HOW CAN FERTILITY AT YOUNG AGES ALONE AFFECT POPULATION AGING?
THE CASE OF BRAZIL

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ABSTRACT
Despite ongoing substantial decline in total fertility since the 1960’s, age-specific fertility rates for the age groups 15-19 and 20-24 rose from 1991 to 2000 (Berquó and Cavenaghi 2005). In this sense, Brazil is a very particular case of a rejuvenated fertility pattern. By 2010, the total fertility rate had already reached below replacement level at 1.9 children per woman and the age-specific fertility rates for younger women also started to fall, albeit still a high one when compared to other countries that underwent similar demographic transitions or have proximate fertility levels (Alves 2012). With an increasing unmet demand for contraception and a continuously lowering of fertility for the remaining age groups, it all indicates that this age group is the one with the most potential of contributing for the future of fertility trends in Brazil. This study provides simulations that show the short and long-term pure demographic effects of changes in fertility for these specific age groups on Brazil’s age structure through stable population theory and age-specific growth rates. Our results indicate strikingly different population age structures as a consequence solely of the contribution of adolescent and young fertility schedules. The age dependency ratios would be very different at each scenario, indicating the demographic importance of understanding this group’s fertility behavior and their impact on the pace of population aging for the next years. Our results suggest dramatic future fertility declines prospects for Brazil, since the first cohort of women reaching reproductive age in year 2010 was already smaller in absolute size than their counterparts in year 2000. Taken all those aspects together, fertility in Brazil is now mainly driven by the contribution of adolescents and younger women who are not only in need of specific sexual and reproductive health policies, but who will also determine the future pace of population aging.

INTRODUCTION

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Latin America is a very unique case of countries experiencing a rejuvenated fertility pattern, to which Brazil is no exception. These countries experience persistently high fertility rates at young ages, even when completing the demographic transition and reaching below replacement fertility levels. This trend has drawn attention from many researchers (Berquó and Cavenaghi 2005; Alves and Cavenaghi 2009; Caterline and Mendoza 2008). In Brazil, by 2010, the total fertility rate had already reached below replacement level at 1.9 children per women (Alves 2012) and the age-specific fertility rates for younger women, which experienced an increase between years 1991 and 2000, also started to fall, but still remained high when compared to other countries that underwent similar demographic transitions or have proximate fertility levels. In 1991, the fertility of the first two age groups of Brazilian females contributed with 41% of the total fertility rate. In 2000 that figure increased to 48% and in 2010 it decreased to 45%\(^3\). Despite the decline, the level of contribution was still high and above the contribution in 1991. If we consider other countries, the contribution for those age groups are substantially lower, as indicated on Figure 1 below.

Figure 1. Relative Contribution of Age Groups on Total Fertility Rate (TFT, %), 2000

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\(^3\) Figures were estimated by computing the ratio between age-specific fertility rates and the total fertility rate.
While in France the relative contribution of adolescent fertility on total fertility is of only 3%, the Brazilian one is 19%, higher than all countries here considered. The age group 20-24 in Brazil also has the highest contribution. In 2010 the relative contribution of the first age group in Brazil decreased to 18%, a still considerably high figure.

