Long-term Consequences of Adolescent Fertility in Colombia: both Women and their Children are Hurt?[1][2]

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Abstract

Although Colombia's overall fertility has steadily decreased since 1960 an increase in adolescent fertility has been observed during the past 15 years. Previous studies have focused on cross-sectional effects, which up-bias the results. This paper will measure the effects on these Colombian women's economic, educational, and health outcomes and their children's health status, by constructing a pseudo-panel using quinquennial DHS data from 1995 to 2005, pooling cohorts born between 1964 and 1974. The results prove practically no effects on education or employment rates for adolescent mothers. Similarly, there is no social stigma on the marriage market. However, there are important effects on their partners' quality, as these women are more abused by them and also in infant health and mortality, which require special attention for the design of policy implications of this problem that has become a public health issue in Colombia.

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I. Introduction

Although Colombia's overall fertility rates have steadily decreased since the 1960s, an unexpected increase in adolescent fertility has been observed during the past 15 years. According to the data from Demographic and Health Surveys (DHS) carried out in Colombia, age specific fertility rates (ASFR), for women ages 15 to 19, have increased from 73.4 in 1986 to 90 in 2005. Interestingly enough, this increase is not compositional (see Figures 1 to 4). That is, adolescent fertility has increased in both rural and urban areas, across educated and uneducated, married and unmarried women, and for teenagers living in all geographic regions, except for those in the Atlantic region. We believe that adolescents nowadays have more options in life than what adolescents had in the past, for that reason the potential effects on educational, labor and marriage markets could be linked to the creation of poverty cycles, as opposed to much older generations, when it was customary for Colombian women to marry and soon start motherhood at very early ages.

Three main explanations have emerged as possible causes of this phenomenon. First, social disorganization including the breakdown of effective social and family forms mostly in lower income households, also observed in the United States case (e.g. Baumer and South, 2001; Billy, Brewster and Grady, 1994; Manlove et al. 2000, Gaviria, 2000), and particularly true in Colombian cities (Barrera and Higuera, 2003). Second, an increase in premarital sexual activity with lack of knowledge on contraceptive methods and their proper use (Flórez and Núñez, 2002). Lastly, a rational shift in fertility timing as a response to socio-economic changes, also observed in Brazil and Dominican Republic (Jhonson-Hanks, et al., 2002).

In contrast, little research has been devoted to the socio-economic consequences of this striking pattern. Yet, what is certain is that this choice is likely to affect the adolescents' socio-economic and personal life as well as health outcomes for their children. These issues are the main interest of this research.

Two previous studies, using cross-sectional information, find that adolescent mothers in Colombia immediately reach lower educational levels and perpetuate poverty conditions in an already poor family (Gaviria, 2000), or lower their school enrollment rates and labor supply (Barrera and Higuera, 2003). The lack of longitudinal surveys in Colombia has not allowed the study of long term consequences of early pregnancies, up-biasing the effects of adolescent fertility as these authors mention on their own studies. Indeed cross-sectional studies on this topic account for educational

desertion at the moment of the pregnancy, missing the possibility of reinsertion in the (near) future. Moreover, cross-sectional data do not account for family background heterogeneity across different women, who have babies at different ages. For those reasons, the true effects of earlier pregnancies have not been fully accounted for in Colombia.

This document will empirically measure the long term effects that adolescent-mothers may experience by measuring educational, labor market, marriage market patterns as well as their children's health outcomes. We propose the use of three recent DHS carried out in Colombia (1995, 2000 and 2005) to build a pseudo-panel.[5] That is, we pooled and followed the birth cohorts of women born in between 1965 and 1990, through each of the DHS and that had their first baby between the ages 15 to 22. That will allow us to follow women at least until the age of 30 which is a desirable age for the purpose of this study, as most Colombian women do not increase their educational levels after the age of 27, less than 3% according to DHS data. Also, 90% of women stop having children at the age of 29.

As the treatment group for this study is adolescent mothers, the challenge is to find the appropriate control group. Adolescents who become mothers are typically self-selected by pre-existent socioeconomic conditions. For that reason, we propose three contrasts between women who became mothers at three different age groups: 15 to 17 (group 1), 18 to 19 (group 2) and 20-21 (group 3). The contrast between group 2 and group 3 allows for a control of a much more similar treatment and control groups, as the majority of age is reached at 18 and it coincides with the end of secondary education, thus these adolescents are closer in educational attainment and other socioeconomic indicators to those slightly older mothers, than younger adolescents. However, the contrast between group 1 and 2 intends for an inclusion of all adolescent mothers, and presents a closer control to the youngest adolescents. Finally, the contrast between group 1 and group 3 will present the extreme cases between the youngest and oldest mothers considered in this study. Although, the differences between both groups are obvious (i.e. lower educational attainments, legal access to job market, longer periods of exposure to risk of a second pregnancy), it could give an idea on the differences

[5] DHS-1986 had a very different sampling design from the rest of following DHS as it was implemented by a different agency. Also, DHS-1990 had two problems for the design of this study. First, it oversample urban places as it has been stated by PROFAMILIA (the Colombian agency that runs the field work and processing of the survey), and second, it produced very small-sized cells which could not fit the required large numbers for the purpose of this document.

between postponing motherhood by at least five years without up-biasing the results by much, as opposed to contrast to all other older mothers.

Our findings show that after controlling for pre-conditional socio-economic status the differences in educational attainment and unemployment outcomes narrow with time and are practically inexistent, however there seems to be the fact that the youngest mothers carry out worse quality jobs, when contrasted to their counterparts. We also show that there is no stigma in the marriage market as adolescent mother rates of unmarried women are even a little lower than those of their counterpart. However, their unions are more unstable, and their partners are definitely of worse quality, measured as less years of education, worse job qualities and more importantly they tend to be more abusive of their wives. Finally, there are important and negative effects on infant mortality and infant health. This result contradicts what has been found in developed countries and opens a new research path, as children born to adolescent women have higher probabilities of death, even if they are born after the mother is not an adolescent.

The remaining of this document is as follows. Section II includes a brief literature review. Section III presents the research design and data. Section IV has the results, while the last section includes final comments and conclusions.

II. Literature Review

The socio-economic impact of adolescent fertility has captured the attention of scholars around the globe. However, there is little available information to empirically test the different hypotheses, and whenever it is available the main challenge is to design the proper research strategy. There are different studies that describe recent trends on adolescent fertility in Latin-American using either national census and vital statistics or DHS. For instance, Rodriguez (2008) show that in all Latin-American there is no reduction in adolescent fertility trends in the recent decades and it is highly correlated with poverty and low educational levels. The author associates this non-reduction of the adolescent fertility rates to the reduction of the average age of menarche, initiation of sexual activity and the low rates of usage of contraceptive methods by adolescents. The latest, according to the author, is due to the assumptions made on the mature use of family planning programs that do not connect to adolescents letting them aside, for which he proposes a structural reform in order to incorporate and convince adolescents on the proper use of family planning services.

The following approaches coincide in the result that, independently of the research design, cross-sectional analysis up-bias educational and income consequences contrasted to longitudinal analysis; as adolescent mothers tend to self-select for several socio-economic characteristics. The results of studies using longitudinal data are presented as follows.

Hotz et al. (2005) define a natural experiment by comparing women who had a miscarriage as teens against teen mothers, using an instrumental variable approach to calculate unbiased estimates of the impact of teenage childbearing. Their study uses data from the National Longitudinal Survey of Youth, 1979 (NLSY79) in the United States of America (USA). Their results show that the negative effects of adolescent motherhood are much smaller than found in previous studies that use alternative methodologies, and that teenage mothers have higher income at older ages than they would have had if delayed pregnancy.

Geronimus and Korenman (1992) exploit the comparison between sisters of whom one timed her first birth as a teenager and other waited after teen years. The document uses data from the National Longitudinal Survey of Labor Market Experience Young Women's Cohort (NLSYW)-1982, the National Longitudinal Survey of Labor Market Experience of Youth (NLSY)-1988 and the data of the Panel Study Income of Dynamics (PSID)-1985. Two issues are salient of this work; first, controlling for family background decreases the effects on the socio-economic outcomes related to a teen birth. Second, their research design allows controlling for unobserved characteristics of family background which lower even more the negative outcomes of adolescent motherhood, such as finishing high school, reaching tertiary education, current income and being married, closing the gap in a significant way. However, the authors point out that the differences between cousins seem to favor the kids born to the oldest mothers.

