

Exploring Maternal Age Cohorts in the Decline of US Birthrates*

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Since the early 21st century, birthrates in the United States have been steadily declining. This paper uses data from the American Economic Association to investigate the decline in birthrates in the US and to explore potential factors behind this phenomenon. Based on the exploration of the data, there is strong evidence that the differences in women's social values between generational groups are key players behind the decline of US birthrates since 2007. The results of this study are significant, as a country's birthrate is indicative its economic development, social dynamics and policy development.

1 Introduction

The birthrate is the average annual number of live births during a year per 1,000 individuals in the population at midyear (The World Factbook 2021). The National Center for Health Statistics (NCHS) gathers data on birthrates for women by different demographic factors such as age group, ethnic identity and education level. These information are compiled and made available through the National Vital Statistics System (National Center for Health Statistics 2024). Researchers are interested in a country's birthrate as it is a indicative of an economy's health and it is useful for population predictions. A declining birthrate tends to result in a smaller workforce and an aging population, which puts economic pressure on younger generations and on government spending (Pettinger 2021). Hence, in order to predict and reduce these consequences, many previous literature explore factors behind declining birthrates in the US such as cost of living, access to contraceptives and environmental concerns (Nargund 2009).

In this paper I am interested in the generational gaps behind the declining birthrates in the US. Using data from the the article "The Puzzle of Falling US Birthrates since the Great Recession"

*Code and data supporting this analysis are available at: https://github.com/DeniseChang9/US_declining_birth_rates.git

(Kearney, Levine, and Pardue 2022), I explore the differences in birthrates between different age cohorts for women from 1980 to 2019 for more insights on the influence of generational value gaps. I find that, although all age cohorts witness a decline in birthrates, younger age cohorts of mothers present a sharper decrease in birthrates than older age cohort.

The remainder of this paper is structured into 3 distinct sections. Section 2 discusses the data collection and the studied variables. Section 3 presents the results and finding of the exploration of the dataset with the help of visualized data. Section 4 explores further insights from the results and discusses a few weaknesses of this paper. This section also briefly mention potential next steps following this paper.

2 Data

2.1 Data Collection

The dataset used in this paper is obtained from the replication package of “The Puzzle of Falling US Birthrates since the Great Recession” (Kearney, Levine, and Pardue 2022) published in the Journal of Economic Perspectives (AEA 2022). The replication package contains dataset compiled from a variety of sources including, but not limited to, the National Center for Health Statistics (NCHS), the Current Population Survey Annual Social and Economic Supplement, the Integrated Public Use Microdata Series (IPUMS) and the New York Federal Reserve/EQUIFAX and the Pew Research Center.

For this study, I am interested in the aggregated data on birthrates by age cohorts of mothers. The dataset was built by Kearney, Levine and Pardue (2022), the authors of the replication package, using data from the SEER program at NCHS and data from Vital Statistics. The built dataset captures birthrates by maternal age cohorts and organizes the mothers into 6 cohorts of 5 years from 1968 to 1997 inclusively.

The dataset used for this paper was retrieved on February 5 2024.

2.2 Variable of Interest

The data was cleaned and processed using the statistical programming language R (R Core Team 2022). Statistical libraries such as `tidyverse` (Wickham et al. 2019), `janitor` (Firke 2023), `knitr` (Xie 2021) and `here` (Müller 2020) are leveraged in the data processing as well.

2.2.1 National Birthrates

Birthrate in the US is calculated as the annual average number of live births per 1,000 individuals in the country at midyear. Births resulting in a child showing evidence of life, such as beating of the heart, pulsation of the umbilical cord and breathing, are considered live births. Live births can originate from any delivery method and from any duration of pregnancy, such that premature babies and babies delivered through Cesarean. The number of live births is measured by the number of birth certificates, which are issued shortly after delivery. Individuals who are considered in the calculation of the birthrate include US citizens and US residents. The national population is measured through a government-funded survey, which is mandatory for all citizens and residents of the US.

Table 1: First Ten Rows of the National Birthrate Data

Year	National Birthrate
1980	68.4
1981	67.3
1982	67.3
1983	65.7
1984	65.5
1985	66.3
1986	65.4
1987	65.8
1988	67.3
1989	69.2

Table 1 is a sample of the ten first rows of the national birthrate data in the US. Each column in this dataset represents a different year in chronological order from 1980 to 2019 inclusively. The “Year” column adds a sense of succession to the data, which allows readers to get more insights on the evolution of birthrates throughout time. The “National Birthrate” column is the calculated national birthrate for its respective year.

2.2.2 Maternal Age Cohort

Maternal age is documented in the US through a voluntary survey issued by each state. Since this variable is self-reported on a voluntary basis, certain mothers choose to opt out or to not disclose their age at childbirth. These cases are marked as “NA” in the dataset, and was removed from the compilation of the data. The data is organized in 6 age cohorts of 5 years.

