

Reproductive Patterns of Mexican Women in Times of COVID-19 ¹

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Introduction

In Mexico, as well as in different Latin American countries and other regions, fertility is in a marked decline process, which intensified from the second decade of the twenty-first century. Data from recent years show that the Total Fertility Rate (TFR) is below the population replacement level (Partida, 2023; Bloom et al., 2024). The accelerated decline in recent years has been explained, in part, by the decline in fertility among women in younger age groups, especially adolescents between 15 and 19 years (Cabella & Pardo, 2022; Mier & Terán & Llanes, 2020). Despite the heterogeneity of fertility levels in the country, the trend towards decline is widespread.

On 28 February 2020, the Mexican government confirmed the first case of the disease within the country. On 18 March, the National Day of Healthy Distancing [Jornada Nacional de Sana Distancia] was proclaimed, and social health distancing measures were introduced (Padilla-Santamaría et al., 2020). A series of measures were enacted to regulate social and economic activity. These included suspending face-to-face schooling at all levels, implementing remote working arrangements in both the public and private sectors, and suspending government activities deemed "non-core" (Segob, 2020). These measures were extended over time in accordance with epidemiological guidelines regulating the use of public spaces, depending on the contagion risk, and remained in effect for two years until 26 April 2022 (Government of Mexico, 2022a).

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Unlike other countries in the region, Mexico did not impose mandatory restrictions on voluntary mobility. Nevertheless, it was one of the most severely affected by the global pandemic, experiencing over 600,000 excess deaths between 2020 and 2021 (Safdari-Dehcheshmeh et al., 2020). Similarly, Mexico was among the countries in the region that experienced the longest delay in returning to face-to-face schooling. Schools at all levels operated remotely for over 15 months, exacerbating the domestic and caregiving burden on families. Furthermore, the government's economic response involved maintaining austerity measures and rejecting countercyclical policies (Sánchez Talanquer & Sepúlveda, 2024). These circumstances, combined with the increased epidemic activity, hospital saturation, uncertainty about returning to "normality" and reduced income, raise questions about the impact of the pandemic on various aspects of life, particularly women's reproductive choices, in a context characterized by persistent wealth inequalities (Sánchez-Ancochea, 2021).

In the case of Mexico, as other countries in Latin-American, evidence about the impact of the pandemic on reproductive behavior is scarce, due to the challenges associated with observation, the unavailability of comprehensive data sources, and the difficulties in making comparisons (Lee et al., 2023).

Some studies in the region suggest that the pandemic has had a negative impact on fertility (Lee et al., 2023) and may have accelerated the pre-existing decline in fertility rates (Cabella & Pardo, 2022; Fostik & Galbraith, 2022). In Mexico, for example, research indicates a reduction in fertility during the initial phases of the pandemic, followed by a slight rebound (Silverio-Murillo et al., 2023). Despite limited access to sexual and reproductive health services and barriers to contraceptive access reported during the initial year of the pandemic in numerous countries (UNPF, 2020), the observed decline in fertility in Mexico is consistent with the available evidence.

This paper aims to examine the impact of the SARS-CoV-2 pandemic on Mexican women's reproductive patterns and to discuss how various demographic characteristics, including age, parity, marital status, and education, influence the fertility transition process. Our analysis

seeks to understand the heterogeneity of the pandemic's impact on Mexican women's reproductive decisions, in a context of socioeconomic inequalities. It is recognized that decision-making processes in times of crisis result in different responses. Some women may have decided to have a child due to the uncertainties associated with the SARS-CoV-2 virus, while others have found it necessary to postpone births, either temporarily or permanently (Sobotka et al., 2011; Luppi et al., 2020).

Linking fertility and COVID-19 evidence

The impact of epidemics on fertility has been the subject of extensive research. Some studies indicated a decline in births in the immediate aftermath of an epidemic, followed by a recovery in subsequent years (Aassve et al., 2020). Other study suggests that fertility recovery may depend on the degree of uncertainty surrounding the epidemic regarding its potential effects and duration (Lee., 2023).