Levine and Painter (2003) take one step further in this type of studies. By comparing pairs of classmates in the same high school and applying matching techniques, they find that adolescent mothers are more prone to having lower educational outcomes. However, most of such effect is explained by pre-existent conditions to motherhood, including lack of knowledge on sexuality and pregnancy.

Hogan et al. (2000) followed three cohorts of adolescent from the National Survey of Family Growth-Cycle V from 1985 to 1995 in the USA, and exploited the life history data of these women to apply a Weibull hazard model for the timing of first sexual intercourse and first pregnancy among sexually active adolescents. The most

remarkable finding is that parallel to the increase on teenage pregnancy there was an important change on sociological variables such as the increase of single-headed household and other non-conventional household living arrangements and unstable family life.

Sanchez et al. (2006) followed 84 pregnant adolescents who attended the prenatal clinic, *"Diana de Especialidades"*, in Oaxaca-Mexico. The women were followed for several months after the baby was born and recorded information in short interviews every visit they did during and after pregnancy. The authors found that 60.7% of these adolescent were single and hold unstable relationships, as they do not last over a year, also found positive correlations with low grades. More interestingly, many of these mothers dropped school before getting pregnant, and so the authors speculate that for these women pregnancy is probably the only chance they have to define their lives, as the fact of being an early drop-out increases the probability of a second pregnancy.

A similar study in Argentina (Burgos and Carreño, 1997) collected retrospective information to nulliparous pregnant women who gave birth, and used their historical clinics to contrast the health outcomes of babies born to adolescents and all other women who are set as controls for all adolescents. The sample was collected between 1993 and 1995 at Hospital *"Las Mercedes"* in rural Tucuman, which includes 9,002 women and of those 4,896 are adolescents. While for Hospital *"Durand"* at the city of Buenos Aires (BsAs) there were 1,069 women, of which 409 are adolescent. The risk factors are estimated separately to each dataset and show that for adolescents in BsAs being a single mother increases the risk of damages to just born babies (depression at birth in Apgar test #1) while in Tucuman it is associated to a higher risk of low birth weight and preterm births, compared to women older than 20. In both hospitals illiteracy and C-sections are good predictors of low birth weight and preterm births.

Another important outcome that has been studied in the literature is the effect that adolescent motherhood may have on marital prospects. Buvinic (1998) reviews four studies in Latin America, finding that teenage childbearing does not affect women's marital prospects negatively. In her survey, she explores the consequences of teen childbearing, describing the differences that emerge from each of the four studies reviewed, to try to determine the importance of background characteristics in teenage childbearing. The Barbados study, uses a sample of 303 women who gave birth between 1983 and 1984, they were interviewed six to eight years after giving birth. The study for

Chile used a representative household survey that was carried out in Santiago in 1990 to draw a sample of 505 women. They compared women who had a child at age 19 or younger to those who had them at age 20 or older. The study for Guatemala used retrospective life histories of 850 women, and followed them in three rounds of surveys: 1967, 1974 and 1987. The comparison was made using the same age groups as in the Chile study. The Mexico study also followed a sample of 462 women who gave birth in a major hospital between 1987 and 1989; they were interviewed four years after giving birth. The comparison was made between women who had given birth before age 18 and those who did so at age 21 or older.

Their results show that adolescents who bore children were not more or less likely than adult mothers to be married in the four countries. Yet, while adolescent motherhood does not seem to carry a social stigma that would affect women's likelihood to find partners and marry, it does seem to be associated with changes in family size (larger families), and family arrangements— more adolescent mothers as boarders; fewer biological fathers as heads and as having financial responsibility for and attachment to the child; and more grandparents taking over responsibility for children. Thus, following this particular result, children of teenage mothers are more likely to live without the father. Mothers expect less educational attainment from them, are less likely to attend pre-school or childcare. These children also had lower scores on language development tests and more behavioral problems. As a result, the teen motherhood cycle tends to repeat itself. In Mexico and Chile adolescent child bearers were themselves born to adolescent mothers. Two thirds of adolescent mothers in Mexico had mothers who also gave birth in their teen years, suggesting that adolescent motherhood can be learned and transmitted within families.

In contrast, for the English society Ermisch and Pevalin's (2003) results suggest little adverse impact of a teen-birth on woman's qualifications, employment or pay at age 30. But the estimated bounds indicate that the partner she is with at age 30, if she has one, is more likely to be unemployed. By using data from the British 1970 Cohort Study and following the methods developed by Hotz et al. (1997) they find that women having a teen-birth appear to fare worse in the 'marriage market', in the sense that they partner with men who are more likely to suffer unemployment. Having a teen-birth also tends to reduce the probability that a woman is a homeowner at age 30.

Other set of documents can only exploit cross-sectional data. Although, authors are aware that it up-biases the results, their main findings still point out that adolescent

mothers tend to self-select by several socio-economic outcomes. Studies for particular countries, such is the case of Uruguay (Gerstenblüth et al., 2009) and Brazil (Berquo and Cavenaghi, 2005), show that it is very hard to find a decisive effect on educational outcomes, although both studies conclude that educational outcomes and school enrollment are negatively affected by adolescent fertility.

In Colombia, Gaviria (2000) uses information from the Social Survey-2000 (household survey carried out in urban Colombia), to measure the role of socio-economic characteristics on the probability of becoming pregnant, using a linear probability model. The author also performs the Oaxaca decomposition to measure how much of the differentials in pregnancy rates between poor and non poor, is attributable to sexual activity and the propensity of becoming pregnant. He finds that teenage pregnancies reduce educational attainment and as a result these women have low expectations for social mobility. His results suggest that in urban Colombia differences between poor and non-poor teenagers are not associated with knowledge or access to birth control methods, but rather with more deliberate decisions associated with low socioeconomic expectations. The policy implication, thus, is to move into the line of raising economic and social mobility expectations, to increase the opportunity cost of becoming pregnant early in life.

For Colombia and Brazil, di Cesare and Rodriguez Vignoli (2006) use a logit model on the probability of being an adolescent mother. The authors find that it is negatively associated to the age at first union, education, the use of contraceptives, and belonging to a traditional family with both parents in the household. As with other studies, once the social class is controlled education loses its effects.

Núñez and Cuesta (2006) do an estimation using instrumental variables to estimate the potential effects of adolescent fertility on educational outcomes, another simultaneous equations model to estimate the effects on the labor market and a propensity score matching to find out the effects on adolescent's kids, for women who by year 2005 where between 22 and 30 years old, using DHS-2005. Like with most cross-sectional studies the authors find that adolescent fertility reduces the average educational and job market outcomes, as it is also positively related to the formation of unstable family formations. It also portraits very bad health and educational outcomes of adolescent's kids, which are reflected in negative effects of vaccination, health status and years of education.

Flórez and Núñez (2002) examine teenage fertility trends using DHS surveys for Bolivia, Brazil, Colombia, Guatemala, Dominican Republic and Peru for the second half of the 1990s. They find that teenage fertility (TF) trends have been different across countries and across regions. In all countries rural areas experienced an increase in TF, but it was not necessarily in urban places. Bolivia and Guatemala show little change in both urban and rural areas, remaining as the two countries with the highest teenage fertility levels. Also the proximate determinants of TF vary across countries. For instance, in Peru postponement of marriage, intercourse patterns, high acceptability and use of family planning methods has helped to the decrease of TF. In Brazil and Colombia, although contraception is widely spread among adolescents, teenage fertility has increased as a consequence of increasing intercourse patterns, mostly before marriage, whereas marriage patterns has had no-effects.

Other factors, such as sociological aspects, have been important in the study of the causes of adolescent fertility. In particular, access to information, age to first sexual relationship, family environment and similar are important determinants to adolescent fertility, as pointed out by Pantelides (2002) in her literature review for Latin America. Similarly, Flórez et al. (2004) follow Simmons' (1985) conceptual framework. Namely, socioeconomic and context factors affect both the level and timing of adolescent fertility through proximate determinants, by taking into account the influence of peers, couples, parents, teachers, and the media with regards to sexual activity, dating and pregnancy. The study focuses on decisions adolescent girls make about becoming sexually active, first pregnancy and first birth for two Colombian cities: Bogotá and Cali. Their data show that adolescents living in high socio-economic strata spend most of their teen years studying, while most adolescents from low strata start engagements (marriage or consensual unions), motherhood and employment at early ages.

