

\(^3\) Among those countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haití, Honduras, México, Nicaragua, Panamá, Paraguay, Peru, Uruguay, and Venezuela.
Neto, 2000 and 2005). This assumption arose because, without exception, all theories of fertility assume that education has a reducing effect on fertility and, above all, has an effect of delaying the timing of childbearing. Based on this assumption, data collected in the most recent reproductive surveys and censuses could lead us to presume that the advances in education have been playing an effect on reducing fertility at young ages and, by the same token, this trend to decline should be sustained to the extent that education continues expanding in the region.

Nonetheless, educational systems in Latin America have weaknesses for several reasons, some of them particularly relevant for its potential effect on reducing adolescent fertility (Rodriguez, 2011b; Berquó and Cavenaghi, 2009; Cavenaghi and Alves 2011). The first reason is its pronounced social inequality that persists in a new form: much less as disparity in coverage (for the trend towards universal primary and secondary education) and more as a disparity in quality and social and market assessment (particularly by employers). The second is its link to the world of work, since the educational threshold to have opportunities to access good jobs rises much or more than the average education increased, leading to unfulfilled expectations to adolescents that have advanced or completed secondary schooling. And the third reason is the absence or uselessness of sex education and empowerment for self-protection offered by schools.

Consequently, there exists a serious risk that the effect of education could be exclusively due to compositional effect and not to the decrease in the probability of early motherhood controlling the level of education. Moreover, given the vast inequalities that exist regarding the probability of becoming mothers among uneducated women, a dangerous paradox could be happening, since the reduction of inequality could be due to an increase in fertility among middle and middle-high educated groups.

The importance of Education on declining fertility

Cleland (2002) asserts that the links between fertility and educational attainment vary in the various phases of fertility transition and there is no threshold level of education to start the decline since countries have entered transition at different levels of school attainment. Nevertheless the author affirms that almost all countries will increase fertility differentials during the process of transition and this difference will disappear when countries reach low fertility levels. The only seemingly exception is Latin America, where the differentials still exist although fertility is reaching replacement levels and although data from the 1990’s show that the region will soon enough to follow the “rule”. The hypothesis that at the end of fertility transition differentials by education will not exist is shared by other authors based, not only but mainly, on European and North American trends (Jeffery and Basu 1996; Lutz and Goujon 2001 apud Cleland 2002).

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4 Also Carvalho, J. A. M. in communication at the IUSSP Conference, 2009, Session 28, Timing of childbearing.
Nonetheless, data for most countries in developing and less developed countries show that fertility for no educated women is much higher than for the more educated after controlling for socioeconomic variables (Jejeebhoy 1995 *apud* Bongaarts, 2003). Hence, taking a different direction, Bongaarts (2003) argues that there are two most common models regarding the links between fertility and educational attainment. One model is that where fertility is high and about the same in all educational groups in the beginning of the transition, the more educated start declining first and is followed by the other educational groups (“Leader–follower model”). By the end of the transition, all groups would have low and about the same levels of fertility. The second model presents differentials among all educational groups in the beginning of the transition and each group advances the transition keeping constant the differentials until the end of the transition (“Permanent difference model”). Testing the trends with data for 57 developing countries, the author concludes that the most prevalent model is a third one, a combination of both, where differentials are large in the beginning of the transition and no schooling category presents fertility levels closer to primary schooling than secondary, and at the end of the transition, the gaps get smaller, but still exist. The hypothesis put forward by the author to explain this behavior is that for the most educated women the wanted fertility is closer to the observed fertility than for women with only primary school or with zero years of schooling.

Indeed, since the improvements in education vary vastly in all countries, and other factors are determinant to the resulting level of fertility, such as place of residence, income, labor force participation, mortality levels (not including the proximate determinants), there are no consensus on only one model for the relationship among fertility and education. Nevertheless, there is a consensus that education acts as a postponement effect on delaying marriage and age at first birth, as well as acting on other proximate determinants as fecundability and abortion. Hence, for adolescent fertility the relationship between fertility and education has other components. From one side women that have low expectations of education as a project of life will marry and/or have children early and women with high expectations of schooling will delay marriage until after finishing education and entering labor market. The expectations women (or men) would have from education depend on the structure of education and labor market participation, which varies trough time and places. Also, the success in avoiding pregnancy and first birth to fulfill expectations, in a region of high prevalence of sexually active population, depends on the ability young people have to use modern and effective contraception\(^5\) (and access to abortion). In the case of Latin America we have witnessed that the great advances in education by women are not always followed by advances at the same pace in the labor market participation, where the market for women is still very segregated with lower status occupations. Also, it presents marked wage discrimination, even when controlling for working hours, which is another dysfunction of