Also, according to PNDS 2006⁴ the contribution of the first age group (15-19 years old) on the total fertility rate increased from 17% in 1996 to 23% in 2006. In contrast, the contribution of older women (above 35 years) decreased from 13% to 11%. When considering the whole context of Latin American countries, the first two age groups represent about 50% of total fertility, while in Europe that contribution is of less than 30% (Alves and Cavenaghi 2009). This scenario is mainly a resultant from the very particular process of fertility decline in Latin American countries. For almost all those countries, including Brazil, fertility declines started to happen when women from more advanced reproductive age groups stopped having children, rather than spacing out births over the reproductive period or postponing the first birth. This factor was driven mainly by relying on female sterilization as the main contraceptive method to which most couples and women had access to as a result of the Brazilian political and social context (Berquó and Cavenaghi 2002; Caetano 2001; Feyisetan and Casterline 2000). However, despite similarities with its Latin American counterparts, Brazil’s rapid fertility decline is even more impressive due to a lack of family planning programs or oriented public policies (Alves 2006; Caetano 2006). Brazil’s fertility decline was mainly driven by the voluntary use of contraception, with 66% of women using some contraceptive method in 1986 jumping to more than 80% in 2006, with a major contribution from sterilization. According to the PNDS (1996), female sterilization accounted for 52% of all contraceptive methods, followed by the pill (27%). This poor mix of contraception typically reached women after their first pregnancy, being methods that aim at terminating childbearing, instead of spacing or limiting. This has important consequences on the access and use of contraception for young women who are sexually active, but do not wish to bear their first child in order to have access to sexual and reproductive health care, leading to high percentages of unmet demand for contraception among young women, as discussed in more detail below. Hence, due to Brazil’s unique fertility transition, this heritage of a poor mix of contraception, coupled with its increasing unmet demand, and particular characteristics of the youth, have together

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⁴ Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher (National Research on the Demography and Health of Women and Children)
contributed to a rejuvenated fertility pattern in Brazil. All those factors considered have important effects on the age pattern of fertility which in turn have important consequences on population aging. Accordingly, this study aims at addressing the consequences of this rejuvenated fertility pattern in Brazil and how it may affect the pace of population aging. For that, we performed simulations that show the short and long-term effects of changes in these specific age groups on Brazil’s age structure through stable population theory and age-specific growth rates. These simulations allows us to see (1) what would happen if Brazil’s fertility rates at ages 15-19 and 20-24 had not increased between years 1991-2000, but attained levels of other countries that have similar – but not rejuvenated- fertility patterns and (2) what would one expect to see if fertility and mortality schedules remained at current levels until the population reached stable population and age-specific growth rates. We also analyzed the age-specific growth rates profile between years 1991, 2000 and 2010, in order to take a closer look at the growth rates of successive cohorts of women, as well as its absolute size throughout the reproductive years.

FERTILITY PATTERNS AND THE YOUTH IN BRAZIL

The 2000 Brazilian Census showed how fertility rates among the youth (15-19 years old) and younger women (20-24) in Brazil increased from 1991 to 2000, as shown on Figure 2. Already before that increase, research not only in Brazil but also for other countries in Latin America has sought to explain a persistent pattern of higher fertility among adolescents and younger women, relative to other reproductive age groups (Berquó and Cavenaghi 2005; Alves and Cavenaghi 2009; Caterline and Mendoza 2008). By 2010 their age-specific fertility rates (ASFR) declined, but still remained at high levels, when compared to other countries in the world, as Table 1 summarizes. Socioeconomic differentials, female labor force participation and contraception were the most important factors used to explain the lowering of fertility for older women (Alves 2012). Among adolescents and young women the persistently high fertility has been explained as a resultant of cultural and social changes in sexual behavior of adolescent and young women, gender inequality, and an inefficient sexual and reproductive health system (Berquó and Cavenaghi 2002; Hindin and Fatusi 2009; Bankole and Malarcher 2010). Since the focus of our work is on the rejuvenated pattern of fertility, we will concentrate on those factors that affect more closely adolescent and young women, in order to better comprehend our results. Also, although we mention young persons, we are referring to young women,
since this work is focused on fertility outcomes and uses one-sex stable theory projections. However, acknowledging young males’ sexual and reproductive health is of utmost importance.

