Reframing the relationship between fertility and education in adolescence: 60 years of evidence from Latin America

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Abstract

It is a demographic puzzle that Latin America and the Caribbean's high levels of adolescent fertility have persisted over the course of its dramatic fertility transitions and schooling expansions. These phenomena usually occur alongside postponements to entry into motherhood.

To tackle the puzzle, this study untangles, in basic mechanical terms, how the region has maintained such high levels of adolescent fertility. It also delves into the broader theoretical underpinnings of the relationship between schooling and the timing of fertility, which it categorizes into enrollment (i.e. incarceration) and aspirational effects.

The study uses 96 nationally representative demographic surveys from 15 countries in the region to produce cohort-based estimates of the magnitude and timing of parity-specific adolescent childbearing for school attainment profiles measured in single years. Changes in the likelihood of experiencing adolescent motherhood or having multiple births in adolescence for different schooling careers interlock with surprising findings regarding the timings of those births.

The results strongly suggest that school enrollment's ability to forestall fertility appears as effective today as it was over half a century ago, while schooling's aspirational influence has been dramatically modified under changing context and reorganized social hierarchies.

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1 Introduction

In the face of sweeping schooling expansions, total fertility has declined dramatically in Latin America and the Caribbean over the last six decades. Adolescent fertility, on the other hand, has been puzzlingly more resistant to change. Specifically, the region's total fertility declined from six to two children per woman from 1960 to 2020, a three-fold decline (UN Population Division 2024). The adolescent birth rate saw a two-fold decline, falling from 107 to 55 births per thousand adolescents aged 15-19 (UN Population Division 2024). Figure 1 depicts the declines in adolescent fertility rate from 1960 to 2020 in the countries included in this study as well as the regional average, with their various fluctuations and stagnations over time. Importantly, declines have been driven largely by reductions in higher-order births to adolescents rather than fewer adolescents becoming mothers (Berquó and Cavenaghi 2005; Cavenaghi and Diniz Alves 2011; Lima et al. 2018; Neal et al. 2018; Rodríguez Vignoli 2014; Velarde and Zegers-Hochschild 2017). Indeed, over the last half century, about a third of women have consistently entered motherhood in adolescence (UNFPA 2022).

[Figure 1 about here]

Meanwhile, a growing proportion of the female population has attended a progressively greater number of school years. In 1960, one out of every four women aged 20-24 had no formal schooling, but by 2020, less than 2% had never gone to school. Likewise, those women had an average of only four years of schooling in 1960, and by 2020 that figure had more than doubled to an average of ten years (Wittgenstein Centre 2018).

The conundrum deepens when looking at experimental research, which has found, again and again, that schooling directly reduces adolescent fertility. There appear to be two overarching mechanisms at work: an enrollment effect and an aspirational effect. The time adolescent girls spend enrolled and present at school demonstrably reduces teen births (an enrollment effect), and

measurable reductions in teen births can persist even after a girl has left school (an aspirational effect) (Geruso and Royer 2018; Duflo, Dupas, and Kremer 2015; Baird et al. 2010; Cygan-Rehm and Maeder 2013). The evidence is compelling, but only captures single snapshots in time. A handful of demographic studies that have queried the puzzle show broad increases in schooling-specific adolescent fertility in the region over time (Cavenaghi and Diniz Alves 2011; Rodríguez Vignoli and Cavenaghi 2014; Esteve Palós and Florez-Paredes 2014; Batyra 2019).

Further ambiguity arises because the demographic studies reach seemingly contradictory conclusions about what schooling profiles have and have not seen increases. Nevertheless, they examined dissimilar educational divisions, covered different time periods and countries, and measured adolescent fertility in distinct ways. Given the differences in categorizations and conclusions, what is missing is a demographic analysis that can reconcile the mixed messages by bringing together an accounting of what adolescent fertility patterns have been over the long term; what they have been for first as well as higher-order adolescent births; and what they have been for more detailed—and comparable—schooling divisions.

Accordingly, this study aims to explore the evolution of schooling- and parity-specific population patterns in adolescent fertility over the course of more than half a century in the 15 countries in Latin America and the Caribbean where data make this possible. It also examines how long-standing theory on the relationship between schooling and education can be adapted to the adolescent context. That is, how the uncovered trends relate separately to schooling's enrollment and aspirational dynamics.

The countries are Belize, Bolivia, Brazil, Colombia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, Paraguay and Peru. They represent 80% of the region's population and span a rich array of adolescent fertility and schooling levels and trends (UN Population Division 2024).

2 Background

The persistence of Latin America and the Caribbean's high levels of adolescent childbearing speak to a larger underlying theoretical question about the connection between fertility and education. However, before exploring the theoretical underpinnings, it is important to first give flesh to this study's interest in long term and parity-specific adolescent fertility patterns.

This study focuses on adolescent fertility, defined as childbearing among women aged 10 to 19 years (WHO 2007), for two reasons. First, the bulk of causal evidence finds that adolescent fertility has negative consequences for both mother and child (Diaz and Fiel 2016; Duncan et al. 2018; Kane et al. 2013). In Latin America and the Caribbean specifically, research that goes beyond associative evidence to approach causal impact finds negative effects on women's earnings, their educational achievement as well as that of their children, and brings particularly intense vulnerabilities to intimate partner violence (Arceo-Gomez and Campos Vazquez 2014; Azevedo et al. 2012; Rios Neto 2009; Urdinola and Ospino 2015). And research confirms that the consequences of adolescent fertility differ considerably at different ages, with the youngest mothers facing the most negative outcomes (Boden, Fergusson, and Horwood 2008; Olausson et al. 2001).

Second, not only is adolescent fertility exceptionally pronounced in Latin America and the Caribbean, but it accounts for a large and growing share of the region's fertility. On average, 15% of all births are to adolescents (with as many as 25% in some countries) (Álvarez Castaño 2015; Benova et al. 2018), which is higher than any other world region (from 5% in Europe to 10% in Africa) (UN Population Division 2015). Indeed, teenage childbearing and its multifarious occurrence in populations and over time merits continued study (Mollborn 2017).

2.1 Long-term perspective

The importance of a long-term perspective takes root in the fascinating story of the region's fertility transitions. The fertility transitions in Latin America and the Caribbean have occurred largely without widespread childbearing postponement, having instead depended on family size limitation (Cavenaghi and Diniz Alves 2011; Esteve, Lopez-Ruiz, and Spijker 2013). That is, childbearing patterns are now defined by early starting and early stopping. In much of Europe and parts of Asia, in contrast, the progressive postponement of entry into motherhood continues to be an important component of long-term fertility decline (Hirschman 1994; Kohler, Billari, and Ortega 2002; Sobotka 2004; see Perelli-Harris 2005 for an Eastern European exception).

Initially, stagnant age trends in motherhood entry in Latin America and the Caribbean were misinterpreted as no change, but more recent disaggregation unmasks an ever-widening age gap, or a bimodal fertility divide, between the childbearing postponement of the most advantaged groups and the early motherhood of their less privileged peers (Cavenaghi and Diniz Alves 2011; Bozon, Gayet, and Barrientos 2009; Esteve, Lopez-Ruiz, and Spijker 2013; Esteve, Lesthaeghe, and López-Gay 2012; Lima et al. 2018; Nathan 2015; Nathan, Pardo, and Cabella 2016; Rosero-Bixby et al. 2009).

Education plays a vital role in fertility patterns. As a broad rule, education is widely seen as the single most important driver of fertility decline and postponement (Abel et al. 2016; Lutz 2014). Evidence from across the globe not only finds that women at all education levels experience substantial declines in fertility over demographic transitions (Abbasi-Shavazi et al. 2008; Bongaarts 2003; Choe and Retherford 2009; Kravdal and Rindfuss 2008; Shapiro 2012; Yoo 2014), but that educational expansions contribute substantially to childbearing postponement (Lam and Duryea 1999; Liefbroer and Corijn 1999; Monstad, Propper, and Salvanes 2008; Neels and De Wachter 2010; Neels et al. 2017).

Nevertheless, changes in the timing of motherhood entry are not always consistent across educational strata. Even in many high-income countries, where differences in the total number of children born to women with different levels of schooling are small, the timing of first births can follow increasingly disparate patterns (Andersson et al. 2009; Berrington, Stone, and Beaujouan 2015; Bloom and Trussell 1984; Lappegård and Rønsen 2005; Raymo et al. 2015; Rendall et al. 2010; Rindfuss, Morgan, and Offutt 1996). In contexts where all education groups see progressive delays, postponement among the least schooled is often smaller than that of the most schooled (Lappegård 2000; Ní Bhrolcháin and Beaujouan 2012).

In the early stages of Latin America and the Caribbean's demographic transitions, education differentials in realized fertility, but not necessarily desired fertility, were considerable (Caldwell 1980; Cleland and Wilson 1987; Weinberger, Lloyd, and Blanc 1989). Today, education differentials in adolescent fertility in the region are greater than differences in total fertility (Rodríguez Vignoli 2014). While schooling expansion seems an important component of overall fertility decline in Latin America and the Caribbean (Martin 1995), its long-term role in changes in the timing of fertility for adolescents remains unclear. This is particularly the case because recent declines from the adolescent fertility peaks of the 1990s (Cavenaghi and Diniz Alves 2011; Berquó and Cavenaghi 2005; Lima et al. 2018; Neal et al. 2018; Rodríguez Vignoli 2014; Velarde and Zegers-Hochschild 2017) may not necessarily translate to declines relative to earlier decades, and most adolescent fertility research in Latin America and the Caribbean focuses on these more recent fluctuations, leaving the long-term picture relatively unexplored.

The long-term perspective also merits attention given the revolutionary changes in contraceptive technology and access that were in motion during the region's fertility transitions. The pill's approval by the Food and Drug Administration in 1960, followed by approval of IUDs in 1968, and the refinement of injectables and sterilization were pivotal developments (Cleland 2009, Coutinho 1993, Margulies 1975). Sterilization, the pill and IUDs specifically have long been the heavyweights of the method mix prevalent among the region's population (Cavenaghi and Diniz Alves 2009, Mauldin and Segal 1988). Large-scale

family planning initiatives also came into play in those early decades. These were often initially led by civil society, with governments eventually taking a stronger role, and have navigated varying degrees of religious, legal and political resistance (Felitti 2022, Oakley and Rodriguez 2005, Stycos 1984). Data on the extent of modern contraceptive use prior to the 1970s are extremely patchy, but what evidence does exist shows strong growth early on with, in many countries, about half of partnered women practicing contraception by the mid 1980s (Mauldin and Segal 1988, Cavenaghi and Diniz Alves 2009). Today, estimates indicate that Latin America has the highest contraceptive use rate of any region in the world—with an estimated 83% of women of reproductive age who want to avoid a pregnancy using a modern method (Sully et al 2020).

2.2 Parity-specific change

Attention to parity-specific change is critical given that the most common measure of adolescent fertility is not parity-specific, and, in broad strokes, only higher-order adolescent births have declined while the proportion of women entering motherhood in adolescence has remained practically unchanged (Cavenaghi and Diniz Alves 2011; Berquó and Cavenaghi 2005; Lima et al. 2018; Neal et al. 2018; Rodríguez Vignoli 2014; Velarde and Zegers-Hochschild 2017). These fertility changes are strongly related to changing patterns of contraceptive access, partnership formation and fertility intentions.

While access to and knowledge of contraception in the region is now regarded as near universal (Cavenaghi and Diniz Alves 2011), adolescents still face considerable access barriers. Much of the research describing the drivers of sustained adolescent childbearing in the region indicates that increasing rates of adolescent sexual activity and union formation—in terms of higher proportions of adolescents engaging in sexual activity, forming unions, and doing so at younger ages—has not been offset by sufficient increases in adolescent contraception (Ali, Cleland, and Shah 2003; Cavenaghi and Diniz Alves 2009; Flórez and Soto 2013; Heaton, Forste, and Otterstrom 2002; Rodriguez 2013). Indeed, many adolescents do not use any contraception until after the birth of

their first child (Di Cesare and Rodríguez Vignoli 2006; Esteve Palós and Florez-Paredes 2014; Rodríguez Vignoli 2014).

In other words, once an adolescent experiences a first birth, barriers to accessing contraception appear to diminish considerably. While some research suggests that access is not equal across all education strata for adolescents who have already had a birth (Velarde and Zegers Hochschild 2017), other research finds that access is more universal, in the sense that second birth intervals have substantially lengthened for women of all education strata (Batyra 2016; Casterline and Odden 2016). In essence, trends for first and higher-order births among adolescents are likely very different, but almost no research has examined long-term trends in higher-order births among adolescents.

2.3 Educational nuance and theory

The relationship between education and fertility is one of demography's most interrogated questions. Classical theories on why schooling reduces fertility emphasize changing cost benefit, quality-quantity trade-offs to the mother, often in economic or social and psychological terms that transform conceptualizations of child rearing into a more demanding, high-cognitive, resource-intensive task fraught with opportunity costs (LeVine et al. 1991). This means that, as a general rule, when a woman's years of schooling increase, the number of children she has decreases (Ainsworth, Beegle, and Nyamete 1996; Behrman 2015; Brand and Davis 2011; Diamond, Newby, and Varle 1999; Nisén et al. 2014; Sohn and Lee 2019).

However, adolescent fertility is much less about quantity than it is about timing. Theoretical work on the relationship between education and the timing of fertility has been given comparatively less attention than the connection between education and the quantum of fertility, but empirical work on the connection is abundant. In cataloging the evidence on the relationship between schooling and the timing of fertility among adolescents, two overarching themes emerge. These are: (1) there

is an enrollment effect, or being enrolled and present at school reduces the likelihood of childbearing while the woman or girl remains in school; and (2) an aspirational effect, or schooling inspires changes in life goals and expectations and postpones childbearing even after she leaves school.

The strongest evidence for these causal links comes from randomized control trial evidence. Programs that encourage girls to stay in school, or to return to school after they have dropped out, or even simply increase the number of hours they spend at school have proven to reduce adolescent marriage, childbearing and sexual activity rates. This is found in Latin America and the Caribbean, Africa and Asia (Angrist et al. 2002; Baird et al. 2010; Duflo, Dupas, and Kremer 2015; Gulemetova-Swan 2009; Ibarraran et al. 2014; Kalamar, Lee-Rife, and Hindin 2016; Kruger and Berthelon 2009; Novella and Ripani 2016). Other demographic work supports the causal relationship. Often, the enrollment effect is called, amusingly enough, an incarceration effect, especially when the research looks at changes in compulsory schooling. Time adolescent girls spend enrolled and present at school directly reduces teenage fertility levels (Geruso and Royer 2018; Grönqvist and Hall 2013; Kruger and Berthelon 2009; Monstad, Propper, and Salvanes 2008; Silles 2011).

At least in recent decades, an aspirational effect has more relevance to the adolescent context than does the concept of opportunity costs because for adolescents, economic questions are more about future prospects than present engagement, and adolescents' decision-making, both in fertility and other processes, is markedly different than that of adults (Kearney and LeVine 2014; Kearney and LeVine 2012; Levine 2001; Oreopoulos 2007). Indeed, adolescents are still developing their self-control, sense of agency, and their auto-determination; they are more markedly influenced by peer pressure and emotions of the moment and, perhaps most importantly, they heavily discount the future—and thus discount the opportunity costs arising from beginning childbearing sooner rather than later (Azevedo et al. 2012; Flórez 2005; Lipovsek et al. 2002; Patton et al. 2016). However, it

must be acknowledged that the aspirations, socialization and experiences of adolescents in the 1960s differ from the adolescents in the 2010s—and in the intervening decades (Elizaga 1977, Felitti 2018). The meaning and experience of adolescence, or the transition between childhood and adulthood, has undergone its own transformation (Larson and Wilson 2004). A transformation that is connected, in no small part, to the lengthening of normative school careers (Manzano 2010, Larson and Wilson 2004).

Nevertheless, an aspirational conceptualization recognizes the future-orienting power of schooling for adolescents. Indeed, much of the causal enrollment effect research also finds that adolescent fertility reductions can extend years beyond the ages at which school attendance occurs. The studies attribute these reductions to school-inspired changes in adolescent's life aspirations (Baird et al. 2010; Black, Devereux, and Salvanes 2008; Cygan-Rehm and Maeder 2013; Duflo, Dupas, and Kremer 2015; Kalamar, Lee-Rife, and Hindin 2016; Mason-Jones et al. 2016; Monstad, Propper, and Salvanes 2008). More broadly, education is an important means through which individuals gain a greater sense of control over their life course (Lutz 2017; Musick et al. 2009). A number of Latin American studies looking at adolescent mothers' own descriptions of their fertility include themes of a lack of sense of agency or control, aspects that are strongly connected to structural constraints placed on girls by unequal and restrictive gender norms, especially in regards to their sexuality (Azevedo et al. 2012; De Rosa, Doyenart, and Lara 2016; Lenkiewicz 2013; Pacheco-Montoya et al. 2022; Taylor et al 2019).