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\(^5\) As mentioned, Ali and Cleland (2005) show that the use of contraception among young population in Latin American countries does not offset completely the effects of early sexual activity. Indeed, the region not only witnessed an increase in the proportion of sexually active population, but in the last decades, occurred an increase in the frequency of sexual relationships, since in the past it was more difficult and sporadic, and it is more naturally accepted currently.
female labor market (women have less hours in the labor market for cumulating the production to the reproduction work).

The paths education might affect fertility can be classified in two ways, according to Monstad, Propper and Slaves (2008). One mechanism is defined generally as “incarceration effect”, according to the authors, where the activities related to education would reduce the exposure to the risk of pregnancy by reducing the practice of sexual activity. The other mechanism would be by delaying age at first birth (mostly by delaying marriage in several cultures) and reducing the number of children, as stated before. For this second mechanism, the authors find evidence of delaying first birth in Norway by improving education for the less educated, but find no evidence on reducing the number of children. The effect of delaying first birth is also confirmed in the case of the United States and Norway by Black, Devereux and Salvanes (2008). Hence, the authors conclude that policies, and even legislations, to improve education at the lower bottom of the educational distribution would act in favor of decreasing teenager fertility. The evidence of improving lower education in delaying age at first birth is also confirmed by Kırdar, Dayıoglu and Koç (2011), for the case of Turkey, a middle-income country.

Interesting evidence is provided by Brand and Davis (2011) on the impact of college education on reducing fertility. The author contended that when there are improvements in education, which could result from external actions as compulsory schooling or any other reason, a high portion of female that would not enter or finish college would be pushed in this situation. If that is the case, the effect of higher education on delaying fertility would be different for women that had initially the propensity to follow higher education than for women that did not have this propensity initially. Testing data for a longitudinal study in the USA, the authors find support to the stated hypothesis and affirm that the data show:

.. a statistically significant reduction in the fertility-decreasing effect of college attendance and completion as women’s propensity for college increases. That is, disaggregating the effects of college shows that comparatively disadvantaged women who attend or complete college have lower and delayed fertility than similar women who did not attend or complete college. The effects of college attenuate as we consider women from backgrounds more predictive of college attendance. If we focus on college completion, rather than college attendance, the effect may even reverse.” (Brand and Davis, 2011, p. 883).

In Latin America there is no longitudinal survey that could allow for answering this research question. However, there is evidence that the incarceration effect does not operate in the region, since sexual activity has been increasing at the same time as education is improving. Also, fertility schedule for the region, in all countries with no exception, is high at young ages and, indeed, increased in the last decades in several countries when the educational system was improving, mainly for women, with a reversal in the educational gender gap in favor of women (Alves, Cavenaghi, Martine, 2011). However, there are large differentials of fertility by educational groups implying that better education would decrease fertility. The purpose here is trying to advance in this discussion by providing the “true” effects of improving education on reducing motherhood at young ages.
Data and research methods

The data come from Demographic Censuses microdata for countries that already carried out the 2010 round. It considered all countries that had given their microdata to the Population Division of ECLAC, the Latin American Demographic Center (Celade). Among those there were selected countries that had data in at least one year for years of education, that is: Brazil, Ecuador, Mexico, Panama, Dominican Republic and Uruguay that had census in 2010 and Venezuela that carried out demographic census in 2011. Costa Rica, which also has census in 2011, was excluded from the analysis because it does not include question on children ever born. Two basic processes were carried out in these data sets, which are described below.

