Do averages fool us? Birth trends in Argentina's national subdivisions during the Covid-19 Pandemic

Introduction

The purpose of this research is to analyse the situation and evolution of the birth rate during the COVID-19 pandemic in the subnational divisions of Argentina (23 provinces and the Autonomous City of Buenos Aires).

Previous studies have shown that the level and pattern of the birth rate decline during the pandemic were similar between the national total and one of its largest subnational divisions, the province of Córdoba (Ribotta et al, 2023, 2024a, 2024b). However, considering the socio-demographic diversity observed at the subnational level in Argentina, the following research questions arise: Is there a relevant change in birth rates across Argentina's different national subdivisions during the pandemic? If so, were the subnational changes homogeneous or did they have a differential patterns?

Conceptual framework and background

Traditionally, population fertility responds to humanitarian catastrophes, such as famines, epidemics, or economic crises, with a fairly common pattern: it declines due to increased mortality and recovers one to two years after the crisis (United Nations, 2021). Among the findings on the impact of the pandemic on births in developed countries, diverse effects are found, although in general a drop has been observed during the first year of the pandemic, followed by a recovery to pre-pandemic levels (Aassve et al., 2021; Sobotka et al., 2021, 2021, 2022, 2023).

In general, little is known about the impact of the pandemic on fertility at the sub-national level. Similarly, findings on this aspect are quite variable. In South Korea, Jung and Lee (2023) find that, at least until 2021, fertility rates did not decline beyond the pattern explained by already declining fertility. In Colombia, Sánchez Céspedes, Marín Salazar and Palacio Martínez (2022), indicate that in the first two months of 2021 there was a reduction in the general fertility rate in most departments; in twenty-three for married women and in twenty-six for unmarried women, and that this situation would respond to different reasons. In this case, the authors find that the effect of the pandemic on departmental fertility was mediated for married women by unemployment and the closure of commercial and leisure establishments, while for unmarried women it was mediated by strict confinement.

Regarding fertility in Argentina, historically, important regional differentials have been reported (Pantelides, 2006; Torrado, 2007). However, the country has shown a geographically generalized decline in fertility since 2015, a behavior that interrupts the "plateau" it had shown from 2000 to 2014 (Peláez et al, 2022). This context, which tends towards subnational convergence "below" replacement level, makes the study of Argentina's birth rate during the pandemic particularly interesting and relevant.

Methodology and data sources

An exploratory and descriptive quantitative research is proposed. Based on the state of the question, a series of comparative indicators on the birth rate observed before and during the pandemic are defined and examined, elaborated by means of different scenarios based on comparison with previous data and probabilistic forecasts.

The techniques proposed by Sobotka et al. (2021, 2022 and 2023) are used, with some adaptations to the specific information and characteristics of the case studied - the twenty-four subnational divisions of Argentina - as shown below.

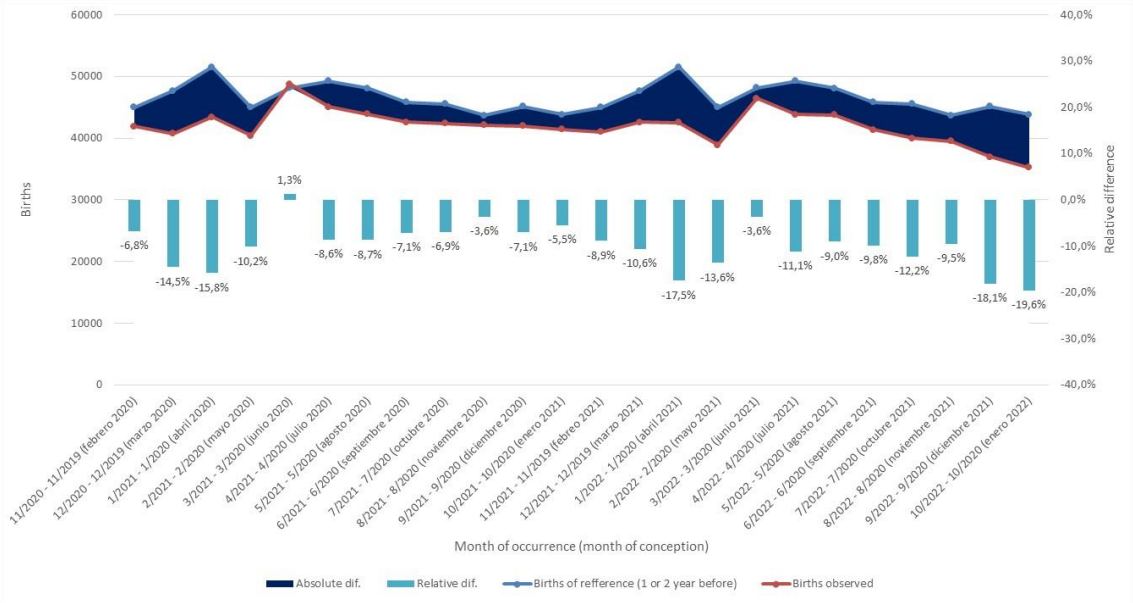
The study period runs from November 2020 to October 2022. Births are thus selected for conceptions that occurred after the start of the pandemic in 2020, i.e., approximately nine months