Uncertainty is a pivotal factor in times of crisis. A lack of information about potential outcomes influences the way individuals make decisions and assume risks (Wright, 2022). In the context of the pandemic, it has been postulated that the intertwining of insecurities across various domains of life has given rise to “existential uncertainty”. Proximity to death was associated with disruptions to daily life in family, work, education, and socialization (Wright, 2022).

For several decades, uncertainty and "narratives of the future" have been recognized as important factors in understanding women's reproductive intentions (Vignoli et al., 2020). Studies in different contexts have demonstrated the impact of ongoing economic crises on reproductive decisions, identifying generalized contexts of uncertainty which result in either the postponement or limitation of births (Adsera & Menéndez, 2011; Sobotka et al., 2011). However, some studies suggest that subjective perceptions relating to stress, fear of contagion, limitations on social interaction, and relationship strain may also influence reproductive decisions among individuals of childbearing age (Manning et al., 2022; Sobotka et al., 2023).

A decline in births was observed in high-income countries during the pandemic of 2020-2021, with fluctuations in 2020 and a sharp drop in early 2021. However, this trend was not universal; Scandinavian countries exhibited a contrasting pattern (Sobotka et al., 2023). In countries where fertility rates had already been falling, the pandemic exacerbated this decline (Aasve, et al., 2020; Sobotka et al., 2022). In some cases, however, fertility rates have rebounded in subsequent months (Fallsen & Cozzani, 2023).

Available evidence from various contexts suggests that reproductive behavior is heterogeneous during the ongoing Coronavirus (COVID-19) pandemic (Fallsen & Cozzani, 2023; Sobotka et al., 2023). Studies using data from high-income countries reveal a decline in births, particularly in January 2021, in response to the initial pandemic restrictions. In countries where fertility rates had already been falling, the pandemic exacerbated this decline (Aasve, et al., 2020; Sobotka et al., 2022). In some cases, however, fertility rates have rebounded in subsequent months (Fallsen & Cozzani, 2023).

The way in which epidemics affect fertility has been documented, reducing births with recoveries in the following years in the short term (Aassve et al., 2020). Uncertainty is a central element during times of crisis. A lack of full or partial information about future situation outcomes has an impact on the ways people make decisions and take risks (Wright, 2022). It has also been suggested that the continuous economic crises in recent decades have generalized contexts of uncertainty, which impacts reproductive decisions, either in the form of postponement or limitation of births (Sobotka et al., 2023). However, during the pandemic, subjective assessments related to higher levels of stress, fear of contagion, limitations in sociability, and tensions in couple relationships, may also have affected the contexts in which people of childbearing age make reproductive decisions (Safdari-Dehcheshmeh et al., 2023; Manning et al., 2022;). The proximity of mortality was combined with the disruptions of daily life in the family, work, education, and sociability, which has repercussions on the reproductive strategies of women or couples, and on the possibilities of making decisions (Wright, 2022).

Winkler-Dworak et al. (2024) posit that countries with higher levels of trust in social policies, robust family programs, as well as less intrusive health measures that disrupt family and social life were able to provide a more favorable context for having children. Conversely, countries with inadequate social policies and more stringent infection control measures were associated with reduced fertility and modest recovery.

Studies conducted in some Latin American countries suggest that the impact of the pandemic on fertility cannot be separated from pre-existing inequalities. In Brazil and Colombia, for example, researchers found that in areas heavily affected by the virus, women with fewer years of schooling did not delay childbearing compared to their more educated counterparts, suggesting that vulnerable groups have more limited reproductive choices (Castro Torres et al., 2024). Thus, existential uncertainty, exacerbated by the COVID-19 pandemic, interacted with potential material deprivation in the region.

Data and research methods

We adopt a descriptive approach and use birth certificate data from the Subsistema de Información sobre Nacimientos (SINAC) of the Ministry of Health as data source.² The source provides information on births that occur in Mexican medical units and facilities, where newborns receive their birth certificate which is later used to register them at the Civil Registry. The SINAC data source provides continuous and updated annual data on births and maternal sociodemographic characteristics, allowing for a comprehensive understanding of the evolving trends in births. It is a valuable resource for analyzing the impact on births of conjunctural events such as the pandemic.