Firstly, it was created a group of women aged 15-19 in two categories, those who are mothers and those who were not mothers by the time of the interview. The status of no mothers is defined as those women who answered zero or did not answer the question about number of children ever born. Hence, the mothers are those identified as having declared to have at least one child ever born. This distinction is important because the aggregated indicator of reproduction in adolescence utilized in this paper, for the investigation of effects of rising education on fertility levels, is the percentage of mothers and not the age specific fertility rate in adolescence (number of children of women aged 15-19 divided by the number of women aged 15-19). The variable created in this dichotomous manner is identified as “condition of motherhood”. Also, to describe the fertility trends in the region, including the most recent data available, we use the age specific fertility rate for women aged 15-19 applying a correction of P/F ratio, basic following the method proposed by Brass (United Nations, 1983).

Secondly, it was created an indicator of years of schooling, which in the majority of countries was based on a combination of the answers for the questions about level of schooling attainment (none, primary, secondary, high school/university, post graduation) and the last

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6 This decision is justified from an exhaustive comparison of the profile of the young women who did not answer with those of zero children. From one side, the pattern between these profiles is very similar to each other, and from another, very different from what it would be expected from a random distribution of the possible answers. This decision obviously underestimates the level of maternity because for sure there are a number of young women, for several reasons, that do not answer this item, but indeed have had a child. It is important to note that it would be possible to input motherhood to some cases base on the conditional probabilities of the variables associated with motherhood, for example if the woman was in a marital union or not attending school, but here we did not opt for this solution in order to maintain comparability among countries.

7 We consider here only the group aged 15-19 as adolescent. Notwithstanding the international definitions use to have 10-19 years older as adolescent, in this case, the group of 10-14 is excluded for substantive (the indices of motherhood at this ages are very small) and practical reasons (several demographic censuses only include women aged 15 or plus in the survey). Also, it is important to mention that the group of 18-19 sometimes is not considered adolescent if the perspective of life course is considered, mainly because a lot of women at this age is already out of school, are mothers, and are participating in the labor force; however, for simplicity we have denominated all aged 15-19 years as adolescent.

8 The selection of motherhood condition and not fertility rate is justified for public policies reasons (in which the objective is most of the time to avoid the occurrence of motherhood during adolescence) and technical reasons (since the age specific fertility rates can decline without a decline in the occurrence of motherhood, when, for instance the births of order 2 or plus decrease but not the birth of first order).
grade approved within this level (first, second, third, fourth, etc. depending on countries’ organization of school system). It is important to mention that some few cases had to be excluded from the analysis because of the lack of one or both of these two questions in the census\(^9\).

To accomplish the objective of estimating the effect of the changes in education on the changes of motherhood condition in adolescents it was utilized a classical direct standardization of the motherhood condition at young ages and a decomposition of this indicator by single age groups and education status. In this classical method the intensities of motherhood condition are applied to the same structure of the conditioning variables, in this case both single age and years of schooling. That is, the percentage of mother at age \(x\) with \(y\) years of schooling in the period \(t+10\) is applied to the population of women at age \(x\) and \(y\) years of schooling in the year \(t\). This procedure gives the number of expected births/mothers for each age and schooling category, which is divided by the population of women ages 15-19 at period \(t\) to give the standardized estimator of motherhood condition. The standardized percentage of mothers aged 15-19 years old at time \(t+10\) is comparable to the observed equivalent percentage at time \(t\) controlled by age and educational structures.

If the standardized percent is lower than the observed in time \(t\), then there was a decrease in the intensity of motherhood; if the value is higher then there was an increase in the intensity of motherhood; and finally, if the percentage is the same, the motherhood intensity was maintained. Comparing the percentage observed in \(t+10\), it shows the joint effect of change in age and educational structures in the intensity of motherhood. Thus, in other words, if the standardized percentage is higher than the observed, it can be said that the age-educational change had an exogenous reducing factor in motherhood in adolescence; on the other hand, if this value is lower than the observed in time \(t+10\), then the joint effect of age and education has an exogenous increasing effect. Finally, if the standardized and observed percentages are equal then the joint effect of age and education that an exogenous null effect\(^{10}\).

Formally, the direct standardization can be obtained as:

\[
\begin{align*}
\text{a) } \text{The intensity of motherhood at age } x, \text{ with } y \text{ years of schooling, in the year } t+10 \text{ is given by:} \\
& WMom^{t+10}_x & (1) \\
& WNonMom^{t+10}_x & (2)
\end{align*}
\]

\(^9\) The case of Brazil in 2010 is one of them, since the question on attained grade within the maximum level of schooling was not asked for people who were not enrolled in school at the time of the interview.