Their study also shows that adolescents become sexually active around age 15, but only 55% to 65% used any contraceptive method during their first sexual intercourse. Qualitative analyses on the data showed that teenagers have unfounded beliefs about use of family planning, reflecting the lack of knowledge on the topic. And this lack of information is more spread in women living in more disadvantaged households. More importantly, the authors do not find any effect on the exposure to sexual education in the schools, but the contextual household factors such as previous teenage fertility in household, sexual abuse to the adolescent, physical and/or verbal abuse, low level of communication with the mother, lack of supervision and a favorable

perception of early sexual activity have a positive effect on the likelihood to start sexual relations, both in Bogotá and Cali.

A follow up of this study, Flórez (2005), uses survival analysis to evaluate the main characteristics associated to the first pregnancy in Bogotá and Cali. The results show that, as before, adolescents from disadvantaged homes are more likely to become mothers, which also coincides with the fact that broken families or where mothers of adolescents are absent or do not talk to their daughters about sexuality increases the risk of adolescent motherhood; while having access to sexual education and family planning methods, either from parents or the school, reduces the probability of having a pregnancy.

Other studies found evidence on the effect of communication with parents on the likelihood of starting sexual activity or using contraceptive methods. Results are mixed where a group of studies found that a favorable opinion on the mother's behalf contributed positively to early sexual activity; in line with this evidence, a misunderstanding on the adolescent's part of the proximity to their parents on sexual subjects may increase sexual activity. Casper (1990) found no evidence of communication with parents on the start of sexual activity, while she did on the use of contraceptive methods. Studies also find evidence that adolescents do not have access to proper information about the use or access to contraceptive methods because the clinics may not offer assistance adequate to their needs. These places may be too costly, too far or not respective of their privacy (Davis et al., 1993).

On the issues related to health outcomes of babies born to adolescent mothers, Auchter et al. (2005) review previous literature that point out at higher health risks of these babies that are related to lower attendance to prenatal controls and pediatric controls once the babies are born, higher proportions of babies born with low birth weight and preterm pregnancies, anemia and malnutrition of mothers, and even higher infant mortality rates, when compared to women ages 20 to 30. They also collect information from a prenatal clinic in Corrientes (Argentina) which includes medical history records for both mothers and babies and conclude that there is a negative relation between the number of prenatal visits and complications at birth; less prenatal visits are also related to higher proportions of babies born with low birth weight and preterm pregnancies.

Another case study, by Fernandez et al. (2004), was carried out between June and December 2001 at Hospital *"Julio Trigo Lopez"* in La Habana (Cuba). The authors

point out that current literature show no big differences in the health outcome of babies born to adolescents compared to older women. The main differences simply point lower results due to low nutritional status and less prenatal visits. Yet, with the data they collected find that one third of women who where undernourished, and that this fact is highly correlated to babies born with low birth weight. Also, they found an infant mortality rate (IMR) twice higher for adolescent mothers (9.7 per thousand) compared to older women (4 per thousand).

In fact, Perdomo et al. (2005) do another case study for Cartagena-Colombia which focuses on the nutritional outcomes of adolescent women. For this study, biometric measures, urine and blood samples were taken. These pregnant adolescents were part of the *Juan Felipe Gomez Escobar* program and the information was collected between March and April 2005. The authors find a direct correlation between malnutrition and higher probability of complications during delivery, including babies born low birth weight and preterm pregnancies.

In summary, teenage fertility literature has followed several methodological approaches to determine the impact of this phenomenon on the lives of mothers. Yet, there is consensus in two issues. First, most of the effect on education and income is attributable to background characteristics or self selection; meaning these women would still be worse off if they had not had a baby while being adolescents. Second, cross-sectional data increases this bias even more. Nonetheless, several critiques arise on the inadequate control group used on the studies cited above. In some cases, because there are large differences on the two groups, then the comparison is null for causality purposes. In other cases the empirical test hardly meets statistical criteria, due to very small samples. For instance, choosing sisters or comparing miscarriages have this type of problem, as it is very hard to match this type of pairs in sample surveys, resulting with very little observations for the analysis. Finally, there is little research in Colombia, and in general in Latin America, on the health outcomes of adolescents' babies. All here cited studies are case studies carried out in particular hospitals or clinics, which by definition are self-selected population, although all point out under-nutrition highly correlated with delivery problems and babies born with low birth weight.

For those reasons, and the following in the next section, the research strategy we chose incorporates such critiques and tries to correct them by, on one hand, choosing a

more appropriate control group. And, on the other hand, using the construction of the pseudo-panel and all observations included in the survey to keep statistical confidence.

III. Research Strategy

As there is no longitudinal data available on fertility for Colombia, there are no previous efforts to prove the long-term effects of adolescent motherhood. Our approach is the construction of a pseudo-panel from the random samples of women in their reproductive years, as drawn by DHS surveys carried out in Colombia from 1995 to 2005. We thus, follow the cohort of women born between 1964 and 1974 and who gave birth to their first child between the ages of 15 to 22. Table 1 shows the details about the number of women in each group that allows us three possible contrasts. In an attempt to control for the pre-existent low socioeconomic characteristics, back when these women were adolescent, we included the height of women, measured at the moment of the survey. This anthropometric measure does not change with time, as women do not grow over 2 centimeters after the date of their menarche and is highly correlated to low quality in nutritional intake and therefore with lower income. Taller people usually come from higher income families and even from higher income countries and vice versa is observed for shorter people (i.e. Meisel and Vega, 2006; Fogel, 2000; Fogel, 1997), and Colombia is not the exception (Meisel and Vega, 2004; Ribero, 2000). With such information we will try to prove the effects, if any, on two sets of outcomes. The first set refers to three women's outcomes that will be measured following expression of the reduced model:

$$Womens'outcome_{i(t)} = \alpha_{i(t)} + \theta a_{i(t)} + \beta x_{i(t)} + \varepsilon_{i(t)} \qquad (1)$$

For $i(t)$=1, 2, …, N_t and t=1, 2, …, T, where the subscript $i(t)$ refers to cells and the number of cells N_t is different for each year t. In this equation the dependent variables (*Womens'outcome*) could be educational, job market and marriage market outputs. Each will depend on the fact that the mother i, who belongs to cohort t, had her first child while being adolescent captured by the estimator θ, controlling for other individual characteristics included in vector x and captured by estimators β. And the disturbance term $\varepsilon_{i(t)}$ does also include a time-invariant individual effect, $f_{i(t)}$, which characterizes the pseudo-panel data. It is important to remember the reader that is only through the use of pseudo-panel data that we can disentangle the cohort (part of the fixed effects) from the age and year effects. This would not be possible if we only

worked with cross-sectional data from only one of the pooled surveys, as for any chosen years there would be perfect collinearity between the age and years.

Besides, the estimators from pseudo-panels are consistent, as noted in the literature review on pseudo panels done by Mora (2006), as long as the original samples are large enough as it is in our case, and the each cell has enough observations. For all continuous dependent variables the regression is a linear estimation, while for dichotomous dependent variables, the regressions follow a logit model.

Also equation (1) includes a "constant" term, $\alpha_{i(t)}$, which is definitely non-constant as it varies with time and certainly can be correlated to independent variables. Deaton (1985) shows that whenever there are large numbers in the original sample, the best estimation for this term is an approximation to its mean value, $\bar{\alpha}_{i(t)}$. This value can be approximated by including a series of dummies per cohort for all cohorts included in the pseudo-panel. For that reason, we have included in all estimation such series of dummies, which allow for consistent and unbiased estimators as well as presenting a control for each cohort's fixed effects.