The main data sources on births in Mexico are the vital statistics and the birth certificate. The first source has near-universal coverage; however, late registrations is a limitation, as the time from birth to registration can sometimes be more than a year. In addition, the timely registration of births was severely hampered during the pandemic. Despite the Mexican government's recognition of vital registration as essential service during the pandemic, a

² Annual data files were downloaded from Government of Mexico (2022b).

decline in timely birth registration was observed due to social distancing protocols designed to reduce the spread of infection.

In contrast, the certificate is an appropriate source because data are collected at the time of birth, when it occurs in hospitals or clinics. It is worth noting that there are omissions in remote regions where access to health services is limited (Mier-y-Terán & García-Guerrero, 2019). Nevertheless, coverage has increased over time and is similar to that of other sources in recent years.

With the SINAC data, it is possible to trace the rapid decline in the number of births of recent years. While in 2017 there were 2.1 million live births, in 2021 the figure dropped to 1.6 million, a fall of 24% within 4 years. As will be seen, this is the result of a previous long-term trend that was strengthened by the Covid-19 pandemic.

Because of the lag between the occurrence of an event and its subsequent effect on births, the impact of the COVID-19 pandemic on fertility may be observed later than other demographic events. To assess potential shifts in reproductive decision-making patterns, the analysis focuses on births resulting from conceptions that occurred approximately nine months before. As the declaration of the public health emergency in Mexico took place on March 30th, to examine patterns in conceptions before and after, we analyze pre-pandemic conceptions that took place from January to March 2020; from April 2020 and until January 2022 conceptions take place in the pandemic period. Births which include these conceptions are those from October 2020 to October 2022. To illustrate, births in January 2021 correspond to conceptions that occurred primarily in April 2020, in the first month of the pandemic.

To assess whether and to what extent conceptions were affected during the different stages of the health emergency, we analyze the relative change between births in a given month and those in the same month of the previous year, whose conceptions occurred before the pandemic, using the same approach as in other studies (Sobotka et al., 2022; Zeman & Sobotka, 2021; Cabella & Pardo, 2022; Sobotka et al., 2023; Robotta et al., 2024). To obtain the relative change of births for the months from October 2020 to October 2021, a

comparison is made with births of the same month of the preceding year (October 2019 to October 2020, corresponding to pre-pandemic conceptions), expressed on an annual basis. For the subsequent months (November 2021-December 2022), the relative change of births is also obtained comparing with those of the months of the year before the pandemic (November 2019 to December 2020), that is, two years before. The relative change of births from October to December 2020 serves as a reference point in the analysis, as it corresponds to the immediate pre-pandemic conceptions from January to March; comparisons with the following months provide an approximation of the change due to the health emergency. This approach avoids the effects of seasonality but does not allow a clear distinction between the current decline and the previous patterns of descent.

To address the heterogeneity of decision-making processes in disruptive situations (Zeman & Sobotka, 2022) and to identify factors that motivate or constrain reproductive decisions (Sobotka et al., 2011), we present the percentages of annual change of conceptions that took place from January 2020 to January 2021 according to certain relevant characteristics of women at childbirth. These include age (under 20; 20 to 24; 25 to 29; 30 to 34; and 35 and older), the number of children born alive (1, 2, 3, or 4 or more children), marital status (cohabiting, married, or single), and educational attainment at the time of birth (primary or less, secondary, upper secondary, and professional). The selection of these sociodemographic variables and their categorization is based on their relevance as predictors of reproductive patterns and their availability in the SINAC data source.

The age of women is a pivotal factor in comprehending of reproductive decisions; nevertheless, age-specific responses to economic shocks or recessions appear to vary according to context (Kreyenfeld, 2016). In Mexico, the age-specific fertility structure is young, and with a relatively young population. In 2019, the mean age of women at childbearing was 26.8 years, with an adolescent fertility rate of approximately 50 per thousand. The peak ages of birth concentration were 20-24 (28%) and 25-29 (26%). Parity has been identified as an indicator of the stage of family formation, and changes may result in a delay in the initiation of the offspring formation rather than influencing the duration of interbirth intervals (Fostik & Galbraith, 2021). Also in 2019, most births in Mexico occurred