Nevertheless, schooling's landscape is spacious and varied—passing through primary, lower secondary, upper secondary and tertiary levels—and each level seems to have a distinct, and changing, relationship with fertility. At low levels of education, the relationship between schooling and fertility is not always systematic. In some regions of the world in past decades, women with just a few years of schooling had more children on average than their counterparts

without any schooling (Ainsworth, Beegle, and Nyamete 1996; Bongaarts 2010; Jejeebhoy 1995; Martin 1995).

In Latin America, a few years of primary schooling has made a more consistent difference for overall fertility (Diamond, Newby, and Varle 1999; Lam and Duryea 1999). In contrast to primary schooling, secondary and tertiary schooling is universally related to smaller family size in lower- and middle-income countries (Ainsworth, Beegle, and Nyamete 1996; Jejeebhoy 1995). While tertiary is related to even stronger family size limitation than secondary, over time, fertility differences between women with tertiary and those with no school have narrowed while differences between women with primary and secondary schooling have widened (Shapiro 2012). Similarly, in the past, the greatest education-related fertility change in lower-income countries was often seen between women with no school and varying years of primary education (Axinn and Barber 2001; Cleland and Ginneken 1988; Jain 1981), but more recently, the greatest fertility change occurs in the middle education groups, not the highest or lowest (Esteve, Lopez-Ruiz, and Spijker 2013; Heaton and Forste 1998; Shapiro 2012). Essentially, after greater educational expansion, it seems that middle and highest levels of education matter more than primary years for lifetime fertility outcomes (Patton et al. 2016).

Existing research on educational differences in adolescent fertility largely reveal the same themes. In recent years, women in Latin America and the Caribbean with no school are found to have a lower incidence of adolescent fertility than those with only a few years of school (Rodríguez Vignoli and Cavenaghi 2014). Additionally, the threshold point in school years—the point at which the high incidence of adolescent fertility begins to diminish—has increased over time from a few years of primary to a few years of secondary (Gupta and Iuri da Costa 1999; Rodríguez Vignoli and Cavenaghi 2014; Gómez-Inclán and Durán-Arenas 2017).

Again, it seems the greatest change and variability for both early fertility and marriage postponement are at the middle education levels, not the lowest schooling years (Esteve Palós and

Florez-Paredes 2014; Weinberger 1987). Even in high-income settings, schooling expansions in upper secondary have been an important marker for teen birth reductions and fertility postponement (Grönqvist and Hall 2013; Lappegård 2000; Rendall et al. 2005).

Worth emphasizing here is that secondary schooling remains comparatively understudied in demography (Patton et al. 2016), yet nearly two thirds of women in Latin America and the Caribbean (63%) finish their schooling sometime during secondary education, with considerable cross-country variation in patterns of lower- and upper-secondary school attainment (Kattan and Székely 2015). In education research, in contrast, now that the region has largely achieved universal primary schooling, attention has turned to secondary schooling, with particular emphasis on the differences in lower- and upper-secondary attainment for positive lifetime outcomes (Kattan and Székely 2015).

Demographic research lags behind this development; we find no fertility research in the region explicitly examining distinctions between lower and upper secondary schooling. Nevertheless, a handful of studies find that schooling certificate years (that is, the final year of a given schooling level) have distinctive fertility outcomes (Ainsworth, Beegle, and Nyamete 1996; Batyra 2019; Lam, Sedlacek, and Duryea 1993).

This is important because a growing proportion of students from poorer socioeconomic backgrounds are reaching upper-secondary schooling, but are not always able to graduate at the rates of their better-off peers. What is more, an increasing share of dropouts in the region are occurring at upper-secondary rather than lower-secondary schooling (Batyra 2019; Kattan and Székely 2015). Additionally, at least for overall fertility decline, it seems differences between incomplete and complete level-specific schooling careers are important at lower schooling levels in the early decades, and differences at secondary and higher levels only emerge more recently (Lam, Sedlacek, and Duryea 1993; Miranda-Ribeiro and Garcia 2013). Indeed, in Ecuador and

Colombia, increases in adolescent childbearing are most intense among secondary dropouts in recent years (Batyra 2019).

In essence, most fertility research lumps graduates and dropouts and lower and upper secondary schooling together, despite growing evidence that there are stark differences between them. All this to say that schooling's relationship with adolescent fertility likely both varies by individual school year and changes over time. To connect it to theory, the enrollment effect suggests that each additional year of school matters for adolescent fertility outcomes, and the aspirational effect allows that certificate years might carry their own distinct weight. Demographic research adds that over time specific schooling profiles seem to increase or diminish in importance for fertility outcomes.

An analysis of adolescent fertility outcomes by school groupings that are too broad may well obfuscate potentially important distinctions. As such, rather than deciding beforehand what schooling divisions matter—and should be studied—this research looks at individual school years, and only combines individual years together that are statistically indistinguishable. Importantly, the 15 countries included in this study see eleven distinct schooling pathways in terms of starting ages and durations for their primary, lower-secondary, upper-secondary and tertiary journeys. Furthermore, in some countries, the duration of certain levels has changed over the past decades. As such, this study uses a novel classification, discussed in the next sections, to make these varied trajectories more comparable.

In summary, adolescent fertility in Latin America and the Caribbean has remained perplexingly high. To unravel the puzzle, this study looks at changes over the last half century in adolescent fertility with measures that pay attention to parity-specific patterns as well as differences by individual school years. It also explores how these trends relate to changes in the presumed enrollment and aspirational effects of education over time.

3 Data

This study took all the Latin American and Caribbean countries—15 in total—for which nationally representative data with women's complete birth histories, and spanning about five decades of birth cohorts, were available. These data came from a total of 96 DHS, MICS and other national reproductive and health surveys, usually with each country's first survey falling in the mid 1980s and its most recent survey falling after 2015. See details in Table 1. Countries not included either had, to our knowledge, no data available with complete birth histories or at most had only two surveys over a more limited time span.

[Table 1 about here]

The analysis took a cohort approach and sample selection included all women aged 20 years or older in the year before each survey to avoid issues of censoring and truncation. Selected cases cover women born as early as 1936-1955 (depending on the country), representing women who completed adolescence, or reached their twentieth birthday, in 1956-1975. The most recent data were from women born from 1986-2001, representing women who completed adolescence in 2006-2021.

Variables of interest came from the retrospective survey questions detailing a woman's date of birth, her attained schooling, and the dates of birth of all her children born up to the time of the survey. Adolescent births were identified as births occurring to a woman before the month in which she turned twenty.

Schooling variables, often reported in terms of years completed at a given level, were translated to total cumulative school years attained by aligning them to the International Standard Classification of Education's (ISCED) specifications (UNESCO Institute for Statistics 2012). A corresponding variable identifying the theoretical exit age for attained school year simply added one year to ISCED's theoretical entry age for the final school year attained by each woman.

Most countries see unique schooling pathways, but primary most commonly begins at age 6, lower secondary at age 12, upper secondary at age 15 and tertiary at age 18. In cases with incomplete schooling responses, the woman was randomly assigned a school year within her reported level. School careers with theoretical exit ages of 21 years and above were combined together given that they occur wholly outside of adolescence. School years with an exit age of 20 were kept distinct because they are entered into at age 19, which is still in adolescence. Women with missing responses were assigned no schooling. In most countries, imputed schooling variables do not exceed 0.1% of cases (refer to Table 1).

The DHS imputes birth dates when a woman is unable to provide the year and/or month of birth for herself and/or her children. For other surveys, we imputed birth months for incomplete dates by randomly assigning a month of birth to those who reported an age or year of birth, but dropped from the analysis those cases with missing years and ages. In most countries, missing and imputed birth dates do not exceed 0.2% and 1.1% of cases respectively (refer to Table 1). Dates were recorded in century month code (CMC), which means the analysis accounted for both month and year of birth.

While the larger sample sizes of the pooled data were important for increasing the precision of this study's estimates (Rafferty, Walthery, and King-Hele 2015), the data are not without their limitations. Retrospective birth histories are subject to reporting errors that can impact the quality of the estimates. Potential errors include misreported dates of birth for mother and children; unreported births, which are more likely if the child died; forward telescoping, which means that births are reported as happening closer to the time of the survey than they actually occurred; and transference, which moves a birth to an earlier date than it actually occurred to avoid answering a long battery of child health questions. One study estimates that less than 2% of births are omitted and 2% are displaced in DHS surveys (Pullum and Becker 2014), and other research finds that forward telescoping is more common for older women (Heaton and Call 1995), who represent a

smaller portion of the study sample. Ultimately, these reporting errors and omissions are likely to be more common in less educated women who also have higher adolescent fertility, which means this study's estimates are more likely to underestimate adolescent fertility rather than overestimate it.

One final point of caution notes that these data are not about adolescent pregnancy but only about reported births. While access to abortion is prohibited altogether or severely restricted in most of the study countries (Guttmacher Institute 2017; Kulczycki 2011; Center for Reproductive Rights 2024), adolescents in the region do obtain abortions, most of which are unsafe (Guttmacher Institute 2017; Shah and Åhman 2004). As access to and use of induced abortion are likely differentiated by socioeconomic status (and therefore, educational attainment), the story of adolescent pregnancies in these countries may well differ from that of adolescent births.

4 Analytical strategy

The analytical strategy progressed through five main inquiries. Each inquiry examined countries separately before estimating a regional average. The first four inquiries used regression analyses and the fifth inquiry used estimated proportions.

The first inquiry examined schooling expansions by single school years. That is, it estimated the changing proportion of women, by year of birth, who had no schooling or attained one, two, three, etc. years of school. The analyses employed semiparametric Generalized Additive Models (GAMs) to identify nonlinear change after model testing confirmed they provided a better fit than parametric regressions (Keele 2008). These semiparametric regressions used successive sets of binary logistic models instead of ordinal regressions because they were more sensitive to reversals in schooling expansions. The equations shared the same general format wherein the outcome was a dummy variable for whether or not woman i attained a given school year and s denotes the restricted maximum likelihood (REML) splines used as the smoothing function:

$$\log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + s(\text{birthyear}_i) \quad (1)$$

$$log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + s(birthyear_i)$$

The second inquiry estimated the incidence of first births in adolescence, or the changing probability for a woman, given her year of birth and schooling attainment, to experience a first birth in her teenage years. The binary logistic regressions shared the same general format wherein the outcome was a dummy variable for whether or not woman *i* gave birth before age 20, *birthyear* was a linear term of the woman's year of birth, and *schoolattain* was a categorical term for her school attainment for which the grade corresponding to a theoretical school exit age of 21 and above was used as the reference category:

$$\log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 \text{birthyear}_i + \beta_2 \text{schoolattain}_i + \beta_3(\text{birthyear}_i \times \text{schoolattain}_i) \quad (2)$$

$$log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 birthyear_i + \beta_2 \text{schoolattain}_i + \beta_3(\text{birthyear}_i \times \text{schoolattain}_i)$$

The third inquiry explored patterns of additional births in adolescence by looking at cumulative adolescent fertility among teen mothers. That is, it estimated the average number of total births women who began childbearing as teenagers had before exiting adolescence, given their year of birth and schooling attainment. Note that the regression analyses looked only at the subset of the female population that had at least one birth in adolescence. These poisson regressions shared the

same general format as equation 2 except that the outcome variable, in this case represented as $log(E(Y|x))$ rather than $log(\frac{\pi_i}{1-\pi_i})$, was the total number of births woman *i* had before age 20.

The fourth inquiry explored changes in the mean age at first adolescent birth. Here again, the analyses looked only at the subset of the female population that had at least one birth in a linear regression in adolescence, and the outcome variable, in this case represented as y_i represents the age, counted in months, at which woman *i* had her first birth. The equation is otherwise identical to the logistic and poisson regressions above except for the addition of an error term ϵ_i.

The foregoing regression models used general maximum pseudo-likelihood estimation for multistage stratified, cluster-sampled, unequally weighted survey samples using the survey package in R (Lumley 2004). The models pooled multiple surveys over time within the same country but each individual survey's clusters and strata were coded with unique identifiers to ensure variance estimation remained true to the individual survey designs. Model selection explored whether an additive model, where the schooling-specific estimates follow similar rates of change from differing starting points (that is, they have distinct intercepts but parallel slopes) appropriately described the data, or if a model that includes an interaction, where the schooling-specific estimates have both distinct rates of change and distinct term β_3 starting points (that is, distinct intercepts and distinct slopes), provided a better fit to the data. Testing also explored whether schooling was best modeled as a numeric variable or as a factor, and when modeled as a factor, whether any successive, individual schooling years were statistically identical. Design-based analogues of tests of analysis of variance (ANOVA), Wald chi-square and Akaike information criterion (AIC) guided model selection (Lumley and Scott 2017).

Additionally, the inquiries looking at first adolescent births, cumulative adolescent childbearing, and mean age at first adolescent birth, and also explored trends at the population-level, to contrast them against changes in schooling-specific patterns. These population-level regressions used

GAMS to be able to capture nonlinear change. Model testing confirmed they provided a better fit than parametric regression techniques. The equations can be represented by equation 1 while substituting the corresponding outcome variable as described above for each inquiry.

The fifth inquiry explored changes in the timing of adolescent pregnancies in relation to school leaving. The analyses estimated the proportion of conceptions leading to a first birth in adolescence that occurred before, after or coincided with school leaving for each school attainment profile. In the absence of self-reported data on the age at which women left school in most surveys, this study imputed each woman's age at school leaving under the assumption she started school in line with each country's theoretical age for grade schedule and its school calendar, and progressed without any interruptions or grade repetitions. It also assumed all women had a nine-month pregnancy (see Table 2 for details).

[Table 2 about here]

In this case, the analysis did not model the year-on-year changes but instead estimated ten-year cohort averages to convey the greater inherent uncertainty. Adolescent conceptions prior to school leaving were those that were imputed to have occurred more than nine months before the woman's theoretical age at school leaving. Adolescent conceptions after school leaving were those that were imputed to have occurred more than four months after the woman's theoretical age at school leaving (so as not to include pregnancies in summer holidays). Adolescent conceptions that coincided with school leaving were those imputed to have occurred between nine months before and three months after her theoretical timing of school leaving. This imputation provided only a very rough estimate. Changes in schooling schedules and entry ages, as well as the very common occurrence of grade repetition and progression through school at non-standard ages, were not possible to determine from the data.

Finally, each of the five inquiries also explored regional averages. Models that looked at all countries together, to provide the regional average, reweighted the data to give each country equal weight but otherwise used the same analytical techniques described above. This means the results for these models reflect the average across countries, rather than the regional population average. The alternative of weighting by population size gave more pondus to population heavyweights Mexico and Brazil, but ultimately, the regional estimates differed only marginally for the two weighting options. For these regional models, testing explored whether country schooling variables were better matched along theoretical exit ages or cumulative number of school years.

To emphasize, all regression models (inquiries one to four) are based on a woman's school attainment, as identified in the data, not her imputed age at school exit. As such, assumptions about school exit ages do not enter into the regression equations in any way. However, the figures and text describing the regression results categorize school attainment in terms of theoretical age at school exit, simply because it is the most parsimonious way to identify the disparate schooling trajectories across countries.

5 Results

5.1 Schooling expansion

Figure 2 presents the region's schooling expansion (see Appendix Figure A1 to see how these translate to schooling levels). Note that while the regression models examined school expansion in terms of school attainment (unique to each country), the figure presents the results by theoretical exit age for simplicity. The sweeping change is beautiful and impressive. In broad terms, in the earliest years, most women had no formal schooling or exited after a few years of primary. That is, they left school before they reached adolescence. A few decades later, most women exited school towards the end of their adolescent years.

[Figure 2 about here]

Specifically, on average across countries in the 1960 adolescent cohort, 57% of women either had no schooling or theoretically finished school at or before 9 years of age (30% with no school). Nevertheless, for every decade from 1970 and after, the majority of women left school sometime during their adolescence. By the 2015 cohort, only 8% of women exited school in childhood (3% of women with no school) and 66% left in adolescence—with almost equal proportions leaving in early, middle and late adolescence. Moreover, while 3 out of every 100 women in the 1960 cohort were in school for their entire adolescence, by the 2015 cohort, one out of every four were.