The first women's outcome to consider is educational attainment. It is not only a job market indicator, but also a proxy for individuals' income, as it is not recorded in the survey. Women's education is also the most important determinant on infant mortality and infant health in Colombia (Urdinola, 1998) and is strongly correlated with their partners' education (*assortative mating*), which in turn will determine household's income, its redistribution within household members and health preferences for children in the household. The next two outcomes refer to job market: unemployment and job quality for those occupied by the time of the survey. We expect to find lower unemployment rates for adolescent mothers, like most previous studies pointed out (see section II), given that younger mothers feel an additional pressure to find any kind of job once their child is born. But, we also expect the quality of their jobs to be poorer than those of comparable non-adolescent mothers, as they have less waiting time when searching for a (better) job. As income is not available in the survey we have measured job quality as the formality of the current employment of women. More formal jobs are considered as high quality (professionals, technicians, managerial, clerical, sales, and skilled manual workers), while informal are classified as lower quality (independent

with low education, family worker without remuneration, domestic worker, unskilled manual workers, and agricultural jobs).[6]

The last set of the women's outcomes relates to the marriage market. Marital status accounts for the success/failure on family formation for adolescent mothers and the stability they may have for their kids and themselves, so we will look at their current marital status looking for segregation in the marriage market and for the number of partners they have had to quantify for stability. Colombia has experienced profound social changes during the second half of the 20th century; we expect to find little effect on this issue. That is, until the 1950s women had children at younger ages, but mostly were conceived under marriage, as children born out of wedlock were socially segregated.[7] Also, adolescent unmarried mothers were not allowed to continue studying, and most of them were denied at their paternal homes, as the father of the child typically did not marry the young mother. Yet, since the 1970s Colombia has suffered dramatic social changes on this matter. For instance, by that decade almost all couples were formed in marriage, while by the turn of the millennium more than 60% of Colombian couples live in cohabitation (Flórez, 2000), and children born from those family formations are not socially segregated any more. In fact, the society has changed so much in this respect that even legislation has reacted to those changes. As for today Colombian couples formed from cohabitation *and* that have lived together for two or more years have the same legal obligations and benefits of any married couple, for each member of the couple and the children born from that family arrangement. Also, by law adolescents who become pregnant cannot be expelled from private or public schools any longer (Laws: *Sentencia T-772/2000, Sentencia No. T-211/1995, and T-543 de 1995)*.

Finally, even if women live in stable relationships the quality of the partners may differ between adolescent mother and their counterparts, as has been pointed out by other researchers. Thus, we measure their quality by two proxies: (1) their current partners' job quality, which follows the same definition of women, and (2) if women have been physically abused by their partners, the richness of the data allows us to estimate two proxies of less severe domestic violence (pushed, slapped, punched or

[6] Women occupied under the category "services" were classified as formal jobs if they worked outside their households and received payment; and informal otherwise.

[7] Among others could not carry their father's last name, were not accepted at school or church, and did not have the same legal protection as their half-brothers born in marriage.

kicked) or more severe domestic violence (partner tried to strangle or burn, been threatened or attacked with weapon).[8]

The last set of outcomes refers to children's outcomes, which will be measured following Equation (2):

$$Health_{i(t)j} = \alpha_{i(t)} + \theta m_{i(t)j} + \alpha z_{i(t)j} + \beta x_{i(t)} + \varepsilon_{i(t)j} \qquad (2)$$

Those outcomes are basically health indicators of children *i* born to mother *j* who belongs to cohort *t*. Two indicators are available from DHS data: infant mortality and birth weight. The latest, by nature, is only available for their kids born during the five previous years at the date of the survey.[9] Similarly to the previous equation, the effect of teenage motherhood will be captured by θ, controlling for individual characteristics of the child *i*, measured by the vector of characteristics *z* and capture by the estimators α; and individual characteristics of mother, summarized by vector *x* and captured by estimators β. The main indicators from the DHS questionnaire allows to construct mortality indicators and birth weight, as it is one of the best predictors of future health and even motor and intellectual development of children in future years (see Douglas et al, 2005). As younger mothers may be exposed to the risk of having additional children for longer periods than their counterparts and thus may indeed report more children with different health qualities, we have controlled for parity of the baby for the first and second child, which the data allows numbers large enough for the here-proposed methodology.

A. The Data

The DHS has been designed to capture information, among other topics, on health programs, contraceptive use, fertility, infant and maternal mortality and nutritional status. The DHS survey targets households, collecting information of women in their reproductive ages (12 to 50 in Colombia) and their children born in the previous five years. It also collects several anthropometric measures, vaccination coverage and nutritional status of both mothers and their children, all of them very relevant for this

[8] The categorization of formal and informal jobs for women's partners differs only in the fact that those working in the category of "services" cannot be reassigned as the question on place of work and payment is not asked to men. Thus, for partners we accounted for three categories: formal, informal and services.
[9] The definition of children born dead or alive in Colombian DHS follows the international standards of census questionnaires; the literal question is "Is your child (name) dead"? and applies to all children ever born to women. Instead, birth weight is the weight registered at birth and collected for the kids born during the 5 previous years at the moment of the survey

particular study. Moreover, it accounts for a series of socio-economic variables of these women and their households, as well as the basic demographic variables. Colombia is one of the few Latin American countries with several DHS implemented every five years since 1990, being 2005 the last survey. This allows the construction of a pseudo-panel, satisfying the statistical conditions for it (Deaton, 1985), given that the samples of each survey are large enough both for women and their children. In pseudo-panel data the measurement error is assumed to be normal, independent and homocedastic. In particular, all measures capture the cohort's mean measures instead of the individual's means. Thus, we can assume that measurement errors are distributed with zero mean and independent of the true values, and the rest of the econometric estimations will follow the standard statistical models, and the only difference is that there are not worked on independent and identically distributed vectors but matrices, instead.

B. Treatment and Control Groups

Media news has shown several cases of girls below age 15 giving birth in Colombia. As a result DHS started collecting information for women from age 12 since the 1995 survey. However, when looking at the data there are just a handful of observations of women below age 15 pregnant or already mothers. Moreover, the same media news show that most of the time those young girls have been victims of some type of abuse. For that reason those cases make a complete different group of adolescent mothers and we will only focus on women between ages 15 and 22.

Unfortunately a controlled experiment that directly contrasts between the here-proposed treatment and controlled groups is not possible to carry out, with the available data. Both covariates and output variables are changing in the long run and confound to each other, besides we cannot establish the original socioeconomic characteristics of these women back when they where mothers for the first time. Thus, the best we can do is to run the econometric models proposed in equations (1) and (2), keeping two contrast groups at a time. Contrast one (C1) exploits the natural discontinuity around age 20, compares the outcomes of interest of older teenage mothers (18 to 19) and their children against those who became mothers by 20 to 21 years old. Contrast two (C2) presents the differences between the youngest adolescents (15-17) and the slightly older adolescents (18-19). Finally, contrast three (C3) presents the differences between the youngest and the oldest mothers: ages 15 to 17 versus 20 to 22. The purpose of the three different contrasts is to have the best control group for each treatment, trying to

homogenize in both socioeconomic and fertility characteristics. For instance, the contrast of the youngest adolescents (15-17) to all other mothers is known to up-bias the results, thus narrowing the control group the slightly older non-adolescent mothers, ages 20-22, will reduce such bias (C3). However, women who become mothers right after their adolescence years probably have higher chances of having more years of education, easier access to the job market and lower exposure to risk of being a mother of a second child, compared to the youngest mothers. For that reason, a better control group for the youngest mothers is the slightly older adolescents, ages 18-19, presented in C2.

The pseudo-panel adds up to a total of 6,554 observations and 44 groups for a panel of 132 observations in the case of C1. C2 counts up to 6,440 observations and 55 groups for a panel of 163 observations. Finally, C3 is composed of 7,503 observations and 66 groups, to form a panel of 195 observations. The cells were built from birth cohorts of women born in years 1964 to 1974 and ages at which women became mothers. All of the following econometric exercises include the estimations of fixed effects by cohorts by including each cohort's effects, following Deaton (1985), which are used as a valid estimator of the fixed parameter, $\alpha_{i(t)}$, in equations (1) and (2). By doing so, the estimators are consistent both for continuous and categorical variables as proved by Deaton (1985). The inclusion of such dummies help to reduce individual's selection bias transformed into cohort's selection bias, and all estimations have been proved to meet the statistical needs of traditional models.

IV. Results

Descriptive statistics present the observable outputs of the women of interest at the ages of 25, 30, 35 and 40 for each contrast group, Tables 2 to 4 show the differences in means for the three different contrast groups, evaluated with the classic t-test. Table 2 shows the average differences for educational and labor market outputs, where we can see that women who became mothers at earlier ages have on average lower educational attainment although the gap closes slightly by the age of 40. In the case of C2 the gap disappears by age 40. We do not find a significant difference in the quality of jobs between younger and older mothers and the proportion of good jobs shows an inverted U pattern, for the two extremes with the lowest proportions. The descriptive statistics do not show differences between younger and older mothers in the proportions of being

employed; only in the case of C3 at age 30 we find a significant difference in favor of the older mothers.