*Cultural and social changes*

The expression “cultural and social changes” is frequently used to mention the factors underlying adolescent and young women’s fertility. However, the term is too broad to go unnoticed and more accurately defined, since cultural and social changes can mean a wide array of possible changes. To complicate things a bit further, the definition of adolescence and youth may vary from a cultural context to another. Despite age being a straightforward measure, the definition of youth is not. This already provides an indication of how careful one needs to be when studying this age group, since not only age, but cultural, social, biological and psychological aspects and transformations are also imbedded within that group. For example, the World Health Organization (WHO) defines adolescence as all persons between 10 and 19 years of age, and defines youth as all persons between 15 and 24 years of age. Together, adolescents and youth are referred to as young people, encompassing the ages of 10-24 years. In Indonesia, however, adolescence is related not only to age, but to a person’s marital status. Hence, an adolescent is a never married person between 10 and 19 years of age (Utomo and McDonald 2009). In this work we will adopt the UN definitions.

As regards a young person’s reproductive behavior, the most important cultural and social changes frequently debated in the literature are related to their rates of and age at sexual initiation; the relationship between childbearing, marriage and sexual intercourse; empowerment to make decisions about contraception and sexual activity; and gender inequality (Hindin and Fatusi 2009). The cultural transformations driving those changes in Latin American countries could be the secularization of society, especially concerning sexuality and the increasing autonomy of adolescents which already took place in developed regions. Evidence has indeed shown that sexual initiation is happening at an earlier age, thus increasing the risk of young pregnancies. In Brazil, while 6.1% of all women aged 20-24 had their first intercourse at the age of 15, in 2006 that percentage more than doubled, to 14.4%. At the age of 18 the figures are 29.8% in 1986 and 58.4% in 2006, respectively. However, at the same time that young women are initiating their sex life earlier, the age pattern of first union has not significantly changed, resulting in more vulnerability to adolescent motherhood and violence, as discussed in more detail below (Rodríguez 2013). So, one of the most fundamental social and cultural
changes is this dissociation of sexual activity and marriage, which affects young people differently. This aspect is important because despite feeling more freedom and being more exposed to an earlier sexual initiation, this behavior is not always followed by proper sexual and reproductive health policies, as well as social acceptance freed from taboo.

Gender inequality

Another important issue is gender inequality in young women. Gender inequality is an important matter per se, but it assumes different subtleties when considering young girls and women. Early marriage and sexual activity already poses health threats for young women that range from unwanted pregnancies to sexually transmitted diseases and other obstetric complications. However, besides those health issues, it has been evidenced that young women usually initiate their sex life with older partners, making them particularly vulnerable to HIV infections and other diseases, as well as suffering from violence, leading to higher rates of unintended pregnancies, induced abortion and sometimes death. Their early age prevents these young women from having more power of bargain within their families and older partners, especially as regards the use of contraception and safe sex. In Brazil, despite an increase in the median age at first marriage from 23 years of age for women in 1980 to 26 years in 2007 (Alves and Cavenaghi 2012), still 36% of women aged 20-24 years old got married or entered into union by age 18. This figure is among the 41 countries in the world where the prevalence of child marriage is 30 per cent or more (UNFPA 2011). This estimate alone indicates how many young women are more exposed to early childbearing, health issues and violence. Taken together, all those aspects contribute to higher fertility rates for those groups, and higher unintended pregnancies and unmet demand for contraception, as discussed in more detail below.