in the first two orders, comprising 39% and 33%, respectively, while those of higher orders were less common, representing 18% and 9%, respectively, for orders 3 and 4 and above. With respect to the marital status, in Mexico the practice of cohabitation has persisted in parallel with that of marriage. It has been primarily prevalent among the economically disadvantaged and regarded as a preliminary phase to marital union. However, in recent decades, there has been a notable increase in cohabitation, which has become more prevalent and generalized, although significant social differences remain (Amador, 2016). Furthermore, the formation of the first union also tends to be delayed, resulting in longer periods of singlehood. As shown by the SINAC data, in 2019 most births (55%) were to cohabiting women, with almost a third (31%) to married women and 10% to unmarried women. In education, there has been a remarkable increase in women's educational attainment in recent decades. However, significant inequalities persist, with secondary education remaining the most prevalent category, as evidenced by SINAC data on women who gave birth in 2019. 14% of women had completed only primary school, while the majority (37%) pursued secondary education, 31% attained upper secondary level, and only 18% had professional studies.³

Results

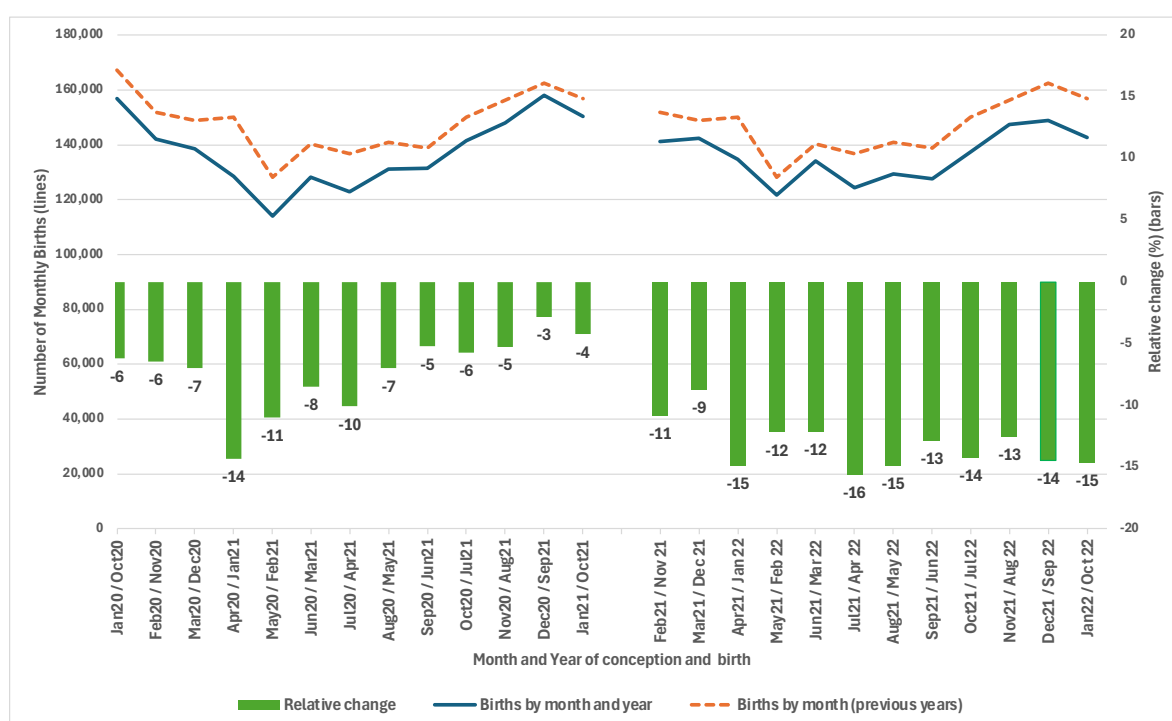
One way of measuring the change associated with COVID-19 over the different phases of the pandemic, excluding the effect of seasonality, is to look at the relative change in the number of births in the same month between years. Figure 1 shows the percentage change or relative change in births from October 2020 to October 2021, a period that covers conceptions before and during the first months of the pandemic. In addition, from November 2021 to October 2022 births are compared with those that occurred two years earlier. To have an order of magnitude, the curves of monthly births used to calculate the relative change are also included.