Table 3 shows the descriptive statistics for the marriage market outcomes. For C3 there is a significant difference in the proportion of women living with a partner at all ages (first and second columns); for the youngest mothers the proportion increases with age. The proportion of women who never get married appears to be lower for younger mothers; in the case of C1 only by age 40 is a significant difference, the same is true for C2, while for C3 the difference is significant at ages 25 and 30, but disappears at 35. The proportion of women who have more than one union (third column) tends to be higher for younger mothers, and it increases the most for C1; the difference is significant only by age 30 in both C1 and C2, while for C3 women giving birth by 15-17 have a higher proportion of more than one union when compared to mother at 20-22. Column fourth of Table 3 shows the "quality" of their partners, where we find that partners of the youngest mothers have lower education on average, this difference is significant for most ages in C3 and C1. However, when we proxy partner's quality by his job quality this differences are non-significant, with the exception of C1 by age 40, where young mother's partners show a higher share of good jobs. Finally in the case of physical violence (last two columns), the share of women suffering from severe violence is higher among youngest mothers, and the proportion appears to increase with age. In the case of less severe violence results are weaker, except for C3 that shows the just described pattern, with a much higher share of women suffering from less severe violence, close to 50% of the youngest mothers.

Finally, Table 4 shows the average difference between the proportions of surviving children between the contrast groups. Once again, the largest and more significant differences are in C3, with lower proportions of surviving children for the youngest mothers.

A. Estimation Results

As stated before, all of the following estimations include the approximation of the constant parameter $\alpha_{i(t)}$ in equations (1) and (2) by including fixed cohort effects that produce consistent estimates, which will correspond to the effects 20 to 30 years after these former adolescents became mothers for the first time. Tables 5 to 7 show the results on educational attainment and job market, the marriage market and infant

mortality. The three panels have the results of each contrast, above-described, and include the women's height as a control for pre-existent socioeconomic characteristics.

Table 5, first column, shows in all cases negative and significant effects of adolescent motherhood on years of education; however the magnitude varies with the contrast group. The first contrast (C1) shows the smallest effect, being the difference between the oldest adolescent mothers (17-18) and the youngest adult mothers (20-21) just below one year of schooling difference. Similarly, C2 shows a difference of just over a year and C3 shows a difference of almost two and a half years. These results evidence the importance of the contrast group on the analysis. The choice of C1, where women are all considered legally adults, and reached the average age of finishing secondary education, making both groups more homogeneous in this particular output. The opposite is true for the widest contrast (C3). The youngest adolescent mothers are, on average, at least five years of education apart from the women who became mothers at the age of 20 and years later these very young mothers definitely tend to catch-up with their older counterparts, although in the long run they still show a difference of two years of education. In all cases, thus, these results suggest a negative effect of adolescent motherhood on the accumulation of human capital.

Table 5 also shows the results on the labor market outputs. The second column shows the odd ratios for those occupied at the time of the survey of being employed in a formal job. In all cases adolescent mothers have a lower probability of having a better job, contrasted to their particular counterparts. Both C1 and C3 effects are also significant and show a similar effect of lower probability of around 30% in each case. However, C2 shows a non-significant effect of just 3% of a lower probability of having a more formal job for the youngest mothers (15-17), compared to just a couple of year older adolescent mothers (18-19). Although these results cannot be fully conclusive, as the available data only takes into account the currently employed women at the time of the survey, it suggests that in this case is also true that the youngest mothers have lower job quality when compared to women who postponed their motherhood right after teen years. Finally, column 3 shows the results on the probability of being employed at the time of the survey. In all cases the effects are non-significant and odd rations are in all cases very close to one, which supports the previous results on the negligible effect of adolescent motherhood in the probability of being working in the long-run, and poses as a potential reason the fact that the young mothers feel an additional pressure to find and sustain a job all their lives in order to provide for their youngest.

The second set of outcomes for women is related to the marriage market. The first and second columns of Table 6 show no segregation on this matter. In all cases and contrasts the coefficients are significant and show a lower probability for the youngest of never being married. Once again, the magnitude changes with the contrast made, being the most dramatic the effect on C3, where the youngest adolescent mothers have a 50% lower probability of never being married compared to the young adult mothers. This result simply reflects that, as in other Latin American countries, there seems to be no stigma for adolescent mothers in the marriage market, which makes sense if we consider the fact that most couples live under informal arrangements, and marriage is not anymore a condition to start a family in the Colombian society. Now, looking at the proxy for stability on the unions that the contrasted groups have, we found that the youngest mothers always showed a significant and larger probability of being in more unstable unions, as the odd ratios show a bigger probability of having more than one partner 20 to 30 years after they became mothers. The larger the difference between the treatment and control group, the larger is also this probability. For instance, in C1the probability that an adolescent mother of 18-19 compared to a mother of 20-21 is around 40%, while contrasting the youngest adolescent to our oldest mothers, the probability increases to over 100%. In this case, the differences explain both by the event of interest, but also this same fact (becoming a mother at young ages) increases the exposure to risk of being involve in a (unstable) relationship, as there is no social stigma in the marriage market for these women in Colombia and the same fact of having a baby is what pressures a young couple to stay together, even if the relationship is not definitely the best equilibrium for both parts in the marriage market.

The remaining columns in Table 3 intend to account for their current partner's quality. Column 4 shows a slightly and significant difference in their partner's years of education of the youngest moms: less than a year for the first two contrasts and of almost two years for the extreme contrast (C3). However, it is very probable that there is assortative mating in this issue, for that reason we focus on the analysis in the following columns of Table 3. Indeed, column 5 shows that partners of the youngest mothers have lower and significant probabilities of having a good job, of 10% (C2) to 25% (C3). Moreover, the last two columns show a much higher and significant probability for these women of being victims of domestic violence in hands of their partners. The odd ratios show, again, that for the biggest the age difference between treatment and control groups, C3, the larger is the probability for the youngest mothers

to have an abusive partner in the long run. The effects are more dramatic for severe violence, physical abuse, than for less severe physical violence, with odd ratios that show higher probabilities of this victimization pattern of 34% for C1, 43% for C2 and 100% for C3. Many different factors may be leading this particular result that could come from lower educational attainment, to the need of economic support, passing through sociological and even psychological differences between the youngest mothers, compared to their counterparts. The path to these results is untraceable with the current data and lies outside the objectives of the present study, however poses a very interesting research question worth pursuing in the future.

Finally, Table 7 shows the results on infant survival for the children of the mothers under study, being a dichotomous variable which takes the value of one if her first and second child are still alive and zero if at least one of them is dead. The results show that, on average, an adolescent mother has a lower probability of not facing the death of her children ranging from 33% in C1, 45% in C2 to 64% in C3, compared to women who postponed their maternity by a couple of years. This kind of reduction in infant mortality is only accomplished by large and massive social investments, such as the increase of average female's years of education, clean piped-water, sewages and access to toilets (see medical literature review on Miller and Urdinola, 2010).

Unluckily, the sample does not allow following other health outcomes of children at older ages as the questionnaire for children is for those five year of age and younger over the surveys, and thus the sample design may produce larger errors when constructing a pseudo-panel for children and not mothers, the sampling target. Despite of this we estimated a pooled sample regression for children born to teenage mother, as expressed in equation (2). Table 8 shows the results of these estimations restricting the sample to first and second born children respectively. Results show significant impacts on birth weight of children born to teenage mothers; these children face a higher risk of weighing less than 2500 grams. The results are significant for C1 and C3, where first borns in C1 have a 7% higher likelihood of being born with low weight and second borns have a much higher probability, 39%. In the case of C3, first borns have a 6% higher change of having been born with low birth weight while second borns are 46% more likely to have this risk.

In summary, this research strategy shows the differences between pure descriptive of cohorts and the estimations by constructing a pseudo-panel and points out the importance of choosing an appropriate contrast group. The results between adolescents

(C2) do not show very important differences in the outcomes under study. However, the contrast to the slightly older mothers, for both the youngest and the oldest adolescents, shows important differences in the outcomes of job quality, partner's quality and infant health and survival. The lattest results prove a clear draw back on human capital both for these mothers and their children, which perpetuates poverty circles in Colombia.