\(^{10}\) The eventual null effect can be either due to no change in the joint structure of age and schooling between time \(t\) and \(t+10\) or due to changes with opposite signs in both variables. Hence, to differentiate changes in age and schooling it is important to estimate a direct decomposition. This was carried out by first estimating the effect of age alone and then by difference with the combined effect it is estimated the effect of education.
\[ \frac{\sum_{15}^{19} SB}{\sum_{15}^{19} W} \]

Where
\( WMom \) is the number of mothers
\( WNNonMom \) is the number of non mothers
\( PWMom \) is the percentage of mothers
\( x \) ranges from \([15, 16, 17, 18, 19]\)
\( y \) ranges from \([0, 1, 2,…, 20]\)

b) Standardized births/mothers (SB) obtained by the application of proportion of mothers at time \( t+10 \) to the population of age \( x \) and \( y \) years of schooling at time \( t \).

\[ SB = \frac{\sum_{15}^{19} SB}{\sum_{15}^{19} W} \]

Where \( W \) are all women from each respective age and schooling category at year \( t \).

c) Hence, the proportion of standardized mothers correspond to the sum of standardized birth divided by the population aged 15-19 at year \( t \):

\[ PSB_{15}^{19} = \frac{\sum_{15}^{19} SB}{\sum_{15}^{19} W} \]

Trends in motherhood and age specific fertility rates

This section provides recent trends in motherhood and adolescent fertility by single age groups for different groups of schooling attainments, as well as standardized percentages of motherhood by single age and educational status for several countries in Latin America. Looking at the last three demographic censuses data in several countries allows to disclosure some of the differences and similarities in motherhood at young ages in the region.

Adolescent Reproduction in Latin America: world exceptionality and recent trends in motherhood and fertility

According to the most recent data available, Latin America continues having a fertility rate well above of what would be expect in light of its total fertility rate (Graphic 1) and its socioeconomic indicators.\(^{11}\) As it can be observed, the Latin America and the Caribbean region had the same level of total fertility as Asia in 2012 according to UN estimates, but had an age specific fertility rate for women aged 15-19 that is almost the double of Asia’s. On the other hand, Africa compared to Latin America has a TFR that is double in size but the ASFR of 15-19 women is 1.3 times more than in LAC.

\(^{11}\) The levels of socioeconomic indicators put the region as “medium income” in the world context.
The decrease in the percentage of mothers aged 15-19 in the last decade, as seen in Graphic 2, was heavily influenced by the trends occurred in Brazil, which represent 2/3 of the total population of the region. Besides the high level presented, adolescent motherhood has increased from 1990 to 2010 in the region, although it has decreased in the last decade (2000-2010), as it can be observed in Graphic 2, for women aged 15-19 and also for those between 15-17 and 18-19. Hence in the period of 1990-2010 the tendency was of increase and it was relatively higher among the youngest in this group, that is, the relative increase was higher for women aged 15-17 years old. For these reasons, besides others, as the social inequality, this paper examines early reproduction, which is amongst one of the top priorities of public policies and research agenda in Latin America.

Table 1 presents, for selected countries, the trends in motherhood condition by single age groups for three decades and also the age specific fertility rate for this period. Although the

Data for Latin America were estimated by aggregating information from different censuses as follows, for each decade. For the 1990’s: Argentina, 1991; Bolivia, 1992; Brazil, 1991; Chile, 1992; Colombia, 1993; Costa Rica, 1984; Ecuador, 1990; El Salvador, 1992; Guatemala, 1994; Honduras, 1988; México, 1990; Panama, 1990; Paraguay, 1992; Peru, 1993; Uruguay, 1985; and Venezuela 1990. For the 2000’s: Argentina, 2001; Bolivia, 2001; Brazil, 2000; Chile, 2002; Colombia, 2005; Costa Rica, 2000; Ecuador, 2001; Guatemala, 2002; Honduras, 2001; Mexico, 2000; Nicaragua, 1995; Panama, 2000; Paraguay, 2002; Dominican Republic, 2002; Uruguay, 1996; and Venezuela, 2001. For the 2010’s: Argentina, 2010; Brazil, 2010; Costa Rica, 2011; Ecuador, 2010; El Salvador, 2007; Mexico, 2010; Nicaragua, 2005; Panama, 2010; Peru, 2007; Dominican Republic, 2010; Uruguay, 2010; and Venezuela, 2011.
levels of motherhood condition and ASFR are high in all countries, there is a significant variation, with the lowest ASFR in Uruguay, around 50 children per 1,000 women, and the highest in Dominican Republic, 116 children per 1,000 women in 2010. Is interesting also to note that from 1985 to 1995, Uruguay presented an increase of 15.9% and then a decrease of 33% in the 15-19 ASFR and Dominican Republic had an increase of 6.1% in the most recent period (from 2002 to 2010). Indeed, almost all countries had an increase and then in the following years presented a decrease of fertility rate in adolescence. The exceptions are Panama and Venezuela, which presented only decreases, but started from rates above 100 in the 1990’s and by 2010 still have rates above 80 births per thousand women aged 15-19.