Inefficient sexual and reproductive health

On a very important work on youth in Indonesia, Utomo and McDonald (2003) discussed how, on the one hand, “liberal values were promoted through Westernized education, media marketing propaganda, and peer pressure; on the other hand, traditional Indonesian Islamic teaching and moral values were promoted by religious schools and groups, families (especially those of the older generation), and the state”. Despite Indonesia’s particular social, political and cultural setting, this
conflict of values illustrated by two very radical opposite life views is common to societies that undergo rapid demographic transitions. Young people are the one age group that immediately suffers with impact of those conflicting values and decisions, generally squeezed between one generation’s value and the other. With that, at the same time that young women are more exposed and stimulated by the media and liberal values of contemporary societies to initiate their sex lives, that view of life still often shocks with more traditional values and taboos, which prevent them from having appropriate access to sexual and reproductive health. This leads to an inefficient sexual and reproductive health setting, often leading to unintended pregnancies, due to high rates of unmet contraception, and sexually transmitted diseases due to lack of access to condoms and other means for safe sex. Latin America has experienced high unwanted fertility when compared to other regions. 37% of births were unwanted in Latin America & Caribbean in year 2000, while 16% were unwanted in Sub-Saharan Africa and 30% in South & Southeast Asia (Casterline and Mendoza 2008). Also, 34% of births were unwanted in Brazil, higher than Paraguay, Guatemala, Nicaragua, and El Salvador. At the same time, Brazil presents the lowest wanted fertility rate (1.2). This contradiction signals the inefficiency in sexual and reproductive health, and the poor access to and effective use of contraception. In fact, in Latin America, 26% of the sexually active female adolescents aged 15-19 who were married reported unmet need for contraception between years 1995 and 2007. 40% of the unmarried female adolescents reported unmet contraception (Bankole and Malarcher 2010). That means that a substantial fraction of those adolescents wish to avoid pregnancy but are not using any method of contraception. In Brazil, for year 1996, 7% of married women aged 15-49 experienced unmet need. Of those, 16% of young women aged 15-24 reported unmet need, in contrast to 7%, and 5% for those aged 25-34 and 35+, respectively (Sedgh, G. et al 2007).

Hence, on one side, with a relatively high proportion of young women marrying or entering union at young ages, a considerable percentage of young women reporting unmet need for contraception, and all changes related to social and cultural reproductive behavior in Brazil help to explain the persistently high fertility rates at those ages. At the same time, keeping in mind Brazil’s rejuvenated fertility, the unmet need for contraception being the highest at those younger ages, coupled with an already below-replacement level fertility which influences the perception of ideal family sizes, are social factors that, if contemplated, will induce a steeper decline of Brazilian fertility rates in the next few years.
AGING IN BRAZIL

It is well-known to demographers that fertility decline is the primary determinant of population ageing. Fertility reductions are followed by an increase in both the absolute and relative size of the population at older ages (Kim, Schoen, and Sarma 1991; Preston and Martin 1994). Over the last half century, the total fertility rate decreased worldwide from 5.0 to 2.7 children per woman. Over the next century, it is expected to decline to 2.1, and many countries in the world experience a level well below the replacement level for some time (United Nations, Population Division, 2010). Fertility decline affects aging so directly because the concept of population aging is related to the proportion of persons 65+ in relation to persons under 15 years old. Hence, as soon as fertility declines, the proportion of older persons increases. Almost half of the world’s population lives in countries where the total fertility rate (TFR) is below replacement from years 2005 to 2010. The TFR is 1.5 births per woman in Europe and 1.4 births per woman in Japan (United Nations 2012). Such low fertility levels lead to a rapid population aging. This has been raised as a major concern particularly in European countries where fertility levels have been very low for a long period of time. However, with few exceptions, developing countries are also experiencing a rapid ageing process, as a result of their very fast and steep fertility decline, which includes Brazil.

Due to its rapid demographic transition, Brazil is experiencing a fast ageing process. Since the 1960’s the fast and substantial decline in fertility triggered a rapid path of changes in the population age structure. The proportion of children under 5 years old declined from 15% to 11% from 1970 to 1990 and then to 9% in 2000. At the same time, the proportion of persons 60 and over increased from 5.1% in 1970 to 8.6% in 2000 (Wong and Carvalho 2006). The total dependency ratio, the relation between persons of economically active age and those who are not of economically active age declined from 80.3% in year 1950 to 52.7% in year 2000. The proportion of persons 65 years and older to the population under 15 years old, denominated the aging index, increased more than twofold from 7.2 in year 1950 to 17.6 in year 2000 (Wong and Carvalho 2006). The proportion of the population aged 60 years and over is projected to double from 11% in 2010 to 22% in 2025. Alongside, Brazil retains a purely pay-as-you-go public pension system that totaled 11.4 percent of GDP in 2006—more than many developed countries with much older age structures spend on their public pension systems. As Brazil ages, its pension system threatens to become an even larger burden on the budget and economy (Center for Strategic and International Studies 2009).
Hence, it is paramount to assess the factors underlying the aging process in Brazil, as well as those aspects which may accelerate or slowdown that process. In this paper our results indicate that due to the rejuvenated fertility pattern, if the elements contributing for a relatively higher level of fertility for those age groups are not at work anymore, fertility levels would drop substantially, leading to an even more profound aging process.