In the months prior to the pandemic, the number of births exhibited a substantial annual decline of between 6.0 and 7.0 percentage points, corresponding to births in October,

³ The education levels are, respectively, 0 to 6 years of schooling, 7 to 9, 10 to 12, and 13 or more.

November, and December 2020, with conceptions in January, February and March 2020. However, the downward trend is markedly accentuated in the births of January 2021 (14.4%), conceived in April 2020, just after the official declaration of the health emergency in March 2020, and the first COVID deaths were confirmed. This pronounced decline in January 2021 is consistent with the observations reported by Sobotka et al. (2023) in their analysis of data from multiple countries.

Figure 1. Live births whose conception occurred in the first year of the pandemia, live births in the prior months and relative change, 2020-2022, Mexico*



Note. *Annual (October 2020 to October 2021) and biannual change (November 2021 to October 2022).

Source: Own elaboration with data from SINAC.

In Mexico, a reduction in the rate of decline of births begins since February 2021, with an interruption in April, when the relative change increased again (-10.0%). This corresponds to the conceptions of July 2020, a period characterized by the intensity and lethality of the pandemic (Sánchez-Talanquer & Sepúlveda, 2024, 63), and which preceded the peak of the first wave of deaths. As of May 2021, the modest recovery in births resumes, approaching pre-pandemic levels. Moreover, the values for September and October 2021 demonstrate a recovery that exceeds pre-pandemic levels, with a decline of only 3% and 4%, respectively. This is consistent with the conceptions of December 2020 and January 2021, which suggest

that the holiday season may have contributed to easing of certain restrictions. As of November 2021 onwards, the magnitude of the relative change has increased in accordance with its biannual dimension. Nonetheless, the decline in births appears to be resuming its pre-pandemic pace.

The trend described above is consistent with the observed behavior of fertility during periods of economic recession. It has been demonstrated that a decline in births during periods of crisis is cyclical, with a subsequent compensation or reduction in the rate of decline in subsequent years (Sobotka et al., 2011). In the case of Mexico, this modest recovery must be situated within the context of sustained fertility reduction prior to the onset of the pandemic (Mier-y-Terán & Llanes, 2022).

Differentials by women's characteristics

The subsequent section will examine variations in women's reproductive behaviors, categorizing these according to factors including age, parity, marital status, and educational level. This will be achieved by examining the relative change in births conceived during the months of the first year of the pandemic. These are then compared to births occurring in the same month one year earlier.

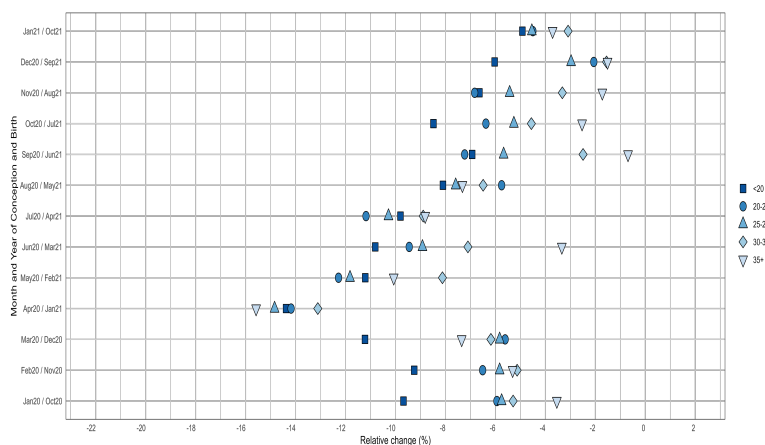
Age

Figure 2 illustrates that the reduction in births prior to the onset of the pandemic was pervasive across all ages. The initial reduction in births was observed among women aged 35 years and above, beginning in December 2020, and reaching a decline of approximately 16% in January 2021, corresponding mainly to conceptions in April 2020. However, these women showed the most pronounced recovery in the subsequent months, particularly in March and June. A possible explanation is a greater risk perception for older women, due to the consideration of pregnancy as an additional risk associated with mortality from COVID-19.