**Graphic 2**

**Latin America: motherhood percentage by age groups 15-19, 15-17 and 18-19, around 1990, 2000 and 2010.**

![Graph showing motherhood percentage by age groups 15-19, 15-17 and 18-19, around 1990, 2000 and 2010.](image)


Note: The estimation of motherhood condition was carried out by summing up the quantities of women with at least one child born alive in the specific age groups in the available censuses for the decade (and the cases of non-response were considered as zero children) and diving it by the total number of women in the specific age groups.

Regarding to the percentage of mothers by single age groups, there are also enormous variations by age and by country (Table 1). From 15 to 16 years old the rates generally double and again from 16 to 17 years old. In the group of 18-19, when women barely started adulthood, one out of 4 already became a mother. In countries like Panama and Dominican Republic, more than one out of 3 women at these ages already had at least one child. As for the trends in the percentage of young women who are mother by single age group, there are three types of marked behaviors: countries that had an increase in motherhood in all single age groups from the first period to the second and decrease from the second to the third period (Brazil, Costa Rica, Panama); countries that only increase in motherhood in all periods and ages (Mexico, Ecuador- with the exception of 15 years older’, and Dominican Republic); and countries in which the trends are different for each age (Venezuela). Moreover, it can be observed that there is no apparent relationship between the level of fertility and the trends in the last years.
Table 1
Latin America (selected countries): percentage of mothers by single age (15-19 years old) and age specific fertility (ASFR) rates for 15-19 years old women according to the last three demographic censuses.

<table>
<thead>
<tr>
<th>Country</th>
<th>Census’ year</th>
<th>Percentage of mother by women’s age</th>
<th>ASFR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Brazil</td>
<td>1991</td>
<td>2.2</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>3.3</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>2.9</td>
<td>6.5</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1984</td>
<td>2.0</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>2.5</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>2.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1990</td>
<td>6.2</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>3.2</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>3.8</td>
<td>8.8</td>
</tr>
<tr>
<td>Mexico</td>
<td>1990</td>
<td>1.4</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>1.8</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>2.0</td>
<td>5.3</td>
</tr>
<tr>
<td>Panama</td>
<td>1990</td>
<td>3.6</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>4.1</td>
<td>9.3</td>
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<tr>
<td></td>
<td>2010</td>
<td>3.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>2002</td>
<td>4.4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>5.6</td>
<td>11.3</td>
</tr>
<tr>
<td>Uruguay</td>
<td>1985</td>
<td>1.2</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>1995</td>
<td>5.0</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>1.2</td>
<td>4.2</td>
</tr>
<tr>
<td>Venezuela</td>
<td>1990</td>
<td>3.3</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>3.1</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>3.2</td>
<td>7.5</td>
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</tbody>
</table>

Source: Microdata from Demographic Censuses.

Education and the probability of being an adolescent mother

As we have exposed in the theoretical background, education is a factor that for different ways contributes to the reduction of reproduction at adolescent ages. Empirically, this relationship has been verified in Latin America, and it is well documented from the specialized demographic and health surveys. Nonetheless, these surveys, for statistical confidence reasons, group data in three of four categories of education (no education, primary schooling, high school and university) and age is analyzed in 5-years age groups. In general, using this classification it is observed an inverse and almost lineal relationship between level of education and reproduction at adolescent ages. However, these grouped data can hide important within-group differentials.