Country differences were considerable and patterns were diverse. For example, at the extremes in each country's earliest cohorts, 90% of women in Haiti never went to school or left during childhood while in Belize this was 13%. But again, the adolescent years soon became the most definitive, and by the time of the most recent cohorts, just over half of countries see a larger proportion of women leaving school in late adolescence than any other age group—between 31% in Mexico and 52% in Ecuador. Elsewhere, in three countries, more women left in middle adolescence (34% in Nicaragua, 36% in Peru and 64% in Guyana), while in the remaining four countries with the poorest educational profiles, more women left in early adolescence than any other age group (roughly 36% in Belize, Guatemala, Haiti and Hon duras). Also in the most recent cohorts, the share of women exiting school after adolescence ranged between 1% in Haiti and 35% in the Dominican Republic. In no country did the size of this post-adolescence group exceed the size of women exiting in late adolescence. Rarely did it exceed the numbers exiting during early and middle adolescence.

The pull of certificate years was also apparent across most countries. In Mexico, for example, where it was especially pronounced, much larger proportions of women exited school upon graduating from primary (exit age of 12), lower secondary (exit age of 15), or upper secondary (exit age of 18) than left in intervening years. In Peru, the pull of upper secondary was strong, and

most women who entered lower secondary made it all the way to graduation from upper secondary (exit age of 17). In Haiti, such patterns were not apparent, indicating an unfortunate and steady march of dropouts occurring at each and every school year. Also worth noting were the apparent declines in recent years in the longest schooling careers, which did not necessarily imply educational reversals but rather that many young women, after breaks or delays in their schooling trajectories, had yet to make their way through tertiary.

In essence, all 15 countries saw sweeping improvements in the educational attainment of their female populations over the last six decades. Nevertheless, dramatic differences in the underlying educational composition of the country populations—and the timing of school exits—persisted.

5.2 First births in adolescence

The contrast between population-level and schooling-specific trends in first adolescent births was stark (see Figure 3). Note that while the regression models examined individual schooling years based on school attainment, the figure groups these by theoretical age at school exit to simplify visual presentation. Declines, usually fairly modest, in the proportion of women with a first birth in adolescence at the population level (black lines) masked dramatic increases in the proportions within specific schooling years (colored lines). The contrast arose because dramatic increases in first-birth likelihoods occurred at almost all school years while increases at the population level were dampened by progressive—though at times uneven—advancements of the female population into higher schooling years with comparatively lower risk. This advancement is depicted in the thickness of the plotted lines, which represent the share of the female population by their educational attainment.

[Figure 3 about here]

In the 1960 adolescent cohort, countries saw an average of 43% of women entering motherhood in adolescence. By the 2015 cohort, the average had fallen to 37%. Effectively a one percentage-point decline per decade. In essence, over the last half century, more than one in three women in the region consistently began childbearing in adolescence. Across countries, the range of proportions in the earliest cohorts saw 27% (Haiti) and up to 55% (Dominican Republic) and in the most recent cohorts between 22% (Peru) and 39% (Guatemala). Belize, the Dominican Republic and Peru saw the greatest decline over time while Brazil, Haiti and Paraguay saw, after intermediary periods of increase and decline, the exact same proportion of adolescent mothers in the most recent cohort as in the earliest cohort.

The change in schooling-specific patterns was extraordinary. When looking at the average across countries, women exiting school at age 16 and earlier (or not attending at all) saw their likelihood of giving birth in adolescence roughly double over time—converging between 50% and 68% of these women experiencing adolescent motherhood on average across countries. Essentially, in the 2015 cohort, women who exited school at ages 16 and younger had a higher likelihood of experiencing adolescent motherhood than any woman did in the 1960 cohort. For those exiting school at the ages of 17 and 18, the average likelihood also doubled. Nevertheless, those ages remained quite distinct from other shorter schooling trajectories (with average proportions at 35% and 29%, respectively). In the earliest cohorts, ages 17 and 18 matched the longest schooling trajectories in their likelihood of adolescent motherhood, but over time, the trends diverged markedly.

Importantly, likelihoods of adolescent childbearing for those with school exit ages of 19 and later declined slightly over time. Essentially, only the schooling careers that spanned all of adolescence remained immune to the dramatically intensifying schooling-specific incidence of adolescent childbearing sweeping across the region.

It is worth emphasizing here that statistical testing for the regional model indicated that the education variable that grouped schooling years according to their theoretical exit age, rather than cumulative number of years in school, was a much better statistical fit. Recall that because of differences in the timing of school entry, ten years of cumulative schooling, for example, corresponded to an exit age of 15, 16 or 17 years, depending on the country. In effect, patterns across countries resembled each other more closely when grouped according to the ages at which women were supposed to attend the respective school years, rather than when grouped by the cumulative number of school years women attained.

Model testing also revealed that while most individual school years were unique, all but one country (Guatemala) saw a number of school years that were statistically indistinguishable. That is, most countries had a handful of school years that effectively shared the same likelihood of adolescent childbearing and change over time. Most often, these were non-certificate school years, as opposed to certificate years. They were also more often exit ages in childhood and early adolescence. In effect, certificate years and school careers with exit ages in middle and late adolescence typically maintained distinctive levels and trends in adolescent first births.

One final overarching trend that merits attention is the striking pattern of convergence in the shortest schooling careers over time. In the figure, Colombia, Ecuador and Peru offer particularly clear examples of this. The convergence means that schooling careers that ended in childhood and early adolescence, and sometimes middle adolescence, saw little difference in their most recent levels of adolescent first births. This also means that in recent years there existed a type of threshold in most countries wherein similarly high likelihoods of adolescent fertility were shared by all women with limited schooling, and lower predicted likelihoods only manifested once educational attainment extended into the middle or late adolescent years.

5.3 Additional births in adolescence

Additional births in adolescence were common, but there have been considerable declines in their occurrence over the past decades. Figure 4 represents this by depicting the average number of births that occurred to teen mothers before they exited adolescence. Where the average is close to one, it indicates that few adolescent mothers went on to have additional births in adolescence. Where the average is close to 1.5, for example, it can roughly translate to about half of adolescent mothers having had a second birth before turning twenty. In reality, a fair number of adolescent mothers had three or more births, meaning the translation is not exact. Here again, note that while the regression models examined individual schooling years based on school attainment, the figure groups the school years by theoretical exit age simply for a more parsimonious presentation of the results.

[Figure 4 about here]

In sharp contrast to the first-birth pattern of limited population-level change masking dramatic schooling-specific change, for the average number of adolescent births, dramatic population-level change often masked limited schooling-specific change, especially at lower schooling levels. In most countries, the average number of adolescent births to teen mothers with the shortest schooling careers saw fairly limited change over the past decades. Instead, more dramatic aggregate decline was due to the progressive advancement of the female population into longer schooling careers. Again, the schooling composition is depicted in the thickness of the colored lines, which represent the share of the female population by their educational attainment.

In the 1960 adolescent cohort, countries saw an average of 1.8 births in adolescence per teenage mother. By the 2015 cohort, the average had fallen to 1.3 births—nearly a 30% decline. Across countries, the range in the earliest cohorts was 1.5 (Paraguay) to 2.0 adolescent births (Nicaragua).

In the most recent cohorts, all countries either saw 1.2 or 1.3 average adolescent births. Nicaragua saw the greatest decline over time while Paraguay and Guatemala saw the least decline.

The change in schooling-specific patterns were more limited. On average across countries, schooling careers that ended in childhood and ages 10 and 11 saw about a 10% decline in their total adolescent births—and generally remained at or above 1.5 births in the most recent cohorts. Meanwhile, schooling careers that ended in the other adolescent years saw declines of roughly 20% while the schooling careers that ended after adolescence saw declines of nearly 25%. Interestingly, for schooling exits in adolescence, the greatest declines were among schooling careers that theoretically ended at ages 12 and 13, not older adolescent ages.

Here again, statistical testing for the aggregate model indicated that the education variable that grouped schooling profiles by their theoretical exit age rather than cumulative school years offered a much better statistical fit. Model testing also identified many more statistically identical school years than were found for first births, meaning that even if the proportion of adolescents entering motherhood differed for certain schooling levels, once becoming a mother, their patterns of additional adolescent childbearing did not necessarily differ. Just as with the first birth models, these were most often non-certificate years. However, when a certificate year was identical to another school year, it was more often indistinguishable from the year(s) above, rather than those below. Meaning that adolescent mothers who completed a given schooling level were more likely to see a distinctive (and lower) incidence of additional childbearing than the adolescent mothers who had dropped out from that schooling level. And dropouts within a given level often saw identical patterns of additional adolescent childbearing.

5.4 Mean age at first adolescent birth

Results of the analysis of the mean age at first birth for adolescent mothers are depicted in Figure 5. Recall that this analysis did not consider age trends in first births across the entire female

population but instead only among women with a first birth in adolescence. Additionally, while the figure groups the school years by their theoretical exit age, the regression models examined actual individual school attainment. In broad strokes, the average age at first adolescent birth changed only slightly over the past decades. In the 1960 adolescent cohort, countries saw adolescent mothers give birth on average at age 17.5 while in the 2015 cohort, the average age was 17.7 years old. Given that mean age at first adolescent birth for all but the longest schooling careers became younger over time, the population-level increase in mean age was driven by the changing educational composition.

[Figure 5 about here]

The figure reveals three particularly salient findings. First, the convergence in mean age seen in most countries for the shortest schooling careers over time echoes the convergence happening in first births. That is, schooling careers that ended in childhood and early adolescence became increasingly similar in terms of the timing of first adolescent births—and the births occurred at increasingly younger ages, on average. Whereas in the earliest cohorts, many of these shorter schooling careers saw a mean age of 17.5 and higher, by the most recent cohorts, the means were closer to 17 years of age. Indeed, declines in mean age were strongest for women who exited school in early adolescence.

The declines in mean age have important implications for high-order adolescent births because they indicate that the duration of exposure to the risk of higher-order adolescent births increased for most schooling profiles. As such, adolescent mothers with a given educational attainment generally had more time for additional childbearing in adolescence, but very few schooling profiles in any country saw increases in the average number of adolescent births.

Second, generally only schooling careers with exit ages of 19 and later—the schooling careers that spanned all of adolescence—remained immune to declines in mean age. In fact, in most countries,

the longest schooling careers (usually from exit age 19 and above) shared an identical mean age and increased slightly over time (moving from 18.21 to 18.23 years).

Third, and perhaps most importantly, for almost all schooling careers, the mean age at first birth remained consistently younger than the theoretical school exit age, suggesting that for most schooling profiles, there was minimal overlap in the timing of the two events. There were differences across countries, but the conflict in timing generally first arose for schooling careers with an exit age at 18 years. That is, schooling careers with an exit age of 18 years saw a mean age at first adolescent birth also at age 18 (specifically, 18.2 in the 1960 cohort and 18.1 in the 2015 cohort for the cross-country average). Later school exits also saw births occurring at age 18.2 on average. In contrast, schooling careers with an exit age of 17 years saw a mean age at first adolescent birth after age 18 (also 18.2 in the 1960 cohort and 18.1 in the 2015 cohort). All earlier school exits also saw births occurring after age 17. All this to say that the findings suggest that most adolescent births appear to have happened after theoretical exits from school, even in spite of the declines in mean age at first adolescent birth for all but the longest schooling careers. The next analysis explores this possibility in more detail.

5.5 Imputed timing of conception and school leaving

Figure 6 depicts the results of the imputed timing of conceptions leading to a first adolescent birth relative to theoretical exit ages from school. Results are depicted for the average across all countries. Again, these estimates assumed a nine-month pregnancy and imputed the woman's age at school leaving based on her birth month and year alongside each country's theoretical age for grade schedule, school entry age cutoffs, and school calendar.

[Figure 6 about here]

The patterns are remarkable. Although the proportion of all adolescent conceptions that ostensibly interrupted school grew (see subplot "All adolescent mothers" in the figure), there was

extraordinarily little change in schooling-specific trends. That is, within each schooling profile, practically every cohort saw the same proportion of conceptions happening before, during and after school exit. Looking at the population-level change, 96% of conceptions in the 1960-1969 cohort happened after school exit while 2% happened before and 2% coincided. By the 2010-2015 cohort, 70% of conceptions happened after school exit while 17% happened before and 13% coincided. But again, this change appears to have been due exclusively to changes in the population's educational composition. Schooling-specific trends saw remarkably little change over time.

Schooling careers that ended in childhood saw, understandably enough, effectively all conceptions happening after school exit. Some conceptions that interrupted schooling careers occurred in early adolescence, but the majority of conceptions, up until school exit age 18, happened after school exit. At the school exit age of 18, more than half of conceptions happened before or coincided with school exit. For older exit ages, all or nearly all of conceptions happened before or coincided with school exit. Like other research has argued, this indicates that adolescent pregnancies have not spelled the end of girls' educational careers for a heavy majority of women over the last half century in the region. (However, it does not preclude adolescent pregnancies from truncating what otherwise might have become of those schooling careers.)

But the more pertinent and unique finding of this analysis arises given there was so little change from cohort to cohort within each schooling career. At the population level, the growing number of in-school pregnancies appear exclusively to have been a manifestation of the changing educational composition. Underlying changes in adolescent fertility timing associated with each educational strata were almost entirely absent.

6 Summary and Discussion

This study has sought to conduct a thorough accounting of long term, parity-specific and educationally nuanced demographic trends in adolescent fertility in Latin American and Caribbean. The aim of the accounting was two-fold. First, to untangle, in basic mechanical terms, how the region has maintained such high levels of adolescent fertility in the face of sweeping educational expansions. Second, to speak to broader theoretical underpinnings regarding the relationship between schooling and the timing of fertility given that experimental evidence consistently shows that schooling reduces adolescent fertility. Given the methods employed in this paper, we cannot describe the findings as effects, but rather macro-level population patterns, which are nevertheless helpful for building theoretical understanding, and which have important implications for studying—and tackling—adolescent fertility across the globe.

In summarizing this study's findings and speaking to the first aim of the paper, the puzzle of the region's high adolescent fertility can indeed be untangled. High levels of teenage childbearing have persisted because of dramatic underlying changes in schooling- and parity-specific patterns. In broad strokes, both sixty years ago and most recently, about one in three women gave birth in adolescence even though the female population became dramatically more educated. Decades of modest population-level declines or stagnation in the proportion of women experiencing adolescent motherhood were the result of considerable increases in the probabilities at each specific schooling level—except, in most cases, among the groups of women who remained in school throughout their entire adolescence. Half a century ago, only the very shortest schooling careers saw more women experiencing teen motherhood than not, but in recent decades, almost all schooling careers that end before late adolescence saw more than half of women give birth in adolescence.

Meanwhile, declines in subsequent adolescent births meant that teen mothers had on average 1.3 births before exiting adolescence in recent cohorts, down from 1.8 births in the earliest cohorts.

Declines were the result of an increasingly educated female population moving through schooling careers that not only had lower progression ratios but also saw declines in their risk over time. And these declines were not the result of women simply having less time on average for subsequent adolescent births. Indeed, in most educational strata, the mean age at first adolescent birth became slightly younger over time. In other words, even though teen mothers had more time for additional births before exiting adolescence, their occurrence declined over time for almost all schooling careers.

These interlocking changes in the region's schooling and adolescent fertility patterns culminate in the finding that there has been astoundingly little change in how adolescent fertility has translated to interruptions in schooling careers. Put more simply, for every given schooling career, the proportion of teen pregnancies that happened before, after or coincided with school exit remained almost altogether unchanged over the last half century. In essence, population-level trends have been shaped by considerable compositional shifts in the educational makeup of each country. Underlying these compositional changes, the relationship between schooling and adolescent fertility has shifted dramatically within each educational strata.

Earlier, this study argued that little theoretical work exists on the relationship between schooling and the timing of fertility. In the absence of such theory, and to speak to the second aim of this study, we draw from empirical findings to classify the relationship into two fundamental channels: patterns of enrollment and patterns of aspirations. Enrollment matters because causal evidence finds that the time adolescent girls and women spend enrolled and present in school reduces their fertility. Aspirations refer to the causal evidence that indicates schooling can lead to lower fertility even after school attendance ends. In light of this categorization, the findings of this study clarify that adolescent fertility's link with enrollment appears to have remained largely unchanged while its aspirational link, in contrast, has been radically altered over the past decades. That is, it seems

that enrollment (or incarceration) has remained as consistent a check as ever on adolescent childbearing even when schooling-inspired aspirations have not.

We readily acknowledge that there is considerable uncertainty in our imputation of the timing of adolescent pregnancies and school leaving. Without information on the actual age of school leaving our analysis almost certainly underestimates the incidence of conceptions occurring before and coinciding with school exit given that grade repetition has long been very common in the region (Eisemon 1997; Schiefelbein and Wolff 1992; UNESCO 2022). However, for the purposes of this study, the consistency over time in the patterns is more salient than their precise magnitude. What is more, patterns in first births also point to stability in the enrollment link. Tellingly, the educational trajectories that lasted through the entirety of adolescence were generally the only schooling careers that remained immune to increasing adolescent fertility. Furthermore, recall that in spite of increasing proportions of women experiencing a first birth in adolescence (and at slightly younger ages) within most schooling careers, the average ages at first births in adolescence remained well above theoretical exit ages from school.