C. Checks

Moffit (1993) and Collado (1998) have proved that estimations using instrumental variables (IV) under pseudo-panels will meet the statistical conditions of traditional models, including consistency and efficiency, and serve as control for self-selection of the sample from the original cross-sectional surveys, which served as base to build-up the pseudo-panel. One of the main issues in this document is the self-selection of adolescent mothers, biased to women coming from the lower socioeconomic conditions. As an additional check to our proposed methodology, we carried out the same contrasts using an instrumental variable (IV). In particular, we will use the age of the first sexual intercourse as the instrument, as it is clearly correlated to the exposure of risk of becoming a mother but is not directly related to women's outcomes.[10] Tables 9 and 10 present the results for educational, job and marriage market, in almost all cases the results on the coefficients of interest do not differ between both specifications, neither the standard errors. These results show consistency of the parameters estimated and the appropriate control for unobserved characteristics.

V. Conclusions

Our results show that women who gave birth during adolescence do not always end up having worst standard socioeconomic results than their counterparts who give birth a couple of years older. Yet, the contrast group is definitive on the measurement of these results. In general, the youngest a woman becomes mother, the worse her outcomes, contrasted to women who postpone motherhood by one or two years after adolescence. In particular, there are no effects on occupational status or in having a partner. The latter reflects big social changes in the Colombian society, and a wider acceptance in the society of adolescent motherhood. This fact, as pointed by Jhonson-Hanks et al. (2002),

[10] For a discussion on instrumental variables on this issue see Moffit (2003, pp.454-456)

may be an important determinant in the increase of adolescent fertility in Colombia that cannot be undone and that is leading the society to another state.

However, the quality of both occupations and partner's quality show worse outcomes for adolescents' mothers and large proportions of physically abused women. Similarly, their kids are born in lower health quality and have larger probabilities of dying. These results suggest lower human capital accumulation reflected for these women and their children. As stated before, adolescents who come from the more disadvantaged households are more prone to become mothers, and even after controlling for these variables the results hold. Thus, the increase of adolescent fertility simply perpetuates poverty cycles that need to be broken by generating incentives for adolescents to postpone their first birth. The logical solution is to create targeted programs to adolescents from the more disadvantaged households to promote school enrollment and provide access to technical or higher education, which require no more than one or two additional years of schooling, but that retain these young women in the educational system and provide a better option in the labor market, options that most of these women do not perceive in their current situation.

Also, the reinforcement on sexual education which includes teaching what is required to raise a baby. That is, practical lessons that expose adolescents to the high demands of just born babies in time, health and money that may reveal all the costs that a baby imposes to mothers which help prevent adolescents from risky behavior as teenagers are less prone than adults to think in the long run (Rabin and O'Donoghue, 2000). This kind of "exaggerated" education can provide, in the case an adolescent becomes a mother, with the minimum knowledge for raising a baby, and would know when to look for medical help, that could reduce the higher infant mortality.

Other policy implications of these results should be addressed, perhaps, through implementation or higher coverage of programs aimed at allowing for the return of young mothers to school (CCT programs, public daycare centers) and also making sure young mothers take their children to medical check-ups on a compulsory basis, at least during the first year of life when mortality is higher.

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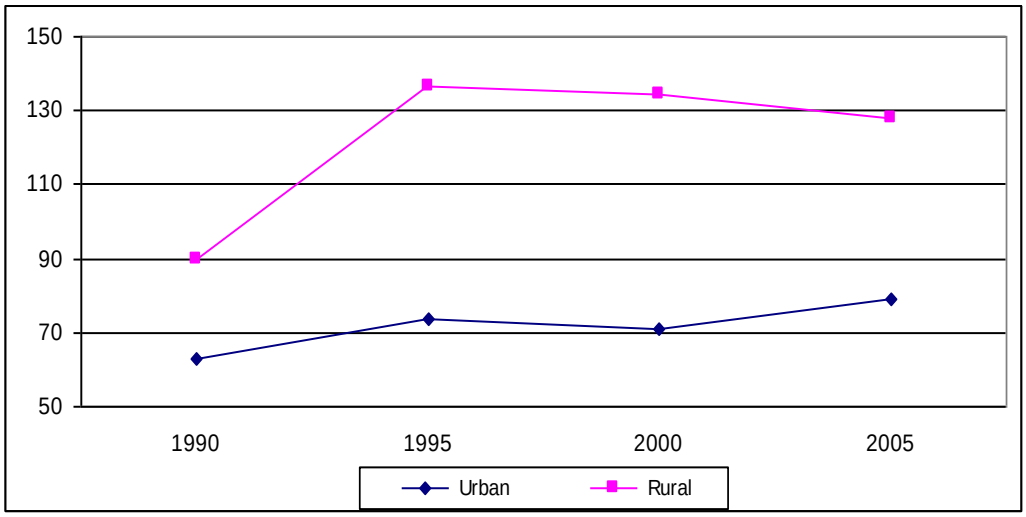
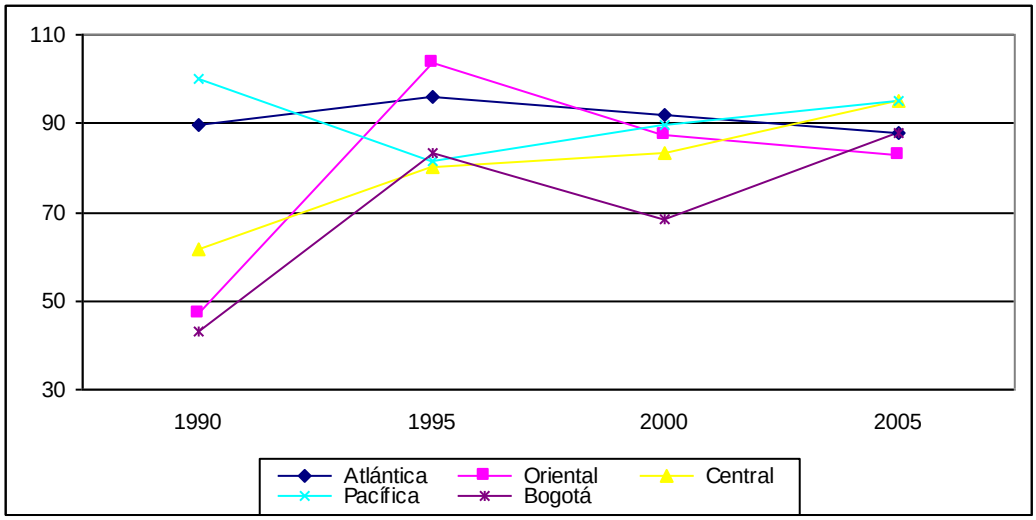
Figures and Tables

Figure 1. Age Specific Fertility Rates (ASFR) for Ages 15 to 19 in Colombia by Rural/Urban Residency. 1990 to 2005



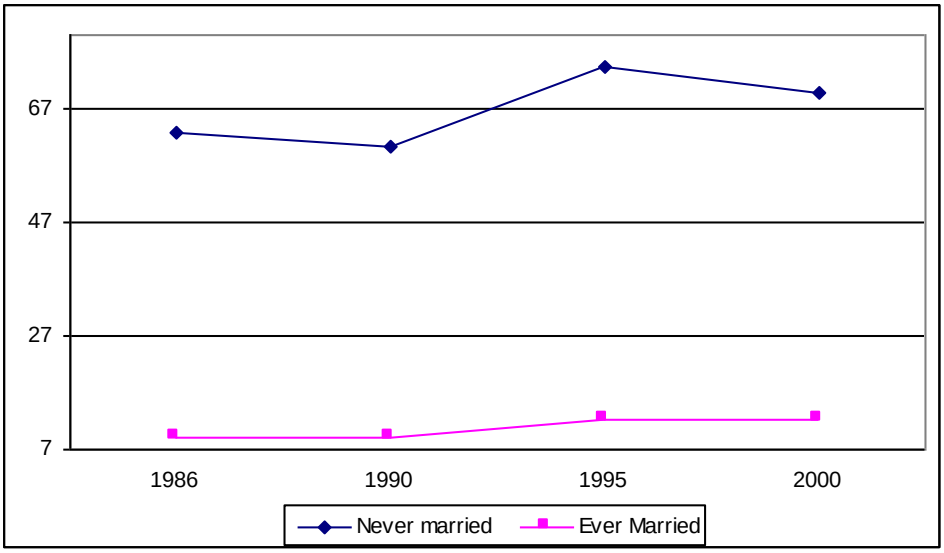
Source: DHS-Macroint.(Stat compiler - http://www.statcompiler.com)