Indeed, the data from the demographic censuses, which do allow analyzing the percentage of mothers by single years of schooling, offer an image that is different regarding the
relationship among these two variables. Graphics 3 and 4\textsuperscript{13} show that against the classical view from the demographic surveys, there is no lineal relationship at all between education and reproduction; instead there is a point of inflection from where education became effectively a powerful force in reducing adolescent motherhood. It is important to note that the point of inflection changes over time, since it is around 5 years of complete schooling in the 1990’s and this changes to 7 years of schooling in the 2010’s. Additionally, these graphics suggest that – against an extended and, in general, very intuitive image - women at young ages with no schooling are not the ones with higher chances of being a mother during adolescence; those who concluded the primary education are the ones with higher probability of becoming mothers. This finding cannot be interpreted as a causal relationship because the direction of the causation could be reversed, since adolescent fertility could not allow for finishing primary school. Censuses data do not provide information to analyze the order of the events (pregnancy, birth and school dropout), hence this issue cannot be addressed here.

The fact that the accumulation of education up to 8 years of schooling is not a factor of “protection” when comparing with those women that have ever gone to school (zero years of schooling) deserves a hypothesis for future research, and the hypothesis has two components. The first component is the growing exceptionality of women with zero years of schooling as a reflection of the tendency of universalization of primary schooling in the region. Due to this, the segment of women with no schooling is the combination of two different groups in terms of reproduction. From one side it has women from social classes, ethnicities, and geographical areas highly excluded, among whose the early reproduction is very high. From another side it has women that for physical and/or mental limitations cannot be enrolled in school, and among whose the early reproduction is unusual (and sometimes unfeasible). As a result of the latter, the intensity of reproduction in this group as a whole is not as high as it would be expected. The other part of the hypothesis is that given the trend towards universal primary education, all those who do not conclude primary school almost certainly belong to the most excluded and poor, whom for material, cultural and public policy register high levels of adolescent reproduction.

\textsuperscript{13} Since there is a relationship between age and possible schooling attainment (an adolescent with 15 years old has zero probability of having finished high school or started university), graphic 3 and 4 are based on data for women aged 19 years old, in which the maximum education possible would be 13 or more years of schooling. This age, because this is the last age considered in the age group we are analyzing, has the virtue of being a better approximation of the probability of being a mother during adolescent ages. Certainly it underestimates this probability, since the age is truncated and there are cases where some 19-years old become a mother after the census’s date of reference.
Finally, Graphic 5 shows in a synthetic manner the reason to carry out the main analysis proposed in this study. When controlling both age (in this case for considering only women aged 19 years old) and also schooling, the picture that emerges is a generalized growth of adolescent motherhood between 1990 and 2010, which is particularly significant in the intermediate levels of education, with the exception of zero years of schooling. The point is that this trend contrasts with a drop in childbearing at adolescent ages in the majority of
countries with available data. The reason for this contradiction might be the educational changes in the last decades, as we explain in the next section.

**Graphic 5**

Latin America (selected countries): Changes in the percentage of adolescent motherhood by years of schooling for women aged 19 years old, around 1990 and 2010.

*Source: Microdata from Demographic Censuses.*

**The educational structure of the population and of the adolescent mothers**

All studies about education show that in the last decades there was a significant advance in education in Latin America, even when persists coverage deficits, in particular regarding to the secondary grade, and a large deficit in quality of education. Graphic 6 presents the trends in education structure of the female population aged 15-19 and it is clear the steady increase of the secondary and tertiary levels at the expense of primary and uneducated. In all countries shown in the graphic, this increase of education among adolescents was higher in the 2000’s, which in social and economic terms was a positive decade in the region, especially for the 2003-2008 period according to CEPAL (2010). In this way, the massification of schooling (a progress, no doubt) avoid poor and disadvantage women to be trapped in school exclusion (with zero years of schooling or having only primary