Other research also finds that most adolescent mothers in the region leave school prior to conception (Flórez and Soto 2007). But for the girls who are in school when they become pregnant, they are more likely to stay in school or return to it if they are younger at the time of birth, are from better-off socioeconomic strata and remain unpartnered (Näslund Hadley and Binstock 2011). And while there is encouraging research that suggests adolescent mothers who stay in school eventually see little difference in their final educational attainment compared to that of their childless peers (Grant and Hallman 2008; Madhavan and Thomas 2005; Ranchhod et al. 2011; Näslund-Hadley and Binstock 2011), in the high-income settings where it has been tested, a mother's schooling acquired after her child is born does not seem to have the same intergenerational returns as schooling acquired before (Augustine and Negraia 2018).

Furthermore, a mother's age at birth is consistently predictive of how much schooling her child will complete (Duncan, Kalil, and Ziol-Guest 2017).

For the pregnancies that coincide with school leaving, it does not necessarily follow that the pregnancies cause school dropout (McQueston, Silverman, and Glassman 2012). Union formation, financial constraints, disenchantment with school, poor performance, and poor quality may be more salient reasons wherein pregnancy simply adds a final excuse for leaving (McQueston, Silverman, and Glassman 2012; Näslund-Hadley and Binstock 2011; Sanchez et al. 2006).

In contrast to enrollment, what occurs after girls leave school—the aspirational aspect—has undergone considerable transformation. And the change has differed at different parities. When looking at the changing likelihood of experiencing adolescent motherhood (first births), many schooling careers progressively lost their selectivity, and their first adolescent birth outcomes became little different from the shortest schooling trajectories. Meanwhile, there were important aspirational changes in higher-order adolescent births. In most countries, the majority of schooling careers saw declines over time in repeat adolescent childbearing.

Underlying the changes are noteworthy shifts in the demographic makeup of each educational strata. Women whose schooling did not extend beyond childhood or early adolescence have been increasingly characterized by intersecting factors of poverty, disability, rurality and indigenous identity (Adelman and Szekely 2017; UNESCO 2016). Other research finds that these characteristics have strong educational gradations in adolescent fertility outcomes, as do patterns of sexual activity, union formation and fertility intentions (Ali, Cleland, and Shah 2003; Bozon, Gayet, and Barrientos 2009; Di Cesare and Rodríguez Vignoli 2006; Esteve, García-Román, and Lesthaeghe 2012; Esteve, Lesthaeghe, and López-Gay 2012; Flórez 2005; Fussell and Palloni 2004; Glick, Handy, and Sahn 2015; Kravdal 2002; Kulczycki 2011; Vignoli 2017; Kroeger, Frank, and Schmeer 2015).

Changes in patterns of marriage and cohabitation are also relevant when considering aspirational influences and the intensification of first births in adolescence. In much of the region, the mean age of union formation has decreased, except among the most educated, with high and increasing rates of cohabitation, especially among adolescents, more than offsetting declines in marriage (Castro Martín et al. 2011; Castro Martin 2002; Núñez and Flórez 2001). Having a partner dramatically heightens the risk of adolescent fertility and, conversely, becoming pregnant intensifies transitions to union formation (Grace and Sweeney 2014; Flórez and Soto 2013; Covre-Sussai et al. 2015). Otherwise, relatively modest increases in adolescent fertility outside of a union have been found mostly among the oldest adolescents and those from the higher socio-economic strata (Flórez 2005; Flórez and Soto 2007). Meanwhile, adolescent mothers who live with their parents, rather than alone with a partner, can see more positive educational and employment outcomes (Jesus, Wajnman and Turra 2017; Näslund-Hadley and Binstock 2011).

In regards to subsequent births in adolescence, declines are happening in most (but not all) educational profiles. Again, declining mean ages at first birth at many schooling levels suggest that aspirational, rather than mechanical, aspects are at play because more time available for subsequent teen births did not translate to a higher incidence of them. The declines could well reflect, for example, findings in other research (reviewed earlier) that indicate access barriers to contraception are lower for adolescent mothers than for their childless peers. Nevertheless, differences in repeat adolescent births across educational careers persist. Other research suggests that the take-up of effective contraception after a first birth continues to see education-differentiated barriers as well as education-differentiated partnership and family-formation intentions (Kroeger, Frank, and Schmeer 2015).

Additional complexity in the aspirational aspects arises when considering the fertility changes that have happened outside of adolescence. The introduction touched on a number of these, including

the dramatic declines in total fertility, and increasing postponement of first births among the most educated, creating an ever-widening age gap in fertility.

Changes in schooling's aspirational influence are likely also related to other relevant hazards that have riddled the region's educational expansions and adolescent opportunities. There are problems with the quality of schooling and availability of comprehensive sexuality education, for example (Azevedo et al. 2012; Panchaud et al. 2019). By some measurements, the region's educational expansions have occurred alongside increasing inequality in schooling access, learning outcomes and earnings differentials (Behrman, Duryea, and Szekely 1999; Paes de Barros et al. 2009; Torche 2010, 2012; Marteleto et al. 2011). Some adolescent fertility studies in the region speak to a repositioning of the social hierarchy—not just the intensification of marginalization at the bottom—to one that favors relative over absolute standing (Batyra 2019; Esteve Palós and Florez-Paredes 2014). Economic research also explores this hierarchical relativity and has found that as schooling has expanded, its marginal effects on women's autonomy and labor market rewards have declined because the positional value of education has taken precedence over absolute skill levels (Urbina 2022; Bol 2015).

Finally, qualitative research repeatedly finds that many adolescent mothers lack other life plans and aspirations (such as further education) that conflict with motherhood, and as such, they do not feel their fertility interrupts anything. They also often doubt that additional schooling will translate to improved employment opportunities (Azevedo et al. 2012). But the aspirational formulation is not meant to demean adolescent mothers, nor imply they lack vision or ambition. Instead, it acknowledges how restrictive gender norms, high levels of inequality, low levels of female employment, and widespread economic hardship and violence in the region obstruct girls' opportunities and curb their perception of what is possible.

Ultimately, it seems likely that schooling's aspirational value—in regards to its incentive to not enter motherhood in adolescence—may well be diminishing in step with its shrinking

socioeconomic returns. Particularly in the face of continued taboos against adolescent sexual activity and barriers to teens' access and use of contraception. In regards to declining subsequent adolescent births, on the other hand, the aspirational changes seem to reflect changing norms around birth spacing, family size, and the availability of contraception for young mothers, making it more likely that adolescent mothers postpone subsequent births.

It is also important to acknowledge that this study does not cover the most recent cohorts of adolescents who are, in many countries, continuing to drive declines in adolescent fertility. Nor does it include several countries in the region that have long seen comparatively low rates of adolescent childbearing. For example, in Argentina, Chile, Costa Rica and Uruguay, adolescent fertility rates are among the lowest in the region and have more than halved over the last decade. For the region as a whole, the rate has fallen by 30% between 2013 and 2023 (UN Population Division 2024). The drivers behind these recent declines are still not well understood, but research points to expanded university education; delays in sexual debut; declines in adolescent marriage and cohabitation; and improved access to contraception better suited to adolescent needs, particularly long-acting reversible contraception (Ceni et al. 2021; Rodgrígeuz-Vignoli and Roberts 2020). Perhaps not coincidentally, the countries with the greatest declines tend to be those with the highest levels and strongest expansion of tertiary schooling in recent years (KC et al. 2024).

Before concluding, it is worth making a final note of the dramatic differences between upper and lower secondary, which roughly occur in middle and early adolescence, respectively. In recent cohorts, lower secondary was little different from the shortest schooling profiles, and though upper secondary was not as resistant as tertiary to increasing first births in adolescence, there was often little difference between upper secondary and tertiary in progression to higher-order adolescent births. Again, fertility patterns for upper secondary have consistently been manifestly different from lower secondary.

Health research is beginning to indicate that many of schooling's myriad benefits on health see a threshold effect; that is, the greatest benefits emerge at upper secondary schooling (Patton et al. 2016), but little demographic research distinguishes between upper and lower secondary. This study finds that the most dramatic and distinct changes are happening at those levels. Not to mention that most women, both historically and currently, finish their schooling careers sometime during upper or lower secondary. Greater attention to differences between upper and lower secondary could translate beneficially to demographic research across the globe. For most of the world, tertiary schooling remains the realm of the elite, and the value of upper secondary—and the importance of making it available to all girls—is perhaps being obscured by a lack of nuance in research.

The implications of these findings for policy and practice are far-reaching. Initiatives seeking to reduce the region's high and stubborn levels of adolescent motherhood will find promising potential in the expansion of access to upper secondary and tertiary. Primary and lower secondary simply do not occupy enough years in adolescence to conflict with early fertility.

Finally, there is considerable nuance to each country's patterns and they merit further study. Adolescent fertility intensities did not always match across similar schooling careers in different countries, but each country also has had a distinct timeline of fertility decline; history of family planning; and chronicles of economic growth, crisis and restructuring (Cavenaghi and Diniz Alves 2009; Heaton and Forste 1998; Weinberger, Lloyd, and Blanc 1989; Grace and Sweeney 2016). Even so, such contextual variety makes this study's broad similarities in adolescent fertility all the more remarkable. School enrollment's ability to forestall fertility appears to have been as effective in the most recent cohorts as it was in cohorts half a century ago, while schooling's aspirational influence has been modified under changing context and reorganized social hierarchies.

Notes

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Data Availability

Data used in this research are publicly available demographic and health surveys. Refer to Table 1 for the names and dates of the surveys used for each country.

References

Abbasi-Shavazi, Mohammad, Wolfgang Lutz, Meimanat Hosseini-Chavoshi, and Samir K. C. 2008. "Education and the World's Most Rapid Fertility Decline in Iran." IR-08-010. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Abel, G. J., B. Barakat, K. C. Samir, and Wolfgang Lutz. 2016. "Meeting the Sustainable Development Goals Leads to Lower World Population Growth." Proceedings of the National Academy of Sciences 113 (50): 14294–99.

Adelman, M. A., and M. Szekely. 2017. "An Overview of School Dropout in Central America: Unresolved Issues and New Challenges for Education Progress." *European Journal of Educational Research* 6 (3): 235–59. https://doi.org/10.12973/eu-jer.6.3.235.

Ainsworth, M., Kathleen Beegle, and Andrew Nyamete. 1996. "The Impact of Women's Schooling on Fertility and Contraceptives Use: A Study of Fourteen Sub-Saharan African Countries." *The World Bank Economic Review*, no. 1: 85–122.

Ali, Mohamed M., John Cleland, and Iqbal H. Shah. 2003. “Trends in Reproductive Behavior Among Young Single Women in Colombia and Peru: 1985–1999.” *Demography* 40 (4): 659–73. https://doi.org/10.1353/dem.2003.0031.

Álvarez Castaño, Víctor Hugo. 2015. “Distribución Territorial y Determinantes de La Fecundidad Adolescente En Colombia.” Notas de Población, Naciones Unidas Comisión Económica Para América Latina y El Caribe (CEPAL) 101: 79–108.

Angrist, Joshua, Eric Bettinger, Erik Bloom, Elizabeth King, Michael Kremer, and Juan Saavedra. 2002. “Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment.” *American Economic Review* 92 (5): 1535–58.

Arceo-Gomez, Eva, and Raymundo Campos-Vazquez. 2014. “Teenage Pregnancy in Mexico: Evolution and Consequences.” *Latin American Journal of Economics* 51 (1): 109–46. https://doi.org/10.7764/LAJE.51.1.109.

Augustine, Jennifer March, and Daniela V. Negraia. 2018. “Can Increased Educational Attainment Among Lower-Educated Mothers Reduce Inequalities in Children’s Skill Development?” *Demography* 55 (1): 59–82. https://doi.org/10.1007/s13524-017-0637-4.

Axinn, William G., and Jennifer S. Barber. 2001. “Mass Education and Fertility Transition.” *American Sociological Review* 66 (4): 481–505. https://doi.org/10.2307/3088919.

Azevedo, Joao Pedro, Marta Favara, Sarah E. Haddock, Luis F. Lopez-Calva, Miriam Müller, and Elizaveta Perova. 2012. “Teenage Pregnancy and Opportunities in Latin America and the Caribbean: On Teenage Fertility Decisions, Poverty and Economic Achievement.” Washington DC: World Bank Group.

Baird, Sarah, Ephraim Chirwa, Craig McIntosh, and Berk Özler. 2010. “The Short-Term Impacts of a Schooling Conditional Cash Transfer Program on the Sexual Behavior of Young Women.” *Health Economics* 19 (S1): 55–68. https://doi.org/10.1002/hec.1569.

Batyra, Ewa. 2016. “Fertility and the Changing Pattern of the Timing of Childbearing in Colombia.” *Demographic Research* 35: 1343–72. https://doi.org/10.4054/DemRes.2016. 35.46.

Batyra, Ewa. 2019. “Increasing Educational Disparities in the Timing of Motherhood in the Andean Region: A Cohort Perspective.” *Population Research and Policy Review* 39: 283–309. https://doi.org/10.1007/s11113-019-09535-0.

Behrman, Julia. 2015. “Does Schooling Affect Women’s Desired Fertility? Evidence from Malawi, Uganda, and Ethiopia.” *Demography* 52 (3): 787–809. https://doi.org/10.1007/s13524-015-0392-3.

Behrman, Julia, S. Duryea, and M. Szekely. 1999. “Schooling Investments and Aggregate Conditions: A Household-Survey-Based Approach for Latin America and the Caribbean” Working Paper No.407. Washington DC, USA: Inter-American Development Bank.

Benova, Lenka, Sarah Neal, Emma G. Radovich, David A. Ross, Siddiqui Manahil, and Venkatraman Chrandra-Mouli. 2018. “Using Three Indicators to Understand the Parity-Specific Contribution of Adolescent Childbearing to All Births.” *BMJ Global Health* 3 (e001059). https://doi.org/10.1136/bmjgh-2018-001059.

Berquó, E., and Suzana Cavenaghi. 2005. “Increasing Adolescent and Youth Fertility in Brazil: A New Trend or a One-Time Event?” Annual Meeting of the Population Association of America. Presentation. Philadelphia, Pennsylvania.

Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes. 2008. “Staying in the Classroom and Out of the Maternity Ward? The Effect of Compulsory Schooling Laws on Teenage Births.” *The Economic Journal* 118 (530): 1025–54. https://doi.org/10.1111/j.1468- 0297.2008.02159.x.

Boden, J.M., Fergusson, D.M., and Horwood, L.J. (2008). “Early Motherhood and Subsequent Life Outcomes.” *Journal of Child Psychology and Psychiatry* 49 (2): 151–160. https://doi.org/10.1111/j.1469-7610.2007.01830.x

Bol, T. 2015. “Has Education Become More Positional? Educational Expansion and Labour Market Outcomes, 1985-2007.” *Acta Sociologica* 58: 105–20.

Bongaarts, John. 2003. “Completing the Fertility Transition in the Developing World: The Role of Educational Differences and Fertility Preferences.” *Population Studies* 57 (3): 321–35. https://doi.org/10.1080/0032472032000137835.

Bongaarts, John. 2010. “The Causes of Educational Differences in Fertility in Sub-Saharan Africa.” *Vienna Yearbook of Population Research* 8: 31–50.

Bozon, Michel, Cecilia Gayet, and Jaime Barrientos. 2009. “A Life Course Approach to Patterns and Trends in Modern Latin American Sexual Behavior.” *JAIDS Journal of Acquired Immune Deficiency Syndromes* 51: S4–12. https://doi.org/10.1097/QAI. 0b013e3181a2652f.

Brand, Jennie E., and Dwight Davis. 2011. “The Impact of College Education on Fertility: Evidence for Heterogeneous Effects.” *Demography* 48 (3): 863–87.

Caldwell, John C. 1980. “Mass Education as a Determinant of the Timing of Fertility Decline.” *Population and Development Review* 6 (2): 225–55. https://doi.org/10.2307/ 1972729.

Casterline, John B., and Colin Odden. 2016. “Trends in Inter-Birth Intervals in Developing Countries 1965–2014.” *Population and Development Review* 42 (2): 173–94. https://doi. org/10.1111/j.1728-4457.2016.00134.x.

Castro Martin, Teresa. 2002. “Consensual Unions in Latin America: Persistence of a Dual Nuptiality System.” *Journal of Comparative Family Studies* 33 (1): 35–55.