Figure 2. Age Specific Fertility Rates (ASFR) for Ages 15 to 19 in Colombia by Geographic Region. 1990 to 2005



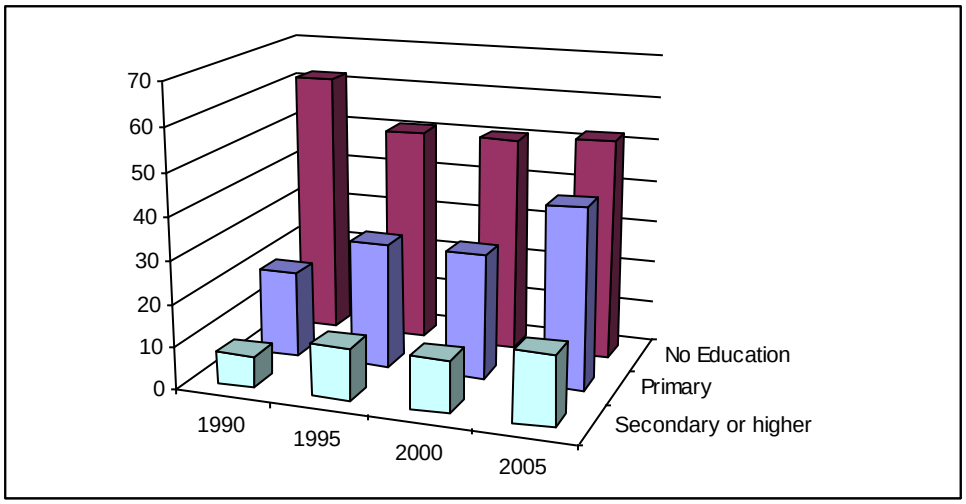
Source: DHS-Macroint. (Stat compiler - http://www.statcompiler.com)

Figure 3. Age Specific Fertility Rates (ASFR) for Ages 15 to 19 in Colombia by Marital Status. 1986 to 2000



Source: DHS-Macroint.(Stat compiler - http://www.statcompiler.com)
*Ever married includes: married, separated/divorced and widows

Figure 4. Age Specific Fertility Rates (ASFR) for Ages 15 to 19 in Colombia by Educational Categories. 1990 to 2005



Source: DHS-Macroint.(Stat compiler - http://www.statcompiler.com)

Table 1. Distribution of Women in Pseudopanel by Cohort and Age at First Birth.

	Contrast 1 Age at first birth					Contrast 2 Age at first birth						Contrast 3 Age at first birth						
Year of Birth	18	19	20	21	Total	15	16	17	18	19	Total	15	16	17	20	21	22	Total
1964	126	152	168	110	556	50	103	131	126	152	562	50	103	131	168	110	118	680
1965	143	144	151	134	572	53	82	140	143	144	562	53	82	140	151	134	120	680
1966	169	136	145	128	578	51	84	107	169	136	547	51	84	107	145	128	117	632
1967	131	133	153	145	562	63	77	111	131	133	515	63	77	111	153	145	123	672
1968	153	153	156	117	579	49	99	127	153	153	581	49	99	127	156	117	139	687
1969	129	162	167	142	600	50	76	104	129	162	521	50	76	104	167	142	110	649
1970	154	174	158	149	635	52	106	121	154	174	607	52	106	121	158	149	121	707
1971	156	159	164	164	643	48	94	142	156	159	599	48	94	142	164	164	99	711
1972	165	208	157	138	668	57	107	172	165	208	709	57	107	172	157	138	120	751
1973	156	144	167	122	589	53	101	148	156	144	602	53	101	148	167	122	103	694
1974	183	147	139	103	572	50	108	147	183	147	635	50	108	147	139	103	93	640
Total	1,665	1,712	1,725	1,452	6,554	576	1,037	1,450	1,665	1,712	6,440	576	1,037	1,450	1,725	1,452	1,263	7,503

Table 2. Average Educational and Labor Market Outcomes by Contrast Group.

Contrast 1: Treatment (Mothers at 18-19) Control (Mothers at 20-21)

Age	Years of Education			Good Job			Employment		
	Treatment	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**
25	6.34	7.83	-3.41	0.69	0.74	-0.50	0.38	0.42	-0.65
30	6.67	7.61	-3.04	0.72	0.76	-0.64	0.53	0.59	-1.36
35	6.77	7.76	-2.80	0.81	0.84	-0.68	0.58	0.54	0.99
40	6.14	7.43	-3.08	0.75	0.78	-0.44	0.61	0.56	0.99

Contrast 2: Treatment (Mothers at 15-17) Control (Mothers at 18-19)

Age	Years of Education			Good Job			Employment		
	Treatment	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**
25	5.40	6.34	-2.33	0.63	0.69	-0.59	0.49	0.38	1.60
30	5.95	6.67	-2.47	0.70	0.72	-0.38	0.51	0.53	-0.56
35	5.64	6.77	-3.30	0.80	0.81	-0.16	0.54	0.58	-0.81
40	6.02	6.14	-0.28	0.74	0.75	-0.19	0.62	0.61	0.12

Contrast 3: Treatment (Mothers at 15-17) Control (Mother at 20-22)

Age	Years of Education			Good Job			Employment		
	Treatment	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**	**Treatment**	**Control**	**t-Stat**
25	5.40	7.87	-5.60	0.63	0.75	-1.34	0.49	0.44	0.74
30	5.95	7.61	-5.75	0.70	0.79	-1.82	0.51	0.60	-2.25
35	5.64	7.76	-6.25	0.80	0.81	-0.02	0.54	0.53	0.38
40	6.02	7.36	-3.47	0.74	0.79	-1.01	0.62	0.54	1.54

Table 3. Average Marriage Market Outcomes by Contrast Groups.

Contrast 1: Treatment (Mothers at 18-19) Control (Mothers at 20-21)

Age	Unions			Never Married			Unions >1			Partner's Education			Partner's Good Job		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0.456	0.448	0.120	0.051	0.074	-0.690	0.110	0.121	-0.100	6.314	7.826	-2.760	0.366	0.363	0.060
30	0.495	0.414	1.860	0.052	0.088	-1.590	0.256	0.184	1.930	6.858	7.726	-2.310	0.375	0.417	-0.970
35	0.440	0.378	1.350	0.026	0.043	-1.000	0.285	0.186	2.500	7.213	7.324	-0.280	0.398	0.461	-1.380
40	0.339	0.322	0.310	0.010	0.073	-2.850	0.298	0.237	1.190	6.286	7.527	-2.530	0.484	0.369	2.080

Contrast 2: Treatment (Mothers at 15-17) Control (Mothers at 18-19)

Age	Unions			Never Married			Unions >1			Partner's Education			Partner's Good Job		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0.584	0.456	1.850	0.009	0.051	-1.720	0.275	0.110	3.080	5.864	6.314	-0.830	0.268	0.366	-1.520
30	0.541	0.495	1.060	0.038	0.052	-0.760	0.273	0.256	0.430	6.386	6.858	-1.350	0.399	0.375	0.550
35	0.506	0.440	1.380	0.025	0.026	-0.090	0.394	0.285	2.390	5.673	7.213	-3.880	0.404	0.398	0.120
40	0.420	0.339	1.550	0.044	0.010	1.970	0.352	0.298	1.040	6.315	6.286	0.060	0.389	0.484	-1.780

Contrast 3: Treatment (Mothers at 15-17) Control (Mother at 20-22)

Age	Unions			Never Married			Unions >1			Partner's Education			Partner's Good Job		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0.584	0.426	2.400	0.009	0.088	-2.590	0.275	0.104	3.390	5.864	7.868	-3.810	0.268	0.380	-1.790
30	0.541	0.407	3.340	0.038	0.086	-2.370	0.273	0.178	2.730	6.386	7.765	-4.030	0.399	0.389	0.250
35	0.506	0.373	2.950	0.025	0.057	-1.710	0.394	0.161	6.020	5.673	7.663	-5.110	0.404	0.449	-0.990
40	0.420	0.297	2.550	0.044	0.064	-0.840	0.352	0.216	2.950	6.315	7.263	-2.210	0.389	0.416	-0.530

Table 3. Average Marriage Market Outcomes by Contrast Groups. (continued)

Contrast 1: Treatment (Mothers at 18-19) Control (Mothers at 20-21)

Age	Severe violence			Less severe violence		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0,089	0,028	1,030	0,547	0,368	1,480
30	0,155	0,065	2,770	0,486	0,439	0,900
35	0,162	0,072	2,970	0,517	0,346	3,680
40	0,078	0,098	-0,620	0,396	0,380	0,280

Contrast 2: Treatment (Mothers at 15-17) Control (Mothers at 18-19)

Age	Severe violence			Less severe violence		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0,072	0,089	-0,270	0,457	0,547	-0,780
30	0,155	0,155	-0,010	0,533	0,486	0,950
35	0,270	0,162	2,740	0,586	0,517	1,410
40	0,186	0,078	2,950	0,484	0,396	1,610

Contrast 3: Treatment (Mothers at 15-17) Control (Mother at 20-22)

Age	Severe violence			Less severe violence		
	Treatment	Control	t-Stat	Treatment	Control	t-Stat
25	0,072	0,020	1,150	0,457	0,275	1,720
30	0,155	0,064	3,090	0,533	0,439	1,950
35	0,270	0,060	6,820	0,586	0,359	4,990
40	0,186	0,083	2,980	0,484	0,327	3,050

Table 4. Average Infant Mortality Outcomes by Contrast Groups.