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14 “Latin America and the Caribbean have made significant progress in expanding coverage and access to education. In relation to the second Millennium Development Goal, the region already in the early 1990s had virtually achieved universal access to primary education. Despite this achievement, progression and completion of this level was far from optimal. Two decades later, the region has scored tremendous achievements in this area, but there is no sign that it is capable of universal completion of primary cycle of education, although some countries are likely to succeed. However, the regional situation regarding primary education is good, which should expand the focus of attention to secondary education. While at this level significant progress has been made, mainly in terms of coverage, inequalities in access, progression and completion of this cycle are a priority in the region and an achievement that is far from being reached”. (CEPAL, 2010, p.117, our translation). According to Wolfgang Lutz and colleagues estimates for the projections (P&DR): “In 2010, the global primary completion rate (measured by the gross intake ratio to the last grade of primary education) reached 90 per cent, compared with 81 per cent in 1999. Regional values ranged from 70 per cent in sub-Saharan Africa to almost 100 per cent in Latin America and the Caribbean and also in the Caucasus and Central Asia” (UN, 2012, The Millennium Development Goals Report, 2012, New York).
education); on the contrary, they attend and complete primary and in some countries attend and complete, or at least approach, high school.

**Graphic 6**


Source: Microdata from Demographic Censuses.

This school massification also is observed among mothers, those who also significantly and steadily increased their level of education between 1990 and 2010; the Graphic 7 shows the trends in schooling for 19 years old mothers in selected countries. In the case of mothers, the increases in school attainment are due to both the general expansion of educational system as to special policies and programs implemented in several countries to retain pregnant young women in school.

**Graphic 7**

Latin America (selected countries): trends in educational structure, mothers 19 years old, 1990-2010.

Source: Microdata from Demographic Censuses.
Given these changes in the educational structure, what is at stake is measuring its effect on the evolution of fertility and motherhood at young ages, to evaluate how much of the recent trends is due to the "exogenous" effects of educational change. For this purpose the direct standardization, in the terms explained in the methodological section, is presented and discussed in the section that follows.

The analysis of this standardization will make possible to elucidate some answers about fertility at young ages in the region that are relevant for public policies implementation, such as: Education advances that were very significant in the region were a decisive factor influencing decline of early fertility in several countries of the region?; Why some countries resist to the decline of early motherhood in the 2000 decade?; The effect of education on fertility is by intensity or only compositional effects?

*The evolution of adolescent motherhood: what and how much has been the effect of educational change*

Following the procedure outlined in the methodological section, the conditional probabilities by single age and years of schooling of adolescent mothers, in all censuses that had this information available, were applied to the corresponding population structure by single ages and years of schooling of the first census in each country. Hence, the standardized percentages are only available for the second and third censuses considered in the analysis.

Graphic 8 shows the percentage of mothers that are observed in each year (bottom bar) and the estimated percentage in the absence of changes in educational and age structured between the censuses (the top bar is the difference between the observed and standardized percentages). The results illustrate clearly that in all countries the combined change in educational and age structure have had a sound effect in the aggregated intensity of reproduction in adolescents (measured as the percentage of mothers in the population), always with a reduction effect. If there were no effects from the educational and age structural changes, the levels of motherhood condition would have been much higher than the already high values observed in the region - the percentages of mothers aged 15-19 in 1990 ranged from 12% to 16% (with the exception of Nicaragua that reached 23%) and in 2010 it would range from 16% to 24% (the highest here for Nicaragua) if educational and age structures had not changed last years. However, the effects in each country do not follow a single pattern and have different levels.

More importantly, in the countries that presented a decrease in motherhood rates in the last 20 years (Costa Rica and Panamá) and in the last censuses’ period (Nicaragua) the decrease was entirely due to the educational improvement. In fact, if there was no educational improvement, others things being equal, motherhood rates would have increased by 20% in

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15 For Brazil, the variable to estimate completed years of schooling was not collected for the entire population, and for Venezuela, the information of age by years of education was not still available by the time this analysis was carried out. Hence, the standardization procedure so far was carried out for six countries in the region. It will be important to analyze the trends in other countries as data are made available.
Nicaragua (from 23.7% to 24.7%), by 34% in Panamá from 2000 to 2010, and 46% increase in Costa Rica in 2011 (from 13.2 in 2000 to 17.2%). In other countries the improvement in education and change in age structure were not enough to decrease motherhood percentages; however, the increases would have been much higher in the absence of these changes. The case of Ecuador, that has a program to prevent unwanted adolescent pregnancy, is iconic because, although the educational improvement is significant in both decades, as it can be observed in graphics 6 and 7, the percentage of adolescent women grew from 13.5% to 15.9% from 1990 to 2000 and it would have increased to 17.2% if there were no educational and age changes, and in the next decade, the increase of motherhood to 17.0% would have been much higher (22.4%) if education and age structure were kept constant.