Table 2: First Ten Rows of Birthrate by Maternal Age

Year	15-19 Years Old	20-24 Years Old	25-29 Years Old	30-34 Years Old	35-39 Years Old	40-44 Years Old
1980	53.0	115.1	112.9	61.9	19.8	3.9
1981	52.2	112.2	111.5	61.4	20.0	3.8
1982	52.4	111.6	111.0	64.1	21.2	3.9
1983	51.4	107.8	108.5	64.9	22.0	3.9
1984	50.6	106.8	108.7	67.0	22.9	3.9
1985	51.0	108.3	111.0	69.1	24.0	4.0
1986	50.2	107.4	109.8	70.1	24.4	4.1
1987	50.6	107.9	111.6	72.1	26.3	4.4
1988	53.0	110.2	114.4	74.8	28.1	4.8
1989	57.3	113.8	117.6	77.4	29.9	5.2

Table 2 shows a sample of the first 10 rows of the birthrates by maternal age cohorts. Each row in this table represents a year from 1980 to 2019 in chronological order. Similarly to Table 1, the “Year” column allows better estimations of the evolution of birthrates for each of the age cohorts. The remaining 6 columns represent the birthrates of the different age cohorts relative to the year of childbirth. A mother who gives birth twice in two different age groups is considered an additional live birth for each cohort. For this study, only the mothers aged 15 to 44 were considered.

3 Results

3.1 National Trends

Figure 1 illustrates the evolution of birthrates in the US from 1980 to 2020. From 1980 to 2020, the birthrates in the US consistently fluctuated around 65 to 70 births per 1,000 women aged between 15 to 44 years old. During this period, increases in birthrates were followed by similar decreases in the following years. Starting from 2007, birthrates have steadily declined, falling from 69.3 births in 2007 to 55.8 births in 2020, which is a 19.4% decrease. In 2011, the birthrate in the US fell to 63.4 births, which went below the previous minimum of 63.6 births in 1997 by 0.2 births. The lowest birthrate recorded was in 2020, which is the most recent year.

3.2 Trends by Age Cohorts

Figure 2 illustrates the trend in birthrates from 1980 to 2019 by maternal age groups. Every age groups present different trends and intensity of change, which are marked by significant