Castro Martín, Teresa, Clara Cortina, Teresa Martín García, and Ignacio Pardo. 2011. “Maternidad Sin Matrimonio En América Latina: Un Análisis Comparativo a Partir de Datos Censales.” Notas de Población 93.

Cavenaghi, Suzana, and José Eustáquio Diniz Alves. 2009. “Fertility and Contraception in Latin America: Historical Trends, Recent Patterns.” Latin American Population Association, Demographic transformations and inequalities in Latin America, 8.

Cavenaghi, Suzana, and José Eustáquio Diniz Alves. 2011. “Diversity of Childbearing Behaviour in the Context of Below-Replacement Fertility in Brazil.” Expert Paper No. 2011/8. United Nations, Department of Economic; Social Affairs, Population Division.

Ceni, R., Parada, C., Perazzo, I., Sena, E. 2021. “Birth Collapse and a Large-Scale Access Intervention with Subdermal Contraceptive Implants.” *Studies in Family Planning* 523: 321-342.

Center for Reproductive Rights. “The World’s Abortion Laws.” April 11, 2024. https://reproductiverights.org/maps/worlds-abortion-laws/.

Choe, Minja Kim, and Robert D. Retherford. 2009. “The Contribution of Education to South Korea’s Fertility Decline to ’Lowest-Low’ Level.” *Asian Population Studies* 5 (3):2267–88. https://doi.org/10.1080/17441730903351503.

Cleland, J. 2009. “Contraception in historical and global perspective.” Best practice & research *Clinical obstetrics & gynaecology* 23(2): 165-76. https://doi.org/10.1016/j.bpobgyn.2008.11.002

Cleland, John, and Jerome K. van Ginneken. 1988. “Maternal Education and Child Survival in Developing Countries: The Search for Pathways of Influence.” *Social Science & Medicine* 27 (12): 1357–68. https://doi.org/10.1016/0277-9536(88)90201-8.

Cleland, John, and Christopher Wilson. 1987. “Demand Theories of the Fertility Transition: An Iconoclastic View.” *Population Studies* 41 (1): 5–30. https://doi.org/10.1080/0032472031000142516.

Coutinho, E. M. 1993. “Latin America's contributions to contraceptive development.” *Fertility and sterility* 60(2): 227-230. PMID: 8339815

Covre-Sussai, Maira, Bart Meuleman, Sarah Botterman, and Koen Matthijs. 2015. "Traditional and Modern Cohabitation in Latin America: A Comparative Typology." *Demographic Research* 32: 873–914. https://doi.org/10.4054/DemRes.2015.32.32.

Cygan-Rehm, Kamila, and Miriam Maeder. 2013. "The Effect of Education on Fertility: Evidence from a Compulsory Schooling Reform." *Labour Economics* 25: 35–48. https://doi.org/10.1016/j.labeco.2013.04.015.

De Rosa, Cecilia, María José Doyenart, and Cecilia Lara. 2016. "Maternidad Adolescente En Barrios Pobres de Montevideo: Un Lugar En El Mundo." *Notas de Población* 103:45–71.

Di Cesare, Mariachiara, and Jorge Rodríguez Vignoli. 2006. "Micro Analysis of Adolescent Fertility Determinants: The Case of Brazil and Colombia." *Papeles de Población* 12 (48): 94–121.

Diamond, I., M. Newby, and S. Varle. 1999. "Female Education and Fertility: Examining the Links." In Critical Perspectives on Schooling and Fertility in the Developing World, 23–48.Washington, D.C., National Academy Press.

Diaz, Christina J., and Jeremy E. Fiel. 2016. "The Effect(s) of Teen Pregnancy: Reconciling Theory, Methods, and Findings." *Demography* 53 (1): 85–116. https://doi.org/10.1007/s13524-015-0446-6.

Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2015. "Education, HIV, and Early Fertility: Experimental Evidence from Kenya." *American Economic Review* 105 (9): 2757–97. https://doi.org/doi: 10.1257/aer.20121607.

Duncan, Greg J., Ariel Kalil, and Kathleen M. Ziol-Guest. 2017. "Increasing Inequality in Parent Incomes and Children's Schooling." *Demography* 54 (5): 1603–26. https://doi.org/10.1007/s13524-017-0600-4.

Duncan, Greg J., Kenneth T. H. Lee, Maria Rosales-Rueda, and Ariel Kalil. 2018. "Maternal Age and Child Development." *Demography* 55 (6): 2229–55. https://doi.org/10.1007/s13524-018-0730-3.

Eisemon, Thomas Owen. 1997. "Reducing Repetition: Issues and Strategies." Paris: UNESCO: International Institute for Educational Planning.

Elizaga, J. C. 1977. “Participación de la mujer en la mano de obra en América Latina: la fecundidad y otros determinantes.” https://repositorio.cepal.org/server/api/core/bitstreams/57b7e323-91ce-4bf5-b7a9-b0e995633599/content

Esteve, Albert, Joan García-Román, and Ron Lesthaeghe. 2012. “The Family Context of Cohabitation and Single Motherhood in Latin America.” *Population and Development Review* 38 (4): 707–27. https://doi.org/10.1111/j.1728-4457.2012.00533.x.

Esteve, Albert, Ron Lesthaeghe, and Antonio López-Gay. 2012. “The Latin American Cohabitation Boom, 1970–2007.” *Population and Development Review* 38 (1): 55–81. https://doi.org/10.1111/j.1728-4457.2012.00472.x.

Esteve, Albert, Luis Angel Lopez-Ruiz, and Jeroen Spijker. 2013. “Disentangling How Educational Expansion Did Not Increase Women’s Age at Union Formation in Latin America from 1970 to 2000.” *Demographic Research* 28: 63–76.

Esteve Palós, Albert, and Elizabeth Florez-Paredes. 2014. “Edad a La Primera Unión y Al Primer Hijo En América Latina: Estabilidad En Cohortes Más Educadas.” *Notas de Población* 99: 39–65.

Felitti, K. 2018. “En sus propias palabras: Relatos de vida sexual y (no) reproductiva de mujeres jóvenes mexicanas durante las décadas de 1960 y 1970.” *Dynamis* 38(2): 333-361.

Felitti, K. 2022. “The Birth Control Pill and Family Planning.” Oxford Research Encyclopedia of Latin American History. Retrieved 19 Sep. 2024, from https://oxfordre.com/latinamericanhistory/view/10.1093/acrefore/9780199366439.001.0001/acrefore-9780199366439-e-1043.

Flórez, Carmen Elisa. 2005. “Factores Socioeconómicos y Contextuales Que Determinan La Actividad Reproductiva de Las Adolescentes En Colombia.” *Revista Panamericana de Salud Pública* 18 (6): 388–402.

Flórez, Carmen Elisa, and Victoria Eugenia Soto. 2007. “Fecundidad Adolescente y Desigualdad En Colombia.” *Notas de Población* 83: 41–74.

Flórez, Carmen, and Victoria Soto. 2013. “Factores Protectores y de Riesgo Del Embarazo Adolescente En Colombia. Estudio a Profundidad Basado En Las Encuestas Nacionales de Demografía y Salud (ENDS - 1990 / 2010).” Bogotá: Profamilia.

Fussell, Elizabeth, and Alberto Palloni. 2004. “Persistent Marriage Regimes in Changing Times.” *Journal of Marriage and Family* 66 (5): 1201–13. https://doi.org/10.1111/j.0022-2445.2004.00087.x.

Geruso, Michael, and Heather Royer. 2018. “The Impact of Education on Family Formation: Quasi-Experimental Evidence from the UK.” National Bureau of Economic Research Working Paper No. 24332.

Glick, Peter, Christopher Handy, and David E. Sahn. 2015. “Schooling, Marriage, and Age at First Birth in Madagascar.” *Population Studies* 69 (2): 219–36. https://doi.org/10. 1080/00324728.2015.1053513.

Gómez-Inclán, Sofía, and Luis Durán-Arenas. 2017. “El Acceso a Métodos Anticonceptivos En Adolescentes de La Ciudad de México.” *Salud Pública México* 59 (3).

Grace, Kathryn, and Stuart Sweeney. 2014. “Pathways to Marriage and Cohabitation in Central America.” *Demographic Research* 30: 187–226. https://doi.org/10.4054/DemRes.2014.30.6.

Grace, Kathryn, and Stuart Sweeney. 2016. “Ethnic Dimensions of Guatemala’s Stalled Transition: A Parity-Specific Analysis of Ladino and Indigenous Fertility Regimes.” *Demography* 53 (1): 117–37. https://doi.org/10.1007/s13524-015-0452-8.

Grant, Monica J., and Kelly K. Hallman. 2008. “Pregnancy-Related School Dropout and Prior School Performance in KwaZulu-Natal, South Africa.” *Studies in Family Planning* 39 (4): 369–82. https://doi.org/doi:10.1111/j.1728-4465.2008.00181.x.

Grönqvist, Hans, and Caroline Hall. 2013. “Education Policy and Early Fertility: Lessons from an Expansion of Upper Secondary Schooling.” *Economics of Education Review* 37: 13–33. https://doi.org/10.1016/j.econedurev.2013.07.010.

Gulemetova-Swan, Michaela. 2009. “Evaluating the Impact of Conditional Cash Transfer Programs on Adolescent Decisions about Marriage and Fertility: The Case of Oportunidades.” PhD diss., University of Pennsylvania.

Gupta, Neeru, and Leite Iuri da Costa. 1999. “Adolescent Fertility Behavior: Trends and Determinants in Northeastern Brazil.” *International Family Planning Perspectives* 25 (3): 125–30. https://doi.org/10.2307/2991961.

Guttmacher Institute. 2017. “Abortion in Latin America and the Caribbean.” Guttmacher Fact Sheet. https://www.guttmacher.org/fact-sheet/abortion-latin-america-and-caribbean

Heaton, Tim, and Vaughn R Call. 1995. “Modeling Family Dynamics with Event History Techniques.” *Journal of Marriage and Family* 57 (4): 1078–90.

Heaton, Tim, and Renata Forste. 1998. “Education as Policy: The Impact of Education on Marriage, Contraception, and Fertility in Colombia, Peru, and Bolivia.” *Social Biology* 45 (3-4): 194–213. https://doi.org/10.1080/19485565.1998.9988973.

Heaton, Tim, Renata Forste, and Samuel M. Otterstrom. 2002. “Family Transitions in Latin America: First Intercourse, First Union and First Birth.” *International Journal of Population Geography* 8 (1): 1–15. https://doi.org/10.1002/ijpg.234.

Hirschman, Charles. 1994. “Why Fertility Changes.” *Annual Review of Sociology* 20 (1): 203–33. https://doi.org/10.1146/annurev.so.20.080194.001223.

Ibarraran, Pablo, Laura Ripani, Bibiana Taboada, Juan Miguel Villa, and Brigida Garcia. 2014. “Life Skills, Employability and Training for Disadvantaged Youth: Evidence from a Randomized Evaluation Design.” *IZA Journal of Labor & Development* 3 (1): 10. https://doi.org/10.1186/2193-9020-3-10.

Jain, Anrudh K. 1981. “The Effect of Female Education on Fertility: A Simple Explanation.” *Demography* 18 (4): 577–95. https://doi.org/10.2307/2060948.

Jejeebhoy, Shireen J. 1995. “Women’s Education, Autonomy, and Reproductive Behaviour: Experience from Developing Countries.” Oxford: Oxford University Press.

Jesus, J., Wajnman, S., & Turra, C. M. 2017. “The Protective Effect of Coresidence for Adolescent Mothers in Latin America.” In PAA 2017 Annual Meeting. PAA.

KC, Samir, Moradhvaj Dhakad, Michaela Potancokova, Saroja Adhikari, Dilek Yildiz, Marija Mamolo, Tomas Sobotka, Krystof Zeman, Guy Abel, Wolfgang Lutz, Anne Goujon. 2024. “Updating the Shared Socioeconomic Pathways (SSPs) Global Population and Human Capital Projections.” IIASA Working Paper. Laxenburg, Austria: WP-24-003

Kalamar, Amanda M., Susan Lee-Rife, and Michelle J. Hindin. 2016. “Interventions to Prevent Child Marriage Among Young People in Low- and Middle-Income Countries: A Systematic Review of the Published and Gray Literature.” *Journal of Adolescent Health* 59 (3, Supplement): S16–21. https://doi.org/10.1016/j.jadohealth.2016.06.015.

Kane, Jennifer B., S. Philip Morgan, Kathleen Mullan Harris, and David K. Guilkey. 2013. “The Educational Consequences of Teen Childbearing.” *Demography* 50 (6): 2129–50. https://doi.org/10.1007/s13524-013-0238-9.

Kattan, Raja Bentaouet, and Miguel Székely. 2015. “Analyzing the Dynamics of School Dropout in Upper Secondary Education in Latin America: A Cohort Approach.” Policy Research Working Papers. The World Bank.

Kearney, Melissa S., and Phillip LeVine. 2012. “Why Is the Teen Birth Rate in the United States so High and Why Does It Matter?” *Journal of Economic Perspectives* 26: 141–66.

Kearney, Melissa S., and Phillip B. LeVine. 2014. “Income Inequality and Early Nonmarital Childbearing.” *Journal of Human Resources* 49 (1): 1–31. https://doi.org/10.3368/jhr.49.1.1.

Keele, Luke John. 2008. *Semiparametric Regression for the Social Sciences.* John Wiley & Sons.

Kohler, Hans-Peter, Francesco C. Billari, and José Antonio Ortega. 2002. "The Emergence of Lowest-Low Fertility in Europe During the 1990s." *Population and Development Review* 28 (4): 641–80. https://doi.org/10.1111/j.1728-4457.2002.00641.x.

Kravdal, Øystein. 2002. "Education and Fertility in Sub-Saharan Africa: Individual and Community Effects." *Demography* 39 (2): 233–50. https://doi.org/10.1353/dem.2002.0017/

Kravdal, Øystein, and Ronald R. Rindfuss. 2008. "Changing Relationships Between Education and Fertility: A Study of Women and Men Born 1940 to 1964." *American Sociological Review* 73 (5): 854–73. https://doi.org/10.1177/000312240807300508.

Kroeger, Rhiannon A., Reanne Frank, and Kammi K. Schmeer. 2015. "Educational At- tainment and Timing to First Union Across Three Generations of Mexican Women." *Population Research and Policy Review* 34 (3): 417–35. https://doi.org/10.1007/s11113-014-9351-8.

Kruger, Diana I., and Matias Berthelon. 2009. "Delaying the Bell: The Effects of Longer School Days on Adolescent Motherhood in Chile." Discussion Paper No. 4553. IZA Institute of Labor Economics.

Kulczycki, Andrzej. 2011. "Abortion in Latin America: Changes in Practice, Growing Conflict, and Recent Policy Developments." *Studies in Family Planning* 42 (3): 199–220. https://doi.org/doi:10.1111/j.1728-4465.2011.00282.x.

Lam, David, and Suzanne Duryea. 1999. "Effects of Schooling on Fertility, Labor Supply, and Investments in Children, with Evidence from Brazil." *The Journal of Human Resources* 34 (1): 160–92. https://doi.org/10.2307/146306.

Lam, David, Guilherme Sedlacek, and Suzanne Duryea. 1993. "Increases in Women's Education and Fertility Decline in Brazil." Annual Meeting of the Population Association of America Presentation. Cincinnati, Ohio.

Lappegård, Trude. 2000. "New Fertility Trends in Norway." *Demographic Research* 2.

Larson, R. and Wilson, S. 2004. “Adolescence across Place and Time.” In Handbook of Adolescent Psychology (eds R.M. Lerner and L. Steinberg). https://doi.org/10.1002/9780471726746.ch10

Lenkiewicz, Noemi Ehrenfeld. 2013. “The Voices of Pregnant Adolescents: The Gap Between Reproductive Health Policies and Women’s Realities.” *Romanian Sociology / Sociologie Românească* 11 (3): 22–42.

Levine, P. 2001. “The Sexual Activity and Birth-Control Use of American Teenagers.” In Risky Behavior Among Youths: An Economic Analysis, 167–217. Chicago, IL: University of Chicago Press.

LeVine, Robert A., Sarah E. LeVine, Amy Richman, F. Medardo Tapia Uribe, Clara Sunderland Correa, and Patrice M. Miller. 1991. “Women’s Schooling and Child Care in the Demographic Transition: A Mexican Case Study.” *Population and Development Review* 17 (3): 459–96. https://doi.org/10.2307/1971950.

Liefbroer, A. C., and Martine Corijn. 1999. “Who, What, Where, and When? Specifying the Impact of Educational Attainment and Labour Force Participation on Family Formation.” *European Journal of Population* 15: 45–75.