Table 2 shows a synthesis of the results of the standardization procedure, where the standardize percent of mothers is presented for six countries and, also, an estimation of the decomposed effects of education, age and the interaction between both. From this data it is clear that the changes in the percentage of adolescent mothers have had a much higher effect of educational changes than of changes in age structure, and it always operates decreasing motherhood. Also, age structure sometimes increases (Costa Rica from 1990 to 2000 and Panama in both periods) and sometimes would have decreased motherhood. This probably occurs because the meaning (or results) of primary education is very different for newer cohorts as the percentage of people attainment that grade increases along the years. That is, to have more than primary education 20 years ago is not the same as having attained it nowadays. As the educational structure improves, the meaning and chances that one more year of education gives is not the same when few people have attained that grade.
These results show evidence that the improvements in the educational system have had a significant declining effect in the observed condition of motherhood in several countries in Latin America. However, they also reveal that they not always mean important effects in decreasing adolescent motherhood, and in some cases, the progress in education is not enough to inhibit increases in the percentage of adolescent mothers in some countries, mostly in the 1990’s. Given the high rates of motherhood at young ages in the region and the slow decline that the rates have presented before an enormous increase in education, there are other actions that must be taken in order to assure that a large percentage of adolescents and young women in the region are not meant to childbearing before finishing school and entering a decent labor market, or at least live this stage of life not having to assume the responsibilities of raising a child as the only option available for going forward in life.

Table 2

<table>
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<tr>
<th>Country</th>
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Source: Microdata from Demographic Censuses.

Final remarks

Although giant advancements have been made in terms of the empowerment of women and improvement of women’s status in several key areas, such as education, as far as reproduction is concerned in Latin America, women are still a long way from sharing the responsibilities of bringing up children equally with men. A large proportion of women, mainly in the low socio-economic and educational groups, still experience life course
transitions that are associated with forming families at young ages. Last years data that are becoming available have shown small changes in the timing of childbearing but the factors associated with this behavior still are to be understood. The exercise carried out here had the intent to collaborate to advance the discussion and allow for better prediction of the future in fertility indicators and inequalities in the region.

The main propose was to determine the compositional effects of fertility changes due to education progress, controlled also by age, in the regions and consequently the effects of educational changes in the inequalities found in fertility by educational groups. A first important finding is that the relationship between motherhood rates and years of schooling is not linear and, most important, has been changing last years the threshold in the region where there is an important decrease of fertility rates at young ages for each attained year of schooling; this threshold was up to five years of schooling in the 1990’s and increased to 7 years in the most recent period.

Additionally, the answer for the question whether education advances that were very significant in the region were a decisive factor influencing decline of early fertility in several countries of the region, is a sound yes, they were decisive. As we have seen from the results, improvements in education can be accounted for most the declines in fertility, mainly during last decade, but the effects are not the same in all countries. In Ecuador, for instance, huge improvements in education were not enough to decrease fertility rates at young ages even with an explicitly program to reduce unwanted teenager fertility (Organismo Andino de Salud, 2009), the country has been presenting an increase in the rate since the 1990’s. On the other hand, countries like Brazil, with no explicit policy aimed to decrease unwanted fertility had important decrease in fertility after having experienced an important raise in the 1990’s (Cavenaghi, 2013).

Regarding the question on why some countries resist to the decline of early motherhood in the 2000 decade, there are multiple reasons. One of them is straight linked to the lack of timely comprehensive sexual education and universal access to reproductive planning for the youth. In order to advance these explanations it is needed to take into account data on individuals, from the demographic and health surveys with information on first contraception intake, which at this point was beyond the scope of this paper. However, to better understand the devaluation of education as a reduction factor in adolescent fertility and calling upon policies that can break barriers to timely access to contraception as key instruments for adolescent fertility decline in the region in the short run is essential. Understanding the complexity that is behind this behaviour and advancing in the explanations for the different contexts in the region are open issues for investigation.
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