A comparable trend, albeit less marked, is evident among women aged 30-34 years, aligning with findings from a related study (Zeman and Sobotka, 2021). It can be hypothesized that they have previously postponed their pregnancy on account of other factors and that they are

therefore not perceived as constituting a population at risk. The age groups with the highest fertility, 25-29 and 20-24, show similarities and are characterized by a lower recovery after January 2021. These age groups have the future timeframe to have children without worrying about the risks of infertility and health problems associated with later childbearing. Conversely, adolescent girls exhibit a more precipitous decline at the onset of the observation period when compared to older women. This decline is particularly marked in December 2020 and even more so in January 2021, when the same magnitude of the decline is observed among women of all ages. Although the young age group shows some recovery from this month onwards, it is less marked than for older women. At the end of the period, in October 2021, marginal disparities emerge in relation to age, with levels that are relatively comparable and quite the same as those of the previous year, except for the under-20s, who start from a much steeper decline (9.7%) and conclude the period with a percentage change of - 4.9%. It is unclear whether there are cases where the delay in childbearing is definitive. However, the data suggests that the recovery of births delayed by the pandemic has stopped and that the pre-pandemic pace of decline is resuming for all but the youngest women.

*Figure 2 Relative change (%) of monthly live births (October 2020 to October 2021) * compared to those of previous year, by date of conception and birth, and mother's age groups.*



* Births conceived during the first year of the pandemic (January 2020 to January 2021).

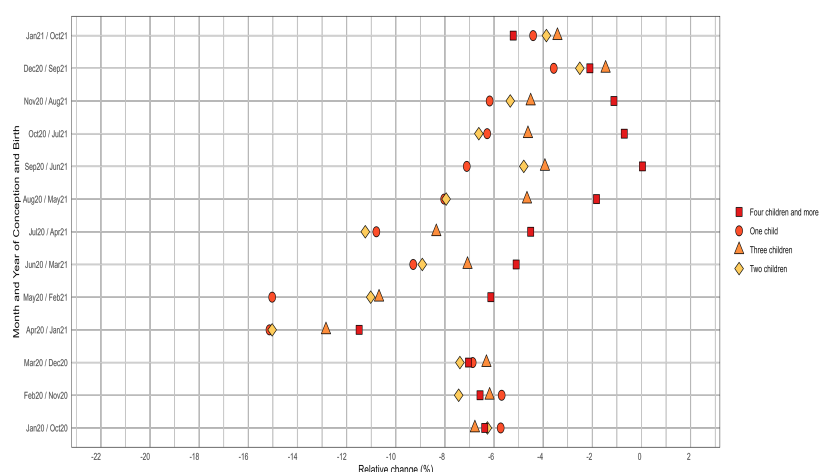
Source: Own elaboration with data from SINAC.

Parity

Before the public health emergency, the decline in fertility affected all birth orders equally (Figure 3). From January 2021, however, the values of the percentage changes begin to

diverge. In this month, the decline is more pronounced, the relative change is large (- 15%) and similar for the first and second orders, closely followed by the higher orders. From February onwards, the public health orders are associated with larger reductions in the first births, followed by the second order. Third births follow the pattern of the lower orders, but with relative changes of smaller magnitude. The data show a trend towards recovery in all these three parities. However, this trend is slightly modified in April, when the number of births fell, as their conceptions in July 2020 coincided with the first peak in deaths. The parities associated with larger families show, in addition to a smaller decrease in January, follow a rapid recovery, so that from March onwards the relative change is smaller than in the pre-pandemic months and approaches the values of the lower orders until September. In October, the decline resumes for all birth orders, although to a slightly lesser extent than in the pre-pandemic months.

*Figure 3. Relative change (%) of monthly live births (October 2020 to October 2021) * compared to those of previous year, by date of conception and birth, and mother's parity including the current birth. Mexico*



* Births conceived during the first year of the pandemic (January 2020 to January 2021).

Source: Own elaboration with data from SINAC.