Lima, Everton E. C., Kryštof Zeman, Tomáš Sobotka, Mathias Nathan, and Ruben Castro. 2018. “The Emergence of Bimodal Fertility Profiles in Latin America.” *Population and Development Review* 44 (4): 723–43. https://doi.org/10.1111/padr.12157.

Lipovsek, V., Ali Mehryar Karim, Emily Zielinski Gutierrez, Robert J. Magnani, and Maria del Carmen. 2002. “Correlates of Adolescent Pregnancy in La Paz, Bolivia: Findings from a Quantitative-Qualitative Study.” *Adolescence* 37 (146): 335–52.

Lumley, T. (2004). “Analysis of Complex Survey Samples.” *Journal of Statistical Software*, 9(8), 1–19. https://doi.org/10.18637/jss.v009.i08

Lumley, Thomas, and Alastair Scott. 2017. “Fitting Regression Models to Survey Data.” *Statistical Science* 32 (2): 265–78. https://doi.org/10.1214/16-STS605.

Lutz, Wolfgang. 2014. “A Population Policy Rationale for the Twenty-First Century.” *Population and Development Review* 40 (3): 527–44.

Lutz, Wolfgang. 2017. “Global Sustainable Development Priorities 500 Years After Luther: Sola Schola Et Sanitate.” Proceedings of the National Academy of Sciences 114 (27): 6904–13.

Madhavan, Sangeetha, and Kevin J. A. Thomas. 2005. “Childbearing and Schooling: New Evidence from South Africa.” *Comparative Education Review* 49 (4): 452–67. https://doi.org/10.1086/432770.

Manzano, V. (2010). “Juventud y modernización sociocultural en la Argentina de los sesenta.” *Desarrollo Económico* 50(199): 363–390. http://www.jstor.org/stable/41219125

Margulies, L. 1975. “History of intrauterine devices.” Bulletin of the New York Academy of Medicine, 51(5): 662.

Marteleto, Letícia, Gelber Denisse, Celia Hubert, and Viviana Salinas. 2011. “Educational Inequalities Among Latin American Adolescents: Continuities and Changes over the 1980s, 1990s and 2000s.” *Research in Social Stratification and Mobility* 30: 352–75. https://doi.org/10.1016/j.rssm.2011.12.003.

Martin, Teresa Castro. 1995. “Women’s Education and Fertility: Results from 26 Demographic and Health Surveys.” *Studies in Family Planning* 26 (4): 187–202. https://doi.org/10.2307/2137845.

Mason-Jones, A. J., D. Sinclair, C. Mathews, A. Kagee, A. Hillman, and C. Lombard. 2016. “School-based Interventions for Preventing HIV, Sexually Transmitted Infections, and Pregnancy in Adolescents.” *Cochrane Database of Systematic Reviews*, no. 11. https://doi.org/10.1002/14651858.CD006417.pub3.

Mauldin, W. P., & Segal, S. J. 1988. “Prevalence of Contraceptive Use: Trends and Issues.” *Studies in Family Planning*, 19(6): 335–353. https://doi.org/10.2307/1966628.

McQueston, Kate, Rachel Silverman, and Amanda Glassman. 2012. “Adolescent Fertility in Low- and Middle-Income Countries: Effects and Solutions.” Working Paper 295. Center for Global Development.

Miranda-Ribeiro, Adriana, and Ricardo Alexandrino Garcia. 2013. “Transition or Tran- sitions? Analyzing the Fertility Decline in Brazil in the Light of Educational Levels.” *Revista Latinoamericana de Población* 7 (13): 91–106.

Mollborn, Stefanie. 2017. “Teenage Mothers Today: What We Know and How It Matters.” *Child Development Perspectives* 11 (1): 63–69. https://doi.org/10.1111/cdep.12205.

Monstad, Karin, Carol Propper, and Kjell G. Salvanes. 2008. “Education and Fertility: Evidence from a Natural Experiment.” *The Scandinavian Journal of Economics* 110 (4): 827–52. https://doi.org/10.1111/j.1467-9442.2008.00563.x.

Musick, Kelly, Paula England, Sarah Edgington, and Nicole Kangas. 2009. “Education Differences in Intended and Unintended Fertility.” *Social Forces* 88 (2): 543–72. https://doi.org/10.1353/sof.0.0278.

Näslund-Hadley, Emma, and Georgina Binstock. 2011. “El Fracaso Educativo: Embarazos Para No Ir a La Clase.” Banco Interamericano de Desarrollo.

Nathan, Mathias. 2015. “La Creciente Heterogeneidad En La Edad Al Primer Hijo En El Uruguay: Un Análisis de Las Cohortes de 1951 a 1990.” *Notas de Población* 100: 35–59.

Nathan, Mathias, Ignacio Pardo, and Wanda Cabella. 2016. “Diverging Patterns of Fertility Decline in Uruguay.” *Demographic Research* 34: 563–86. https://doi.org/10.4054/DemRes.2016.34.20.

Neal, Sarah, Chloe Harvey, Venkatraman Chandra-Mouli, Sonja Caffe, and Alma Virginia Camacho. 2018. “Trends in Adolescent First Births in Five Countries in Latin America and the Caribbean: Disaggregated Data from Demographic and Health Surveys.” *Reproductive Health* 15 (1): 146. https://doi.org/10.1186/s12978-018-0578-4.

Neels, Karel, and David De Wachter. 2010. “Postponement and Recuperation of Belgian Fertility: How Are They Related to Rising Female Educational Attainment?” Vienna Yearbook of Population Research 8: 77–106.

Neels, Karel, Michael Murphy, Máire Ní Bhrolcháin, and Éva Beaujouan. 2017. "Rising Educational Participation and the Trend to Later Childbearing." *Population and Development Review* 43 (4): 667–93. https://doi.org/doi:10.1111/padr.12112.

Nisén, Jessica, Mikko Myrskylä, Karri Silventoinen, and Pekka Martikainen. 2014. "Effect of Family Background on the Educational Gradient in Lifetime Fertility of Finnish Women Born 1940–50." *Population Studies* 68 (3): 321–37. https://doi.org/10.1080/00324728.2014.913807.

Novella, Rafael, and Laura Ripani. 2016. "Are You (Not) Expecting? The Unforeseen Benefits of Job Training on Teenage Pregnancy." *IZA Journal of Labor & Development* 5 (1): 19. https://doi.org/10.1186/s40175-016-0065-7.

Núñez, Jairo, and Carmen Elisa Flórez. 2001. "Teenage Childbearing in Latin American Countries." IDB Working Paper No. 147. https://doi.org/10.2139/ssrn.1814694.

Oakley, M. R., & Rodriguez, E. A. 2005. "Family Planning Policy in Latin America: Rights, Development and Values." *Policy Studies* 26 (2): 211–227. https://doi.org/10.1080/01442870500128194

Olausson, P.O., Haglund, B., Weitoft, G.R., and Cnattingius, S. (2001). "Teenage Childbearing and Long-Term Socioeconomic Consequences: A Case Study in Sweden." *Family Planning Perspectives* 33 (2):70–74. https://doi.org/10.2307/2673752.

Oreopoulos, P. 2007. "Do Dropouts Drop Out Too Soon? Wealth, Health, and Happiness from Compulsory Schooling." *Journal of Public Economics* 91: 2213–29.

Pacheco-Montoya, D., Murphy-Graham, E., López, E. E. V., & Cohen, A. K. 2022. "Gender norms, control over girls' sexuality, and child marriage: A Honduran case study." *Journal of Adolescent Health* 70(3): S22-S27.

Paes de Barros, Ricardo, Francisco Ferreira, José Molinas Vega, and Jaime Saavedra Chan- duvi. 2009. "Measuring Inequality of Opportunities in Latin America and the Caribbean." Washington, DC: The World Bank.

Panchaud, Christine, Sarah C. Keogh, Melissa Stillman, Kofi Awusabo-Asare, Angélica Motta, Estelle Sidze, and Ana Silvia Monzón. 2019. "Towards Comprehensive Sexuality Education: A Comparative Analysis of the Policy Environment Surrounding School- Based Sexuality Education in Ghana, Peru, Kenya and Guatemala." *Sex Education* 19 (3): 277–96. https://doi.org/10.1080/14681811.2018.1533460.

Patton, George C., Susan M. Sawyer, John S. Santelli, David A. Ross, Rima Afifi, Nicholas B. Allen, Monika Arora, et al. 2016. "Our Future: A Lancet Commission on Adolescent Health and Wellbeing." *The Lancet* 387 (10036): 2423–78. https://doi.org/10.1016/ S0140-6736(16)00579-1.

Perelli-Harris, Brienna. 2005. "The Path to Lowest-Low Fertility in Ukraine." *Population Studies* 59 (1): 55–70. https://doi.org/10.1080/0032472052000332700.

Pullum, T, and S Becker. 2014. "DHS Methodological Reports No. 11: Evidence of Omission and Displacement in DHS Birth Histories." Rockville, Maryland, USA: ICF International.

Rafferty, Anthony, Pierre Walthery, and Sarah King-Hele. 2015. "Analysing Change over Time: Repeated Cross-Sectional and Longitudinal Survey Data, UK Data Service." University of Essex; University of Manchester.

Ranchhod, V., David Lam, M. Leibbrandt, and L. Marteleto. 2011. "Estimating the Effect of Adolescent Fertility on Educational Attainment in Cape Town Using a Propensity Score Weighted Regression." Cape Town: SALDRU, University of Cape Town.

Rendall, Michael, Christine Couet, T. Lappegard, Isabelle Robert-Bobée, Marit Rønsen, and Steve Smallwood. 2005. "First Births by Age and Education in Britain, France and Norway." *Population Trends* 121 (Autumn): 27–34.

Rios Neto, Eduardo. 2009. "Intra- and Intergenerational Consequences of Teenage Childbearing in Two Brazilian Cities: Exploring the Role of Age at Menarche and Sexual Debut." XXVI IUSSP International Population Conference Presentation. Marrakech, Morocco.

Rodriguez, J. 2013. “High Adolescent Fertility in the Context of Declining Fertility in Latin America.” CELADE-Population Division of ECLAC. New York: United Nations. Rodríguez Vignoli, Jorge. 2014. “Fecundidad Adolescente En América Latina: Una Actualización.” In Comportamiento Reproductivo y Fecundidad En América Latina: Una Agenda Inconclusa, 33–67. 3. Córdoba: Asociación Latinoamericana de Población.

Rodríguez-Vignoli, J., and Roberts, A. 2020. “El descenso de la fecundidad adolescente en Chile: antecedentes, magnitud, determinantes y desigualdades.” Instituto Nacional de la Juventud, Ministerio de Desarrollo Social (Serie de Estudios No.12). Santiago de Chile.

Rodríguez Vignoli, Jorge, and Suzana Cavenaghi. 2014. “Adolescent and Youth Fertility and Social Inequality in Latin America and the Caribbean: What Role Has Education Played?” *Genus* 70 (1): 1–25.

Rosero-Bixby, Luis, Teresa Castro-Martín and Teresa Martín-García. 2009. “Is Latin America Starting to Retreat from Early and Universal Childbearing?” *Demographic Research* 20: 169–94.

Sanchez, C. N. P., H. U. Reyes, G. U. Reyes, and L. J. Hernandez. 2006. “Factores Que Inducen a La Deserción Escolar En La Adolescente Embarazada.” Boletín Clínico Hospital Infantil Estado Sonora 23 (2): 64–68.

Schiefelbein, Ernesto, and Laurence Wolff. 1992. “Repetition and Inadequate Achievement in Latin America’s Primary Schools: A Review of Magnitudes, Causes, Relationships and Strategies.” The World Bank.

Shah, Iqbal, and Elisabeth Åhman. 2004. “Age Patterns of Unsafe Abortion in Developing Country Regions.” *Reproductive Health Matters* 12 (sup24): 9–17. https://doi.org/10.1016/S0968-8080(04)24002-2.

Shapiro, David. 2012. “Women’s Education and Fertility Transition in Sub-Saharan Africa.” *Vienna Yearbook of Population Research* 10: 9–30.

Silles, Mary A. 2011. “The Effect of Schooling on Teenage Childbearing: Evidence Using Changes in Compulsory Education Laws.” *Journal of Population Economics* 24: 761–77. https://doi.org/DOI 10.1007/s00148-010-0334-8.

Sobotka, Tomás. 2004. “Postponement of Childbearing and Low Fertility in Europe.” PhD diss., University of Groningen.

Sohn, Hosung, and Suk-Won Lee. 2019. “Causal Impact of Having a College Degree on Women’s Fertility: Evidence from Regression Kink Designs.” *Demography* 56: 969–90. https://doi.org/10.1007/s13524-019-00771-9.

Stycos, J. M. 1984. “Sterilization in Latin America: its past and its future.” *International Family Planning Perspectives*, 58-64. https://doi.org/10.2307/2947936

Sully, Elizabeth A., Ann Biddlecom, Jacqueline E. Darroch, Taylor Riley, Lori S. Ashford, Naomi Lince-Deroche, Lauren Firestein, and Rachel Murro, 2020. “Adding it up: investing in sexual and reproductive health 2019.” New York: Guttmacher Institute.

Taylor, Alice Y., Erin Murphy-Graham, Julia Van Horn, Bapu Vaitla, Ángel Del Valle, and Beniamino Cislaghi. 2019. “Child marriages and unions in Latin America: Understanding the roles of agency and social norms.” *Journal of Adolescent Health*, 64(4): S45-S51.

Torche, Florencia. 2010. “Economic Crisis and Inequality of Educational Opportunity in Latin America.” *Sociology of Education* 83 (2): 85–110. https://doi.org/10.2307/10.1177/0038040710367935.

Torche, Florencia. 2012. “Intergenerational Mobility and Inequaultiy: The Latin American Case.” *Annual Review of Sociology* 40: 619–42. https://doi.org/10.1146/annurev-soc-071811-145521.

UN Population Division. 2015. “World Fertility Patterns 2015 – Data Booklet.” ST/ESA/SER.A/370. United Nations, Department of Economic; Social Affairs.

UN Population Division. 2024. “World Population Prospects 2024.” United Nations, Department of Economic and Social Affairs, Online Edition.

UNESCO. 2016. “Global Education Monitoring Report: Education for People and Planet. Creating sustainable futures for all.” United Nations Educational, Scientific; Cultural Organization. https://doi.org/10.54676/AXEQ8566.

UNESCO. 2022. “Education in Latin America and the Caribbean at a Crossroads: Regional Monitoring Report SDG4 - Education 2030.” United Nations Educational, Scientific; Cultural Organization. https://repositorio.cepal.org/server/api/core/bitstreams/70fe53c4-9b47-4f64-957b-1adf27c8b1f4/content.

UNESCO Institute for Statistics. 2012. International Standard Classification of Education: ISCED 2011. Montreal, Quebec: UNESCO Institute for Statistics.

UNFPA. 2022. “Motherhood in Childhood: The Untold Story.” United Nations Population Fund. https://www.unfpa.org/publications/motherhood-childhood-untold-story.

Urbina, D. 2022. “Mass Education and Women’s Autonomy: Evidence from Latin America.” *Demography* 59 (3): 1195–1220.

Urdinola, B. Piedad, and Carlos Ospino. 2015. “Long-Term Consequences of Adolescent Fertility: The Colombian Case.” *Demographic Research* 32: 1487–1518. https://doi.org/10.4054/DemRes.2015.32.55.

Velarde, M., and F. Zegers-Hochschild. 2017. “Measuring the Distribution of Adolescent Births Among 15–19-Year-Olds in Chile: An Ecological Study.” *Journal of Family Planning and Reproductive Health Care* 43: 302–8. https://doi.org/10.1136/jfprhc-2015- 101230.

Vignoli, Jorge Rodríguez. 2017. “Deseabilidad y Planificación de La Fecundidad Adolescente En América Latina y El Caribe: Tendencias y Patrones Emergentes.” *Notas de Población* 44 (104): 119–44.

Weinberger, Mary Beth. 1987. “The Relationship Between Women’s Education and Fertility: Selected Findings from the World Fertility Surveys.” *International Family Planning Perspectives* 13 (2): 35–46. https://doi.org/10.2307/2947826.

Weinberger, Mary Beth, Cynthia Lloyd, and Ann Klimas Blanc. 1989. “Women’s Education and Fertility: A Decade of Change in Four Latin American Countries.” *International Family Planning Perspectives* 15 (1): 4–28. https://doi.org/10.2307/2133273.

WHO. 2007. “Adolescent Pregnancy–Unmet Needs and Undone Deeds: A Review of the Literature and Programs.” World Health Organization.

Wittgenstein Centre. 2018. “Educational Attainment Distribution and Mean Years of Schooling by Age. Population Component of Medium Scenario (SSP2).” Wittgenstein Centre for Demography; Global Human Capital.