earlier. Monthly data for February are adjusted to ensure comparability between 2020 (leap year in which February lasted 29 days) and 2021 (year in which February lasted 28 days).
The analysis assumes that monthly trends are not comparable between adjacent months, for two reasons: i) the difference in the number of days in each month and the uneven distribution of days corresponding to each week in different months, and ii) the seasonality of vital events. To address these issues, the strategy adopted is to analyse by month the births corresponding to conceptions occurring during the pandemic, considering the absolute and relative difference with respect to births occurring in the same month of the following reference periods: (i) the 12 months from November 2019 to October 2020 and (ii) the period from January 2001 to October 2022.
The first measure captures changes over periods of one or two years, depending on the month and year analyzed. It is understood that being a short period of time, the observed number of births would not be affected by changes in the size and composition of the population. In this framework, a reduction in the number of births is considered atypical when it exceeds 15 per cent.
The second measure attempts to provide a more robust comparison of changes in births during the pandemic by looking at a longer period, reflecting the recent fertility trend for each subnational division. To avoid the influence of population composition and size and, in turn, the possible effect of seasonality of births, the following techniques are applied:
a) Monthly births are predicted using a seasonal autoregressive integrated moving average (SARIMA) model (80% and 95% forecast interval), which are then compared with births corresponding to conceptions occurring during the pandemic. This model is an extension of the autoregressive integrated moving average (ARIMA) model and is often used when a seasonal pattern is suspected in the data being analyzed. The reduction in the pandemic birth rate is considered significant when it is below the forecast interval.
(b) A seasonally adjusted series of births is obtained using the R package of Sax and Eddelbuettel (2018) and the seasonal adjustment program X-13-ARIMA-SEATS, from the US Census Bureau.
For the development of this research, information on births by month or year of occurrence and age of the mother, from 2001 to 2022, was required and was provided by the Directorate of Health Statistics and Information (DEIS) of the Ministry of Health of Argentina.

Provisional results

Figure 1 shows Argentine births occurring month by month from November 2020 (approximately nine months after the start of the pandemic) to October 2022, compared in absolute and relative terms with births occurring from November 2019 to October 2020. A declining birth rate effect is observed, with notable expressions at six points in time (December 2020, January 2021 and 2022, February 2022, and September and October 2022). The analysis of births shows that, although the COVID-19 pandemic gave rise to a sort of *baby boom* in the country, this would not be as pronounced or as persistent as expected.
The pattern observed in Argentina is broadly in line with the results obtained in international comparative studies. In this regard, Sobotka et al. (2023) note that, from a longer-term perspective, most of the countries they analyzed experienced neither a sustained boom nor a prolonged fall in birth rates during the first two years of the pandemic. Also, recorded births often follow trends projected based on pre-pandemic birth dynamics.

Argentina: births since November 2020, and absolute and relative change from November 2019 to October 2020
births, by month, 2019-2022
(In numbers and percentages)



Source: Own elaboration, based on DEIS data.

Note: In the legends corresponding to the month of occurrence of the birth, the possible month of conception is included in brackets.

The behaviour observed in the work of Sobotka et al. (2023) highlights the importance of deepening the analysis conducted in Argentina in the provinces that make up the country. In this regard, a comparison of births before and during the pandemic reveals two patterns:

* That all sub-national divisions experience declines in birth rates during the pandemic, broadly replicating the cycles observed at the national level (Table 1).
* That notwithstanding this, there are differences in the intensity and pattern of the decline. In this respect, four different groupings of sub-national divisions can be made, depending on whether they resemble the national performance (up to 20% difference), clearly surpass it (more than 20%), are below it (up to - 20%), or are nil. The respective cases can be shown for the province of Cordoba, the province of Buenos Aires, the Autonomous City of Buenos Aires, and the province of Santa Fe, respectively (graphs 2 to 5).

It is hoped to continue the comparison of registered and estimated birth rates in the different national subdivisions, with the elaboration of a *seasonally adjusted series of births*, and with this input, the elaboration of *probabilistic projections of births*. Finally, the last stage of this research involves *obtaining the TFR from seasonally adjusted births*, which will allow us to obtain a more detailed and more far-reaching perspective on the phenomenon by incorporating the situation and evolution of fertility at the sub-national level into the analysis.