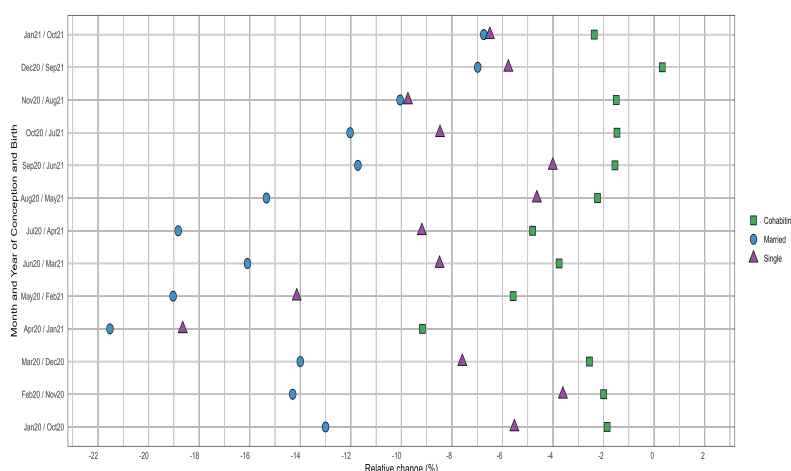
Marital status

Analysis of the SINAC series reveals a striking pattern of decline in births by marital status, which has persisted throughout our observation period (Figure 4). The decline was more pronounced among married women than among unmarried and cohabiting women. In the months before the start of the pandemic, considerable differences were observed, with relative changes exceeding - 13% for married women and reaching a minimum of - 2% for

cohabiting women. After the onset of the health decree, there was a marked decrease in births among women of all marital statuses, especially in January, corresponding to the conceptions in April 2020, the first month of the pandemic. However, the percentage decline is most pronounced among married and single women, at 22% and 19%, respectively. For cohabiting women, the reduction is less than half (9%). Following January 2021, there was a general recovery in births, albeit with fluctuations. A particularly marked decline was observed in April 2021 among married women, who gradually recovered to reach similar levels to those of single women. In the most recent months, the number of births among single and cohabiting women has almost returned to pre-pandemic levels.

It is worth noting that the recovery trend in births to cohabiting women, to the detriment of married women, suggest that possible reduced access to contraception could have an impact on the number of births to cohabiting women. The decline in the number of marriages during the pandemic could also partly explain the lower number of births among married women in 2021. However, greater personal uncertainty may have contributed to the smaller decline among cohabiting women. It has been documented that having a child could be a strategy to reduce personal uncertainty (Friedman et al., 1994), as cohabiting unions are more unstable.

*Figure 4. Relative change (%) of monthly live births (October 2020 to October 2021) * compared to those of previous year, by date of conception and birth, and mother's marital status. Mexico*



* Births conceived during the first year of the pandemic (January 2020 to January 2021).

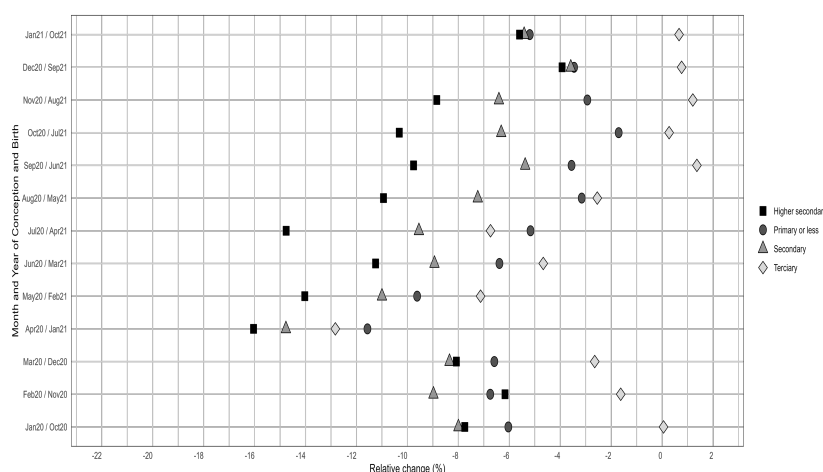
Source: Own elaboration with data from SINAC.

Educational level

Figure 5 illustrates the widening of the gap between the primary, secondary, and upper secondary levels of education during the pandemic. From October to December 2020, women with low and medium levels of schooling experienced declines in births of comparable magnitude, ranging from 6 to 8 percentage points, in contrast to women with professional level, whose decline was either negligible or minimal.