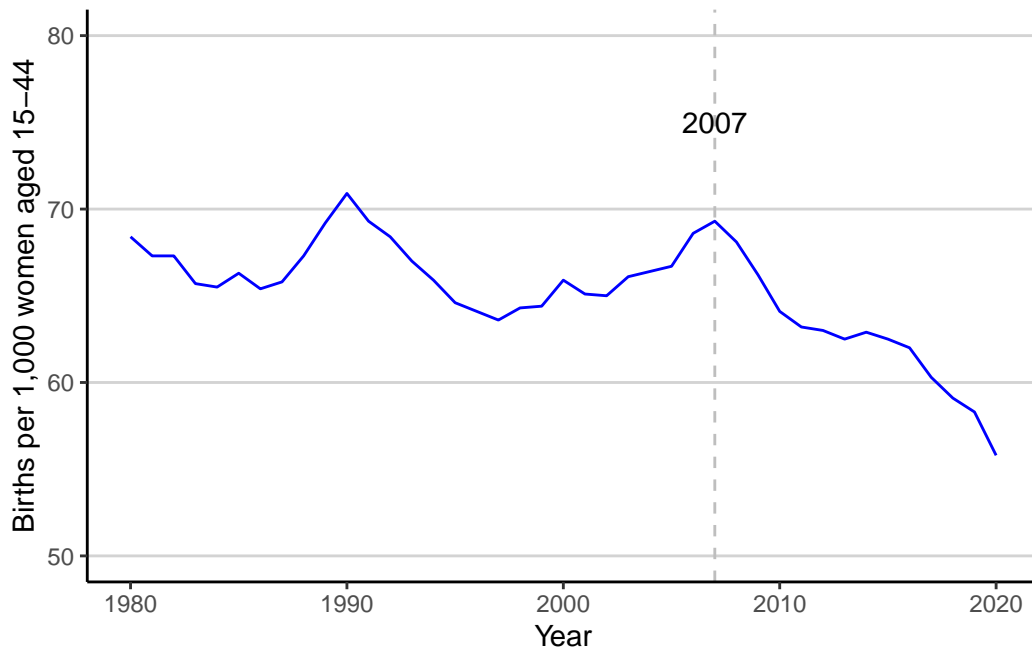


Figure 1: Birthrates in the US from 1980 to 2020

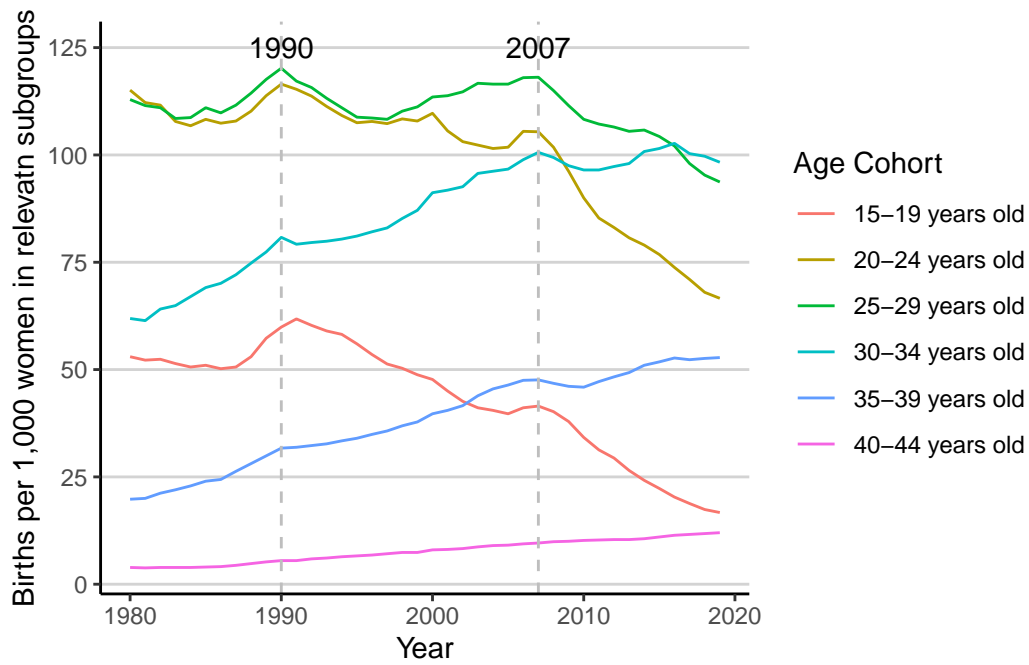


Figure 2: Birthrates in the US from 1980 to 2019 by Maternal Age Cohorts

change in the years 1990 and 2007.

The 15-19 years old groups of mothers shows the most dramatic decline in birthrate in the studied years. Since its peak birthrate in 1991 at 61.8 births per 1,000 women, this age group's birthrate fell to 41.5 births in 2007 and to 16.7 births in 2019. The birthrates decreased by 32.8% between the years 1991 and 2007, and then decreased by 59.8% between 2007 and 2019. Both of the checkpoint years resulted in a drastic decline in birthrates in subsequent years, more so after 2007, for mothers in the 15-19 age cohorts.

The 20-24 years old group of mothers shows similar trend as the 15-19 years old group, but at a higher general birthrate. In 1990, this age cohort peaked at 116.5 births per 1,000 women, and fell to 101.5 births in 2004 before dropping even lower to 66.6 births in 2019. From 1990 to 2007, birthrates for this age group decreased by 12.9%, and then decreased by another 34.4% between 2007 and 2019. The birthrate for the 20-24 years old group was already in slight decline since 1990, and experienced a more pronounced decline in 2004 to 2019.

The 25-29 years old group of mothers presents a decrease in birthrate mainly after 2007. In 1990, the birthrate of the age group was at 120.2 births per 1,000 women. The birthrate decreased by 1.7% in 2007 to a birthrate of 118.1 births. Finally, the birthrate decreased by another 20.7% in 2019 to 93.7 births.

While the three younger age groups each present different decreasing evolution trends marked by the years 1990 and 2007, the three older maternal age cohorts (30-34 years old, 35-39 years old and 40-44 years old) shows steady increasing birthrate trends. The data from 1980 to 2020, though at distinct general birthrates, shows that the older age groups has consistent increases in numbers of birth per 1,000 women per year.

4 Discussion

4.1 Interesting Point 1

4.2 Interesting Point 2

4.3 Interesting Point 3

4.4 (Maybe) Interesting Point 4

4.5 Weakness

A weakness in this paper is that not all mothers who gave birth in the studied years are represented evenly. In the gathering of the dataset, the NCHS randomly sampled each states for their birth certificate count to determine the birthrate per state. In other words, certain states have as much as 100 percent of their population sampled, while other states only have

about 50 percent of their population sampled. Having a few states over-represented than others can bias the results since women from different home states can adopt different social, cultural and religious values. + we can talk about the non-hospitable births such as home births and births from societies like XYZ. no birth certificate hence not counted in the study. ## Future Directions explore in depth the influence of geographical influence in birthrate. from the OG study the south west seems to present the highest decline in birthrate compared to other states. south west states are also baptist, maybe look into religious values, and level of religious to see if there's an influence there!

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