Table 1. Argentina and major subnational divisions (provinces and Autonomous City of Buenos Aires): births since November 2020, and relative change from November 2019 to October 2020 births, by month, 2019-2022 (Percentages), selected months

Jurisdicción	12/2020 - 12/2019	1/2021 - 1/2020	1/2022 - 1/2020	2/2022 - 2/2020	9/2022 - 9/2020	10/2022 - 10/2020
Argentina	-14,5%	-15,8%	-17,5%	-13,6%	-18,1%	-19,6%
Buenos Aires	-13,7%	-17,0%	-22,3%	-16,3%	-20,9%	-21,9%
Catamarca	-11,6%	-23,0%	-8,5%	-17,0%	-14,3%	-22,9%
Chaco	-13,5%	-8,9%	-13,7%	-9,4%	-21,5%	-26,5%
Chubut	-20,4%	-17,9%	-12,0%	-18,4%	-25,3%	-16,2%
CABA	-23,6%	-29,7%	-21,8%	-19,5%	-15,3%	-13,6%
Cordoba	-19,0%	-15,5%	-16,0%	-10,6%	-15,0%	-18,8%
Corrientes	-11,6%	-14,2%	-23,4%	-8,8%	-23,8%	-18,7%
Entre Ríos	-8,4%	-10,5%	-17,9%	-9,9%	-16,1%	-26,0%
Formosa	-12,6%	-13,4%	-17,5%	-13,7%	-15,7%	-18,5%
Jujuy	-19,2%	-13,7%	-17,9%	-11,4%	-10,9%	-18,8%
La Pampa	-69,2%	-18,9%	-16,9%	-17,4%	16,9%	-5,8%
La Rioja	-14,3%	-24,3%	-22,4%	-13,5%	-13,5%	-15,1%
Mendoza	-11,0%	-14,6%	-15,5%	-17,0%	-12,9%	-19,0%
Misiones	-7,0%	-11,6%	-9,8%	-11,0%	-24,3%	-17,8%
Neuquén	-9,8%	-7,0%	-7,7%	-18,0%	-13,2%	-12,0%
Río Negro	-17,8%	-16,7%	-12,3%	-11,9%	-17,9%	-13,9%
Salta	-12,0%	-13,1%	-7,6%	-10,4%	-22,2%	-21,4%
San Juan	-16,9%	-12,4%	-16,3%	-19,2%	-13,5%	-11,4%
San Luis	-13,2%	-10,5%	-9,8%	-14,9%	-23,2%	-29,1%
Santa Cruz	-16,3%	-23,3%	-26,0%	-17,0%	-15,7%	-16,3%
Santa Fe	-12,9%	-12,8%	-7,0%	0,6%	-9,4%	-16,3%
Santiago del Estero	-11,6%	-14,6%	-26,4%	-25,6%	-25,6%	-22,1%
Tierra del Fuego	-9,8%	-22,5%	-34,8%	-27,1%	-9,9%	-16,1%
Tucumán	-15,2%	-14,6%	-11,0%	-11,3%	-18,3%	-16,9%

Source: Own elaboration, based on DEIS data.

Argentina, selected subnational divisions: births since November 2020, and absolute and relative change from November 2019 to October 2020, by month, 2019-2022 (Numbers and percentages)

Figure 2: Córdoba

Figure 3: Buenos Aires

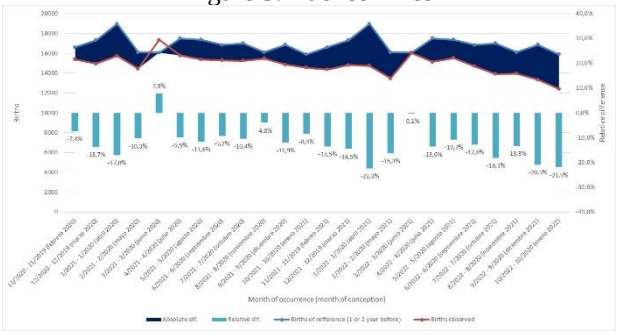


Figure 4: City of Buenos Aires

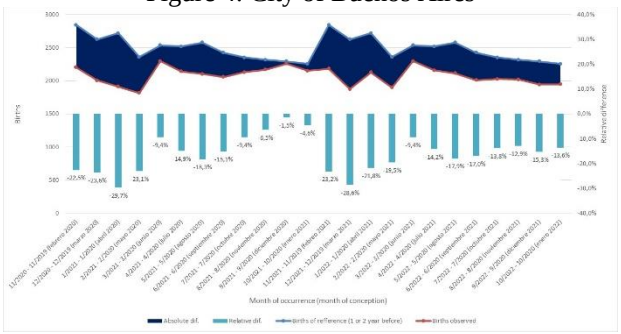
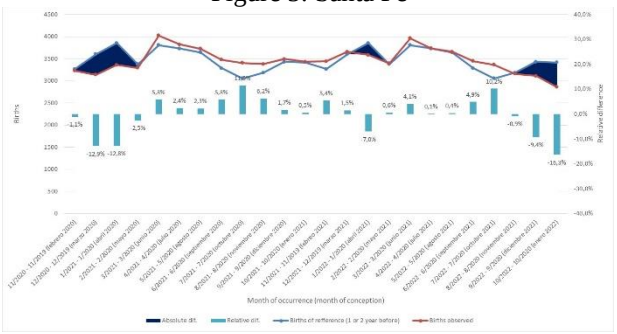


Figure 5: Santa Fe



Source: Own elaboration, based on DEIS data.

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