Yoo, Sam Hyun. 2014. “Educational Differentials in Cohort Fertility During the Fertility Transition in South Korea.” *Demographic Research* 30 (1): 463–1493. https://doi.org/doi:http://dx.doi.org/10.4054/DemRes.2014.30.53.

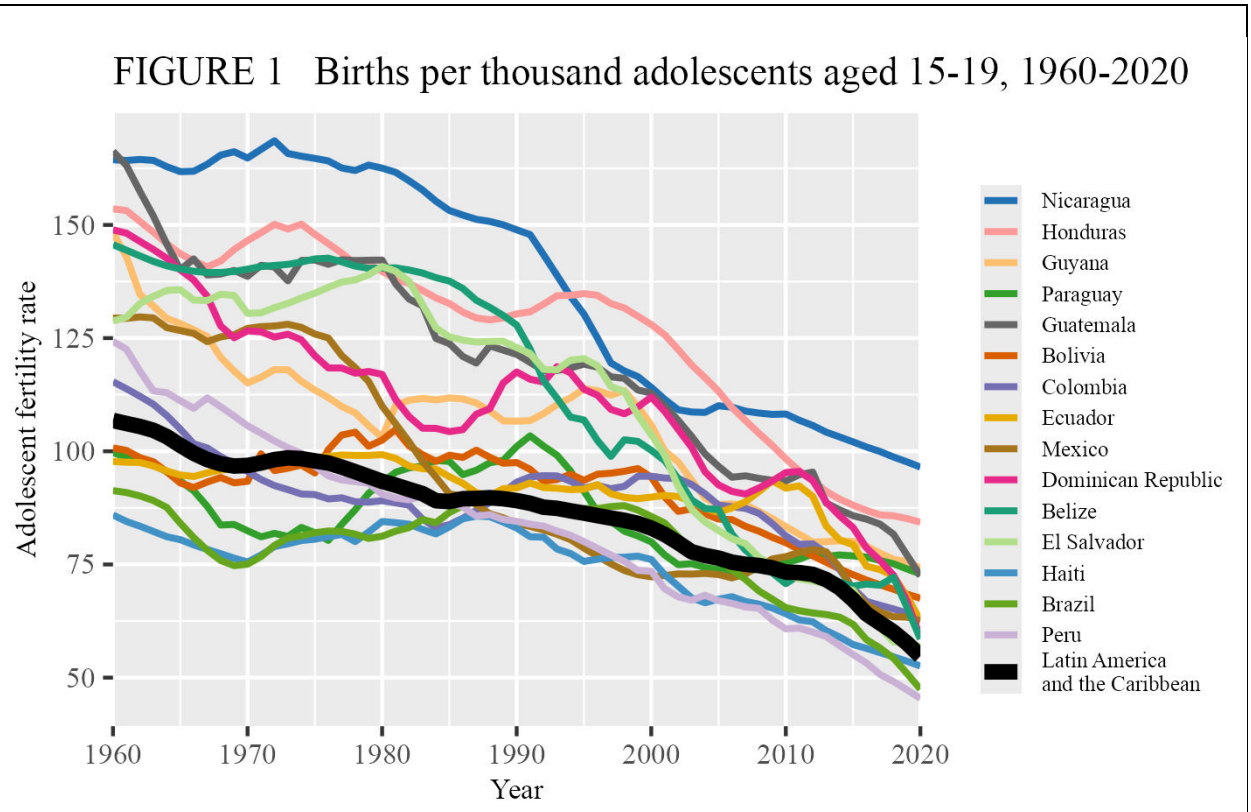


FIGURE 1 Births per thousand adolescents aged 15-19, 1960-2020

TABLE 1 Data table

Survey	Survey year	Selected cases	Women's birth date: Missing (percent)	Women's birth date: Imputed (percent)	Women's schooling imputed (percent)	Child birth date: Missing (percent)	Child birth date: Imputed (percent)
Belize							
RHS	1991	2,116	0.00	0.52	0.00	2.85	2.46
RHS	1999	3,042	0.00	0.33	0.46	1.50	1.06
MICS	2015-16	3,652	0.08	0.14	0.00	0.77	0.90
		8,810	0.03	0.30	0.16	1.52	1.33
Bolivia							
DHS	1989	6,103	0.00	3.97	0.00	0.00	4.49
DHS	1993-94	6,651	0.00	2.07	0.00	0.00	3.81
DHS	1998	8,515	0.00	2.85	0.00	0.00	3.16
DHS	2003-04	13,317	0.00	0.32	0.00	0.00	2.27
DHS	2008	13,209	0.00	0.09	0.00	0.00	1.06
EDSA	2016	9,204	0.00	0.00	9.27	0.00	0.00
		56,999	0.00	1.19	1.50	0.00	2.17
Brazil							
DHS	1986	4,450	0.00	0.65	0.18	0.00	3.79
DHS	1991-92	4,609	0.00	0.87	0.07	0.00	3.55
DHS	1996	9,909	0.00	0.71	0.03	0.00	3.68
PNDS	2006-07	12,886	0.10	0.00	0.02	1.29	0.16
		31,854	0.04	0.44	0.05	0.52	2.25
Colombia							
DHS	1986	3,911	0.00	1.25	0.10	0.00	1.98
DHS	1990	6,655	0.00	0.42	0.06	0.00	1.26
DHS	1995	8,827	0.00	0.33	0.00	0.00	0.87
DHS	2000	9,166	0.00	0.08	0.00	0.00	0.49
DHS	2004-05	30,454	0.00	0.15	0.00	0.00	1.25
DHS	2009-10	39,274	0.00	0.06	0.00	0.00	0.98
DHS	2015-16	28,812	0.00	0.05	0.00	0.00	1.06
		127,099	0.00	0.15	0.01	0.00	1.07
Dominican Republic							
DHS	1986	5,347	0.00	0.00	0.00	0.00	3.28
DHS	1991	5,374	0.00	4.28	0.43	0.00	4.41
DHS	1996	6,333	0.00	2.54	0.06	0.00	2.36
DHS	1999	974	0.00	2.16	0.10	0.00	2.40
DHS	2002	17,923	0.00	1.98	0.04	0.00	3.44
DHS	2007	20,981	0.00	1.19	0.00	0.00	2.81
DHS	2013	7,268	0.00	0.32	0.00	0.00	0.82
MICS	2014	23,600	0.00	0.17	0.08	0.54	0.67
MICS	2019	17,814	0.12	0.56	0.02	0.73	0.48
		105,614	0.02	1.12	0.05	0.24	1.98
Ecuador							
DHS	1987	3,640	0.00	3.35	0.00	0.00	5.93
ENDEMAIN	1994	10,631	0.00	3.82	0.00	1.04	8.50
ENDEMAIN	1999	11,681	0.00	1.62	0.00	0.61	7.00
ENDEMAIN	2004	8,813	0.00	1.24	0.00	0.94	4.60
ENSANUT	2012	15,514	0.00	0.02	0.00	0.00	1.70
ENSANUT	2018-19	32,539	0.00	0.00	0.00	0.00	0.85
		82,818	0.00	1.00	0.00	0.32	3.48
El Salvador							
ESENSF	1998	10,037	0.00	0.60	0.00	0.00	3.11
FESAL	2002-03	8,682	0.00	0.17	0.00	0.00	2.56
FESAL	2008	9,890	0.00	0.15	0.00	0.43	1.75
MICS	2014	10,578	0.01	0.03	0.08	0.24	0.67
		39,187	0.00	0.24	0.02	0.17	1.99
Guatemala							
DHS	1987	3,761	0.00	3.86	0.00	0.00	3.91
DHS	1995	9,034	0.00	2.49	0.00	0.00	1.10
DHS	1998-99	4,523	0.00	1.84	0.00	0.00	1.00
ENSMI	2002	7,315	0.00	0.63	0.00	0.09	1.20
ENSMI	2008-09	13,706	0.00	0.09	0.00	0.07	0.73
DHS	2014-15	19,650	0.00	0.02	0.00	0.00	0.37
		57,989	0.00	0.89	0.00	0.03	0.95
Guyana							
DHS	2005	1,929	0.00	0.21	0.00	0.00	1.26
DHS	2009	3,918	0.00	0.56	0.10	0.00	2.22
MICS	2014	4,101	0.02	0.05	0.18	0.86	0.02

MICS	2019-20	4,754	0.20	0.22	0.00	0.70	0.02
		14,702	0.07	0.26	0.08	0.47	0.77
Haiti							
DHS	1994-95	3,871	0.00	25.68	0.08	0.00	4.68
DHS	2000	7,538	0.00	7.56	0.23	0.00	1.14
DHS	2005-06	7,787	0.00	2.07	0.09	0.00	0.46
DHS	2012	10,560	0.00	0.49	0.03	0.00	0.07
DHS	2016-17	10,839	0.00	0.11	0.00	0.00	0.08
		40,595	0.00	4.41	0.08	0.00	0.79
Honduras							
ENESF	1996	5,933	0.00	0.24	0.12	0.56	1.99
ENESF	2001	6,740	0.00	0.22	0.37	0.28	1.61
DHS	2005-06	15,046	0.00	0.28	0.00	0.00	0.33
DHS	2011-12	17,027	0.00	0.14	0.01	0.00	0.24
MICS	2019	15,004	0.12	0.47	3.93	0.49	0.43
		59,750	0.03	0.28	1.04	0.21	0.64
Mexico							
DHS	1987	6,940	0.00	2.33	0.01	0.00	1.47
ENADID	1992	52,182	0.00	0.65	0.11	0.03	0.74
ENADID	1997	68,568	0.00	0.47	0.27	0.11	1.00
ENADID	2006	31,586	0.00	0.66	0.47	0.26	1.10
ENADID	2009	82,201	0.00	0.03	0.26	0.14	0.74
ENADID	2014	81,624	0.00	0.18	0.10	0.56	1.10
ENADID	2018	90,045	0.00	0.19	0.01	0.49	1.22
		413,146	0.00	0.33	0.17	0.29	1.00
Nicaragua							
NESSF	1992-93	5,701	0.00	1.33	0.00	0.14	1.57
DHS	1997-98	10,080	0.00	1.86	0.01	0.00	3.32
DHS	2001	9,435	0.00	0.73	0.03	0.00	3.22
ENDESA	2006-07	11,314	0.00	0.31	0.00	0.03	1.08
ENDESA	2011-12	12,100	0.00	0.00	0.00	0.07	0.00
		48,630	0.00	0.76	0.01	0.04	1.75
Paraguay							
DHS	1990	4,390	0.00	0.11	0.09	0.00	0.12
ENDSR	1995-96	5,282	0.00	0.28	0.00	0.02	0.84
ENSMI	1998	2,738	0.00	0.04	0.00	0.02	0.19
ENDSR	2004	5,764	0.00	0.03	1.08	0.10	0.06
ENDSSR	2008	4,983	0.00	0.04	0.00	0.06	0.19
MICS	2016	5,838	0.02	0.05	0.02	0.12	0.07
		28,995	0.00	0.09	0.23	0.06	0.25
Peru							
DHS	1986	3,688	0.00	1.19	0.00	0.00	2.11
DHS	1991-92	12,036	0.00	0.63	0.00	0.00	1.72
DHS	1996	22,089	0.00	1.19	0.00	0.00	2.32
DHS	2000	21,370	0.00	0.54	0.00	0.00	1.91
DHS	2003-06	15,140	0.00	0.20	0.00	0.00	1.12
DHS	2007-08	17,979	0.00	0.12	0.00	0.00	0.62
DHS	2009	19,201	0.00	0.07	0.00	0.00	0.39
DHS	2010	18,158	0.00	0.05	0.00	0.00	0.49
DHS	2011	17,919	0.00	0.06	0.00	0.00	0.56
DHS	2012	18,921	0.00	0.03	0.00	0.00	0.52
ENDES	2013	18,420	0.00	0.00	0.15	0.00	0.00
ENDES	2014	20,070	0.00	0.00	0.16	0.00	0.00
ENDES	2015	29,652	0.00	0.00	0.09	0.00	0.00
ENDES	2016	27,644	0.00	0.00	0.02	0.00	0.00
ENDES	2017	27,907	0.00	0.00	0.00	0.00	0.00
ENDES	2018	29,704	0.00	0.00	0.00	0.00	0.00
ENDES	2020	26,358	0.00	0.00	0.03	0.00	0.00
ENDES	2021	28,056	0.00	0.00	0.00	0.00	0.00
ENDES	2022	27,167	0.00	0.00	0.00	0.00	0.00
		401,479	0.00	0.15	0.03	0.00	0.46

TABLE 2 School calendars and entry age requirements

Country	Theoretical entry age	When entry age must be met	Minimum possible age at start of classes	School calendar
Belize	5.0	4 years 8 months at school start	4 years 8 months	August through June
Bolivia	6.0	30 June in admission year	5 years 7 months	February through November
Brazil	6.0	31 March in admission year	5 years 10 months	February through December
Colombia	6.0	start of classes	6 years 0 months	February through November
Dominican Rep.	6.0	31 August in admission year	5 years 11 months	August through June
Ecuador	6.0	31 December in admission year	5 years 8 months	September through June
El Salvador	7.0	start of classes	7 years 0 months	February through December
Guatemala	6.5	start of classes	6 years 6 months	January through October
Guyana	6.0	30 December in admission year	5 years 9 months	September through July
Haiti	6.0	October in admission year	5 years 10 months	September through June
Honduras	6.0	at matriculation (mid-January)	6 years 1 month	February through November
Mexico	6.0	31 December in admission year	5 years 7 months	August through June
Nicaragua	6.0	start of classes	6 years 0 months	February through November
Paraguay	6.0	31 March in admission year	5 years 10 months	February through November
Peru	6.0	31 March in admission year	5 years 11 months	March through December