In response to the health contingency, in January 2021 the number of births decreased among all education groups (conceptions occurring in April 2020). However, the groups with the largest reduction in births were those with secondary education and upper secondary education, with percentages of -15% and -16%, respectively. It is noteworthy that women with professional studies also showed a marked decline in births in this month (13%), but an accelerated and more pronounced recovery in the following months until the end of the observed period. Even births from June to October 2021 (conceptions from September 2020 to January 2021) showed a positive percentage change compared to the pre-pandemic period. This suggests that professional women may have favored the scenarios for conception during the pandemic, perhaps because of the possibility of remote or home-based paid work, which would allow them to stay at home during the first few months of childbearing (Bailey et al., 2022).

*Figure 5. Relative change (%) of monthly live births (October 2020 to October 2021) * compared to those of previous year, by date of conception and birth, and mother's educational level, Mexico*



* Births conceived during the first year of the pandemic (January 2020 to January 2021).

Source: Own elaboration with data from SINAC.

In contrast, women who have attained upper secondary education may have been exposed to more adverse conditions and economic insecurity during the pandemic due to job losses and the inability to work from home, as they often work in sectors of the economy that were heavily affected during the first months of the pandemic, such as the service sector. The changes observed in the group with the lowest level of education are less pronounced and the recovery is faster than in the other two groups with intermediate levels of education. This may indicate an increasing lack of access to public family planning services during the first year of the pandemic, which would be rectified by the end of 2020 and reflected in the increasing decline in births from August 2021 onwards.

A gradation is observed between the three low and medium levels of education, with a decrease in each level, starting in January 2021. The magnitude of the differences increases in the following months and decreases significantly in the last two months observed (September and October 2021). However, the gradation indicates that educational differences between these groups increased during the pandemic.

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Conclusions

- Using SINAC data on monthly births, we obtained consistent results regarding the impact of the pandemic on the reduction in births at different stages. In addition to the preceding downward trend, we showed that the pandemic exerts a strong impact on births, especially in the initial months, when the social distancing measures, contagion fears, employment instability and the first deaths had a more significant disruptive effect.
- The downward trend observed during the initial phase of the pandemic appears to have stabilized with the start of the vaccination campaign, suggesting the possibility of a modest recovery in delayed births. These findings are consistent with those of other studies conducted in Mexico and neighboring countries, which indicate that pandemic's impact on Mexico was primarily short-term.
- Our findings facilitate discussion of how women may have been affected by a combination of structural uncertainties such as precarious material conditions, informal employment and persistent weaknesses in social policies, as well as "existential uncertainties" such as high mortality rates, hospital overcrowding and changes to daily life in various spheres. Women's reproductive choices were influenced by certain sociodemographic characteristics and the different opportunity costs associated with parenthood.

- During the first month of the pandemic, and to a lesser extent in subsequent months, women of all ages, parities, marital statuses and educational levels tended to postpone having children.
- Depending on their age, women perceived and interpreted the risks of serious illness or death differently. This is evident from the greatest decline among women aged 35 and over, who later showed the greatest recovery.
- Epidemiological conditions may also have contributed to the increased uncertainty surrounding the transition to motherhood and the initial stages of family formation. The most significant declines were observed in first and second births.
- The greatest differences in women's responses depended on their marital status, highlighting the importance of adopting a couples' perspective to understand the processes behind reproductive decisions. The pronounced decline among married women can be attributed to a heightened awareness of reproductive intentions. In contrast, greater personal uncertainty may have contributed to the smaller decline among cohabiting women.
- Some women with professional studies may have found it advantageous to have a child during the pandemic. Others with less education may have decided to temporarily or permanently postpone having a child.
- A gradation is observed between the three lowest levels of education, with differences increasing in the middle months of the first year suggesting greater inequalities.
- Similar patterns among multiparous women, those cohabiting and those with lower education suggest that women who are more vulnerable and live in poverty may have encountered temporary barriers to accessing public family planning services.
- The data suggests that the surge in births delayed by the pandemic has ended, and the pre-pandemic pace of decline has resumed for all but the youngest women.

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