DATA AND METHODS

Data

We used data from IBGE (Instituto Brasileiro de Geografia e Estatística-National Institute of Statistics and Geography) and fertility and mortality estimates from the United Nations 2015 World Population Prospects review. We gathered information on age-specific fertility rates and female population sizes. We also used estimates from Alves (2012) for Brazilian age-specific fertility rates adjusted by Brass’s P/F method from 1991 to 2010. We performed simulations that allowed us to see (1) what would happen if Brazil’s fertility rates had not increased for ages 15-24 between years 1991 and 2000, but attained levels of other countries that have similar – but not rejuvenated- fertility patterns and (2) what would one expect to see if fertility and mortality schedules remained stable at current levels\(^5\).

![Figure 2. Age-Specific Fertility Rates for Brazil, 1991-2010](image)


\(^5\) Female life expectancy in Brazil is 74.9 and 77.4 for years 2000 and 2010, respectively.
Table 1. Age-specific Fertility Rates by Country, 2000-2010.

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Methods

The approach used was stable population theory and the variable-r method. The rationale of the method is that a population age structure in a given moment of time is the product of its past fertility and mortality schedules. The measure that relates this set of historical vital rates to its current rates are the set of age-specific growth rates, since in it is contained all the demographic history of a population (Preston and Coale 1982; Horiuchi and Preston, 1988). Hence, in a stable population, the age structure can be expressed as a function of its current demographic rates because, by assumption, these rates also applied in the past. Also, by computing the age-specific growth rates it is possible to further investigate if the cohorts of women reaching reproductive age are growing at a negative or positive rate and when does the absolute size of the cohort increases or decreases. For that, we first fixed the mortality and fertility schedules for scenario (2) and projected until population became stable, that is, attained constant age-specific and population growth rates, and allowed fertility at ages 15-24 to decline to Chilean levels and not increase from 1991 to 2000 for scenario (1). Chile was chosen because of its similar ASFR to Brazil at ages 25-45, reflecting the most probable scenario for Brazilian fertility schedules, if had it not been for the persistently higher fertility at 15-24 age groups.

RESULTS

Our results confirm strikingly different population age-structures as a consequence solely of the contribution of adolescent and young fertility schedules, as Figure 3-4 show. The age dependency ratios would be very different at each scenario, indicating the demographic importance of understanding this group’s fertility behavior for the next years. No demographic dividend with Brazil’s 2000 fertility schedule on the long run. However, if changing fertility of the 15-24 group to Chilean levels, the demographic dividend would end in 2045 and the proportion of persons 65+ relative to
those 15 and younger would be higher. The same analysis applies to Figure 3, where the ongoing
decline in fertility by 2010 indicates that on the long run, Brazil’s demographic dividend would end in
2050 with old age dependency ratio at almost 40. Interestingly, if Brazil’s fertility structure remained
the same, but only declined among the youth, by 2015 the demographic dividend would be over and
old age dependency ratio would stabilize at almost 50. This purely demographic exercise indicates
how the fertility of adolescents and young women has the potential to determine the pace of population
aging in Brazil.

Figure 3. Scenario Brazil, 2000, if stable at current levels and if stable with ASFR from 15-24 from
Chile 2000.

In addition, the cohort of women reaching reproductive age in Brazil has decreased in absolute
numbers from 2000 to 2010, as shown on Figure 5, indicating how demographic inertia due to past
high fertility schedules is decreasing its contribution in terms of number of women in reproductive
ages. The age specific growth rate of this group is also negative. The unmet demand for contraception
is, as previously mentioned, 16% among adolescents in Brazil. All those aspects together are indicative of dramatic future fertility declines in Brazil, now potentially driven by the contribution of adolescents and younger women who are in need of specific sexual and reproductive health policies target to them.