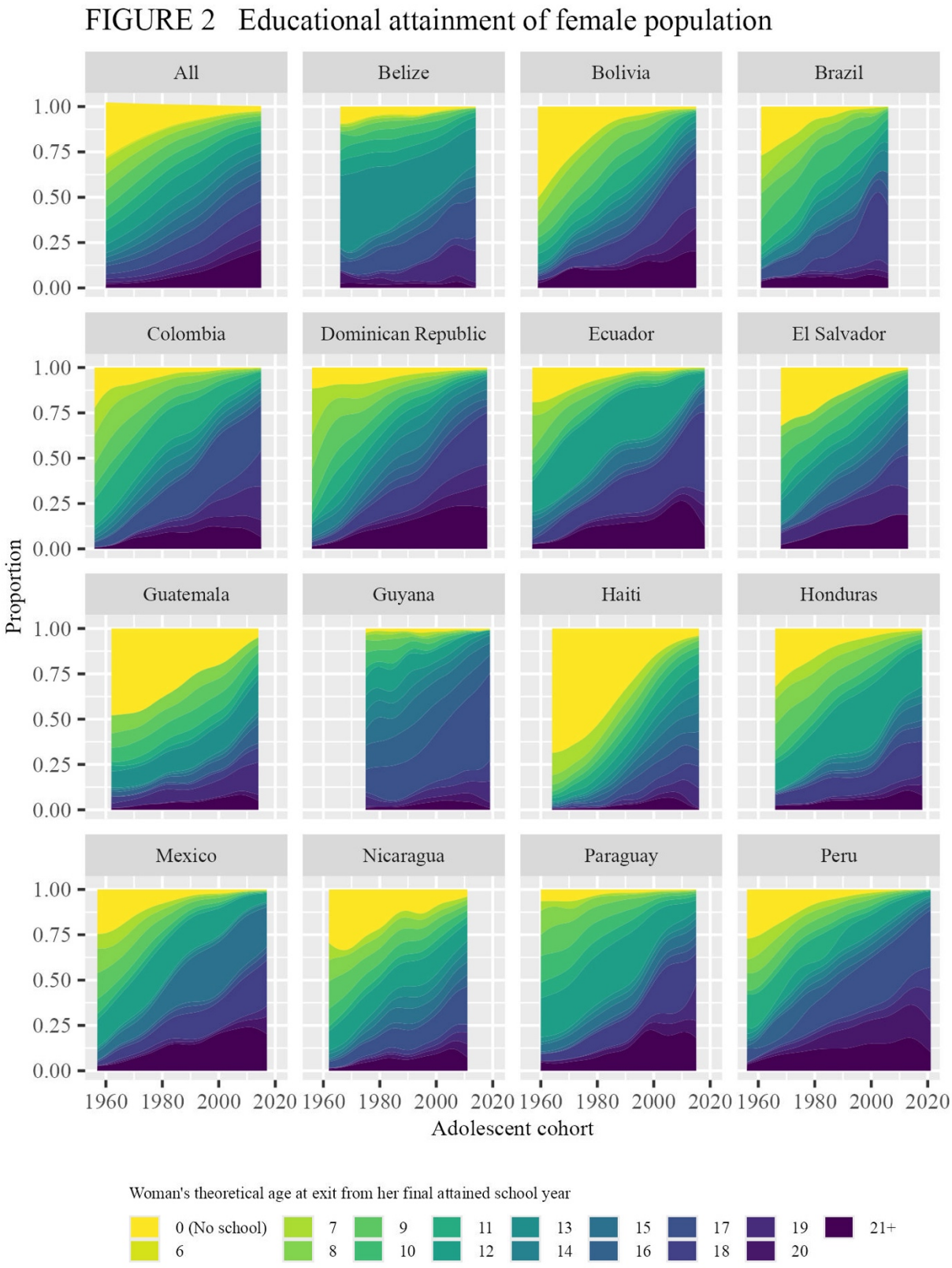


FIGURE 2 Educational attainment of female population

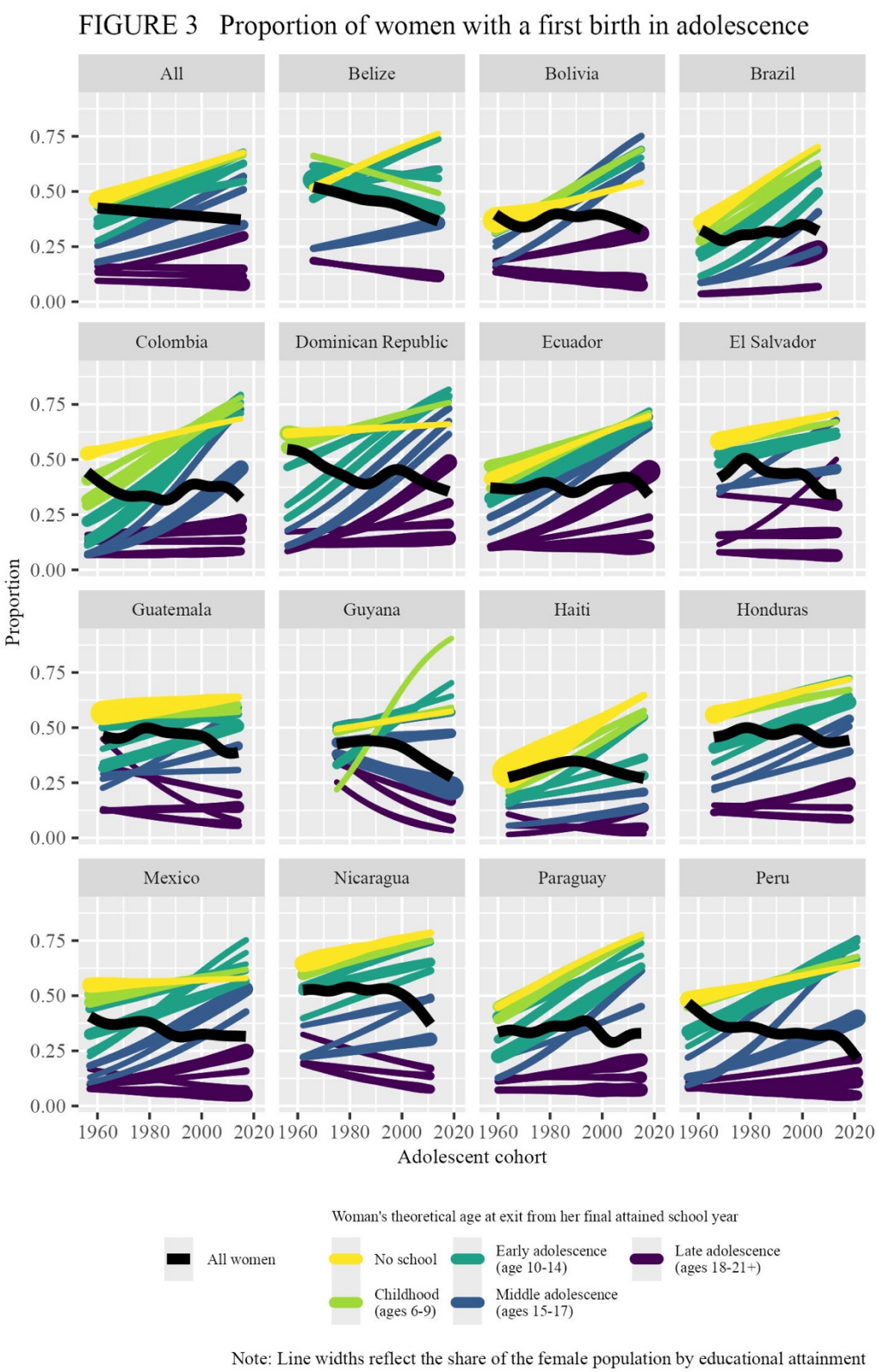
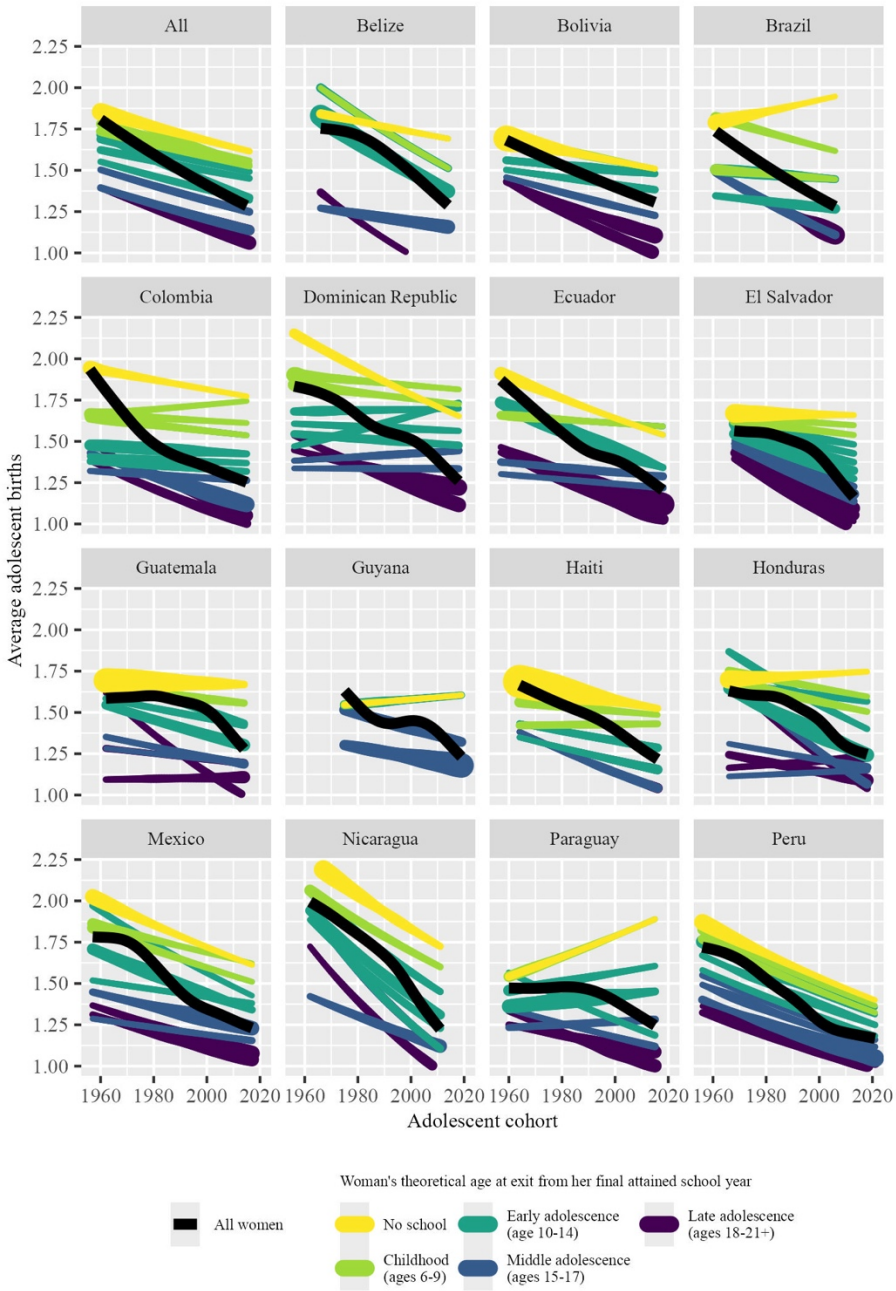


FIGURE 3 Proportion of women with a first birth in adolescence

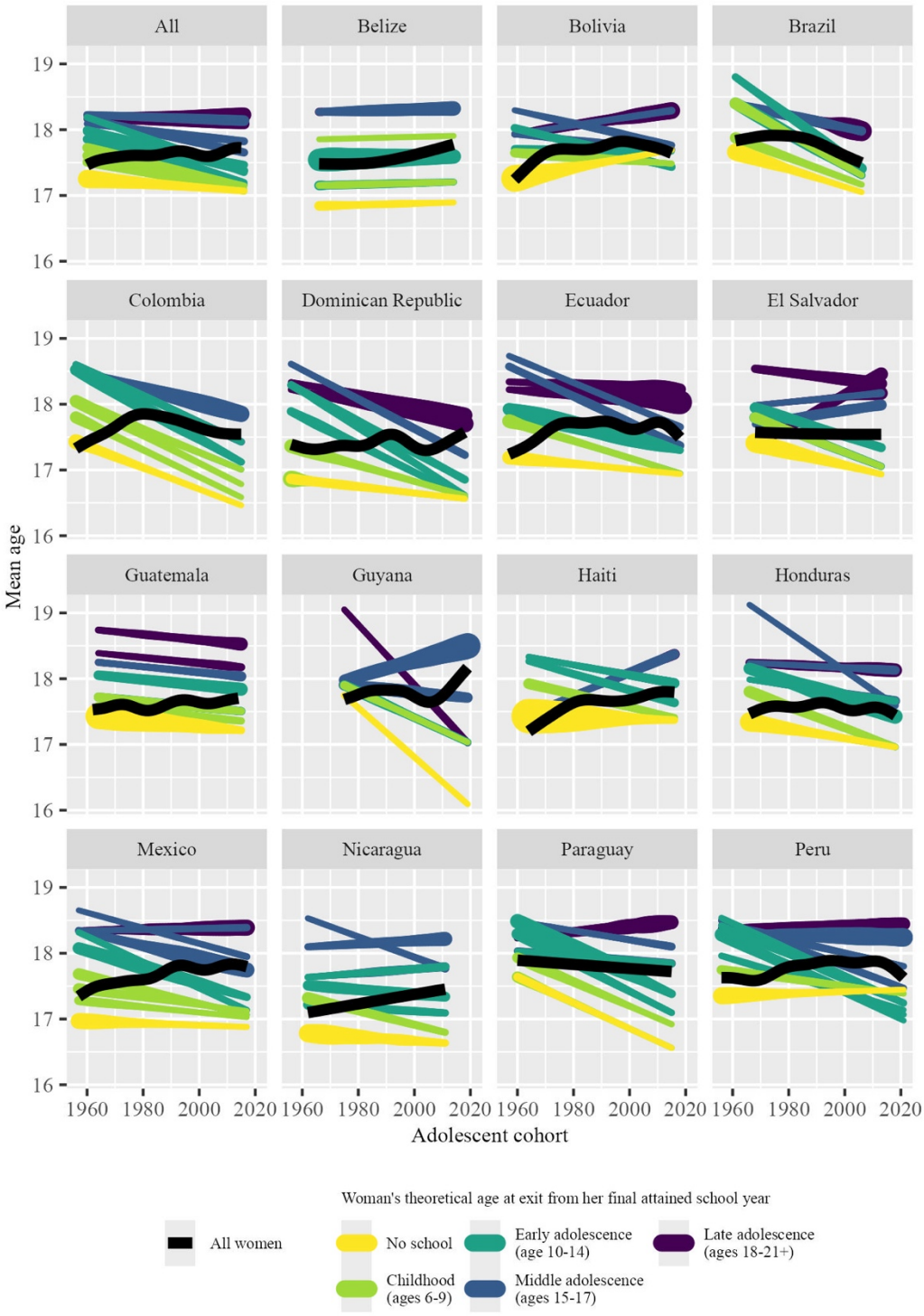
FIGURE 4 Average number of births in adolescence to teenage mothers



Note: Line widths reflect the share of the female population by their educational attainment.

FIGURE 4 Average number of births to teenage mothers

FIGURE 5 Teen mothers mean age at first adolescent birth by educational attainment



Note: Line widths reflect the share of the female population by their educational attainment.

FIGURE 5 Teen mothers mean age at first adolescent birth by educational attainment

FIGURE 6 Timing of conception of adolescent mothers' first birth relative to their theoretical age at school exit, regional average

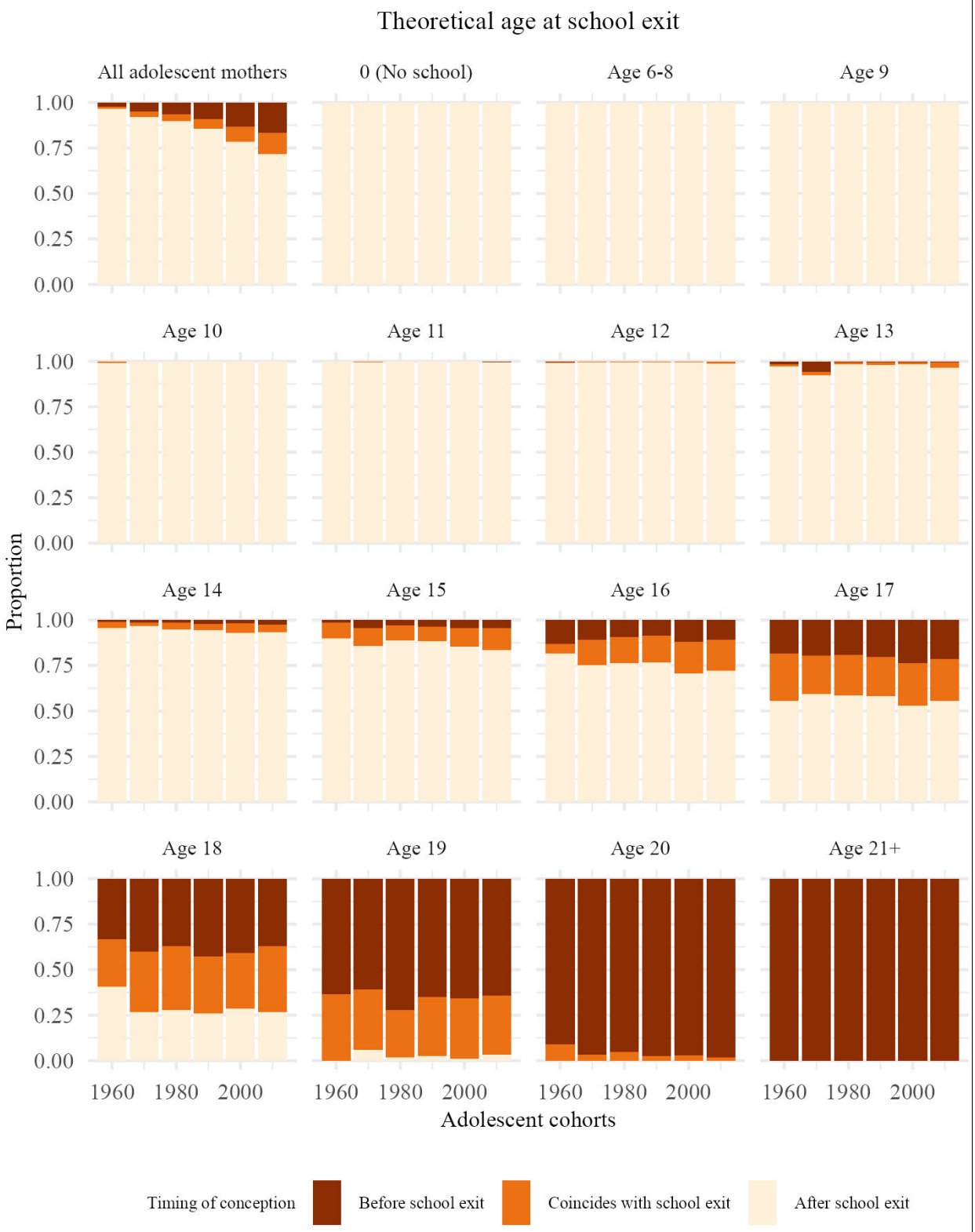


FIGURE 6 Educational attainment of female population