Contrast 1: Treatment (Mothers at 18-19)
Control (Mothers at 20-21)

Age	Surviving Children		
	Treatment	**Control**	**t-Stat**
25	0.97	0.94	1.13
30	0.92	0.95	-1.54
35	0.87	0.94	-2.65
40	0.87	0.86	0.49

Contrast 2: Treatment (Mothers at 15-17)
Control (Mothers at 18-19)

Age	Surviving Children		
	Treatment	**Control**	**t-Stat**
25	0.84	0.97	-3.53
30	0.93	0.92	0.38
35	0.83	0.87	-1.20
40	0.77	0.87	-2.67

Contrast 3: Treatment (Mothers at 15-17)
Control (Mother at 20-22)

Age	Surviving Children		
	Treatment	**Control**	**t-Stat**
25	0.84	0.95	-2.93
30	0.93	0.93	-0.01
35	0.83	0.94	-3.92
40	0.77	0.89	-3.31

Table 5. Estimation Results on Education and Labor Market

Contrast 1: Control Mothers at 20-21

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 18-19	-0.942	0.104	0.764	0.060	0.905	0.045
Height	0.062	0.039	1.032	0.028	1.062	0.018
No. Obs.	132		3561		6554	
No. Groups	44					

Contrast 2: Control Mothers at 18-19

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	-1.192	0.128	0.977	0.076	1.078	0.055
Height	0.048	0.034	1.033	0.026	1.053	0.018
No. Obs.	163		3446		6425	
No. Groups	55					

Contrast 3: Control Mothers at 20-22

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	-2.381	0.143	0.707	0.053	0.976	0.047
Height	0.034	0.033	0.996	0.024	1.036	0.016
No. Obs.	195		4124		4037	
No. Groups	66					

Table 6. Estimation Results on Marriage Market

Contrast 1: Control mothers at 20-21

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 18-19	1,255	0,063	0,674	0,074	1,396	0,088	-0,827	0,136	0,857	0,043	1,336	0,120	1,182	0,069
Height	0,998	0,017	0,951	0,037	1,076	0,023	0,073	0,040	1,064	0,019	0,988	0,032	0,979	0,021
No. Obs.	6554		6554		6181		132		6533		4853		4854	
Groups							44							

Contrast 2: Control mothers at 18-19

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	1,290	0,066	0,722	0,094	1,753	0,101	-0,809	0,151	0,902	0,047	1,426	0,115	1,149	0,067
Height	1,027	0,017	0,899	0,038	1,067	0,020	0,105	0,044	1,053	0,018	1,023	0,027	1,003	0,020
No. Obs.	6425		6425		6156		163		6405		4851		4852	
Groups							55							

Contrast 3: Control mothers at 20-22

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	1,655	0,080	0,493	0,058	2,670	0,154	-1,833	0,152	0,756	0,037	2,005	0,162	1,419	0,079
Height	1,018	0,016	0,959	0,035	1,069	0,020	0,095	0,044	1,021	0,016	1,004	0,027	1,008	0,019
No. Obs.	7488		7488		7080		195		7458		5626		5626	
Groups							66							

Table 7. Estimation Results on Infant Survival

Contrast 1: Control Mothers at 20-21

Surviving Children

	Odds Ratio	Std. Err.
Mother at 18-19	0.669	0.062
Height	0.932	0.029
No. Obs.	6554	

Contrast 2: Control Mothers at 18-19

Surviving Children

	Odds Ratio	Std. Err.
Mother at 15-17	0.545	0.043
Height	0.923	0.023
No. Obs.	6425	

Contrast 3: Contol Mothers at 20-22

Surviving Children

	Odds Ratio	Std. Err.
Mother at 15-17	0.358	0.029
Height	0.973	0.024
No. Obs.	7488	

Table 8. Low Birth Weight of Children Born to Teenage Mothers.

Contrast 1: Control Mothers at 20-21

Low Birth Weight

	First Borns		Second Borns	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.
Mother at 18-19	0.070	0.031	0.390	0.163
Years of Education	0.007	0.005	0.053	0.024
Height	-0.004	0.002	-0.025	0.017
No. Obs.	313		26	

Contrast 2: Control Mothers at 18-19

Low Birth Weight

	Coefficient	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	0.013	0.041	0.134	0.194
Years of Education	0.013	0.007	0.091	0.031
Height	-0.005	0.003	-0.054	0.023
No. Obs.	275		37	

Contrast 3: Contol Mothers at 20-22

Low Birth Weight

	Coefficient	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	0.064	0.043	0.464	0.217
Years of Education	0.001	0.005	-0.043	0.027
Height	0.000	0.002	0.011	0.015
No. Obs.	349		31	

Table 9. IV Results for Education and Labor Market Outcomes

Contrast 1: Control Mothers at 20-21

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 18-19	-1.130	0.149	0.739	0.057	0.906	0.073
Height	0.066	0.035	1.033	0.029	1.063	0.023
No. Obs.	132		3561		6554	
No. Groups	44					

Contrast 2: Control Mothers at 18-19

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	-1.609	0.191	0.902	0.049	1.078	0.079
Height	0.051	0.033	1.053	0.024	1.053	0.022
No. Obs.	163		3446		6425	
No. Groups	55					

Contrast 3: Control Mothers at 20-22

	Years of Education		**Good Job**		**Employment**	
	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	-2.634	0.166	0.707	0.057	0.976	0.070
Height	0.032	0.032	0.996	0.021	1.036	0.019
No. Obs.	195		4124		4037	
No. Groups	66					

Table 10. IV Results for Marriage Market

Contrast 1: Control Mothers at 20-21

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Rat	Std. Err.	Odds Ratio	Std. Err.
Mother at 18-19	1.251	0.056	0.663	0.095	1.413	0.131	-0.944	0.186	0.851	0.041	1.329	0.143	1.188	0.084
Height	0.998	0.018	0.951	0.032	1.075	0.037	0.079	0.036	1.065	0.020	0.988	0.031	0.979	0.019
No. Obs.	6554		6554		6181		132		6533		4853		4854	
Groups							44							

Contrast 2: Control Mothers at 18-19

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Rat	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	1.290	0.072	0.722	0.107	1.753	0.129	-1.116	0.203	0.902	0.049	1.426	0.120	1.149	0.072
Height	1.027	0.020	0.899	0.037	1.067	0.027	0.109	0.038	1.053	0.024	1.023	0.025	1.003	0.016
No. Obs.	6425		6425		6156		163		6405		4851		4852	
Groups							55							

Contrast 3: Control Mothers at 20-22

	Unions		Never Married		Unions >1		Partner's Education		Partner's Good Job		Severe violence		Less severe violence	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Coefficient	Std. Err.	Odds Ratio	Std. Err.	Odds Rat	Std. Err.	Odds Ratio	Std. Err.
Mother at 15-17	0.493	0.061	0.493	0.061	2.670	0.209	-2.023	0.169	0.756	0.050	2.005	0.138	1.419	0.071
Height	0.959	0.028	0.959	0.028	1.069	0.025	0.096	0.038	1.021	0.016	1.004	0.023	1.008	0.019
No. Obs.	7488		7488		7080		195		7458		5626		5626	
Groups							66							