Figure 5. Variation in absolute female cohort size numbers, Brazil 2000-2010.

![Variation in cohort size](image-url)


Figure 6. Age-specific growth rates, Brazil, 1991-2010

![Age-specific growth rates](image-url)
Figure 6 also depicts how the age-specific growth rates are increasingly negative for the age group 10-15. This reinforces the fact that not only smaller cohorts are entering the reproductive ages as shown in Figure 5, but that the rates of the successive cohorts are negative. These results indicate that starting in 2010, even if young women’s fertility increases, they are already a smaller cohort of women entering the reproductive ages, relative to their preceding cohort. This alone will drive fertility decline, out of a pure demographic effect of negative momentum. However, we have previously seen that with all cultural and social changes happening, together with a high unmet demand for contraception among young women, if one considers improvement in sexual and reproductive health, as well as structural changes happening, the fertility decline can be even more pronounced and more rapid.

DISCUSSION

Some authors argue that unless structural changes in education and the labor market, as well as full access to reproductive health and effective contraception take place, the fertility schedule in Latin American countries will hardly resemble those of developed countries, where women aged 20-24 still have low fertility compared to the 25 – 29 age group (Alves and Cavenaghi 2009, Goldani 2002). However, we argue in this paper that structural changes and access to reproductive and effective contraception are fundamental to guarantee the young population a better quality of life, qualified labor, as well as their reproductive rights, in conformance to those affirmed by international organizations since ICPD Cairo. Nonetheless, despite those important changes, our results show that fertility at younger ages will inevitably decline in the next few years, due simply to the negative population momentum, or in other words, due to smaller cohorts now entering reproductive ages. If important structural changes, public policies and unmet demand for contraception take place, those factors will only accelerate the process, but will not ultimately cause it. Hence, if those changes take place, the effect it will have is to contribute to an even steeper fertility decline, and consequently, to accelerate the pace of population aging. However, it is important to note that we only analyzed the Brazilian case, so further investigation is necessary to evaluate if the process is underway on other Latin American countries. Also, we have not analyzed fertility outcomes by socioeconomic groups, regions nor labor force participation, which can inevitably enrich those results.
In addition, these results provide support for discussing the low-fertility trap hypothesis, developed by Lutz et al (2006) for European contexts, in developing country scenarios. This hypothesis has three components: a demographic one based on the negative population growth momentum; a sociological one based on the assumption that ideal family size for the younger cohorts is declining as a consequence of the lower actual fertility they see in previous cohorts; and an economic one based on the first part of Easterlin’s relative income hypothesis. Lutz et al (2006; 2007) argue that all those three factors would work towards a downward spiral in births in the future, being practically an irreversible process. In 2010, Brazil already experiences a below replacement level fertility, a smaller cohort of women entering reproductive ages and, as Casterline and Mendoza (2008) have shown, the perception of ideal family size is decreasing in Brazil, with 28% of women aged 15-24 reporting 0 or 1 as the ideal number of children in year 2000. When it comes to discuss low-fertility levels and its implications, attention is particularly driven to the European context. However, we argue that countries that have undergone an extremely fast fertility transition also deserve a special attention, because the consequences felt by those countries will be even sharper, with little or no time to think through the changes and the policies needed to address those consequences.

Finally, this paper contributes to understanding the purely demographic factors underlying fertility patterns and levels in Brazil and its effects on population aging. It also underscores the importance of investigating more closely those countries that have undergone a fast paced unique demographic transition. All changes within this context happen more quickly and with more complexity when compared to European transitions. At the same time Brazilian young fertility schedules are worrying, the aging of the population is happening at an incredible rate. We argue that more studies focusing on the demographic dynamics and population structure are necessary to identify when relative size cohorts are changing and how do they affect demographic schedules.
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