The cost of giving birth: examining the underlying causes to the falling US birth rate*

Replication of 'The Puzzle of Falling US Birth Rates since the Great Recession'

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Abstract

Women in the US experienced an unstable birth rates decline from 68.4% in 1980 to 55.8% in 2020. We replicated some of the data plots in the original paper (Kearney, Melissa S., et al). Then we tried to analyze the data and conclude some of the factors that could fluctuate the US birth rate. By dividing the women in the US into groups (such as age, race and ethnicity, and marital status), we may suspect the reason for the declining birth rate. Hopefully, we can address the root cause of the continuous declining birth rate. https://doi.org/10.48152/ssrp-dzf4-ae39

1 Introduction

Study shows that the economy is determining the birth rate. Due to the 'Great Recession, the US birth rates peaked in 2007, then kept declining after 2008' (Kearney and Pardue 2022). Firstly, we could conclude how the economy is related to the birth rate and how the income decline prevents women from giving birth. Before giving birth to a baby, many factors must be considered, such as the cost of living, unemployment rate, and policies, etc.

The birth rates of different demographic groups can give us information about how the recession affects other groups of women. By comparing the overall US birth rate changes to the changes in the birth rate in different demographic groups, we may find some of the critical factors hidden behind the overall economics/fertility environment.

The remainder of this paper is: Section 2 contains replications of tables and figures from the original paper, Section 3 explains our data, Section 4 displays our results, and Section 5 contains discussions about our findings, weaknesses, and next steps.

*Code and data are available at: https://github.com/UofT-STA304-Paper2/US_birth_rates_folder.

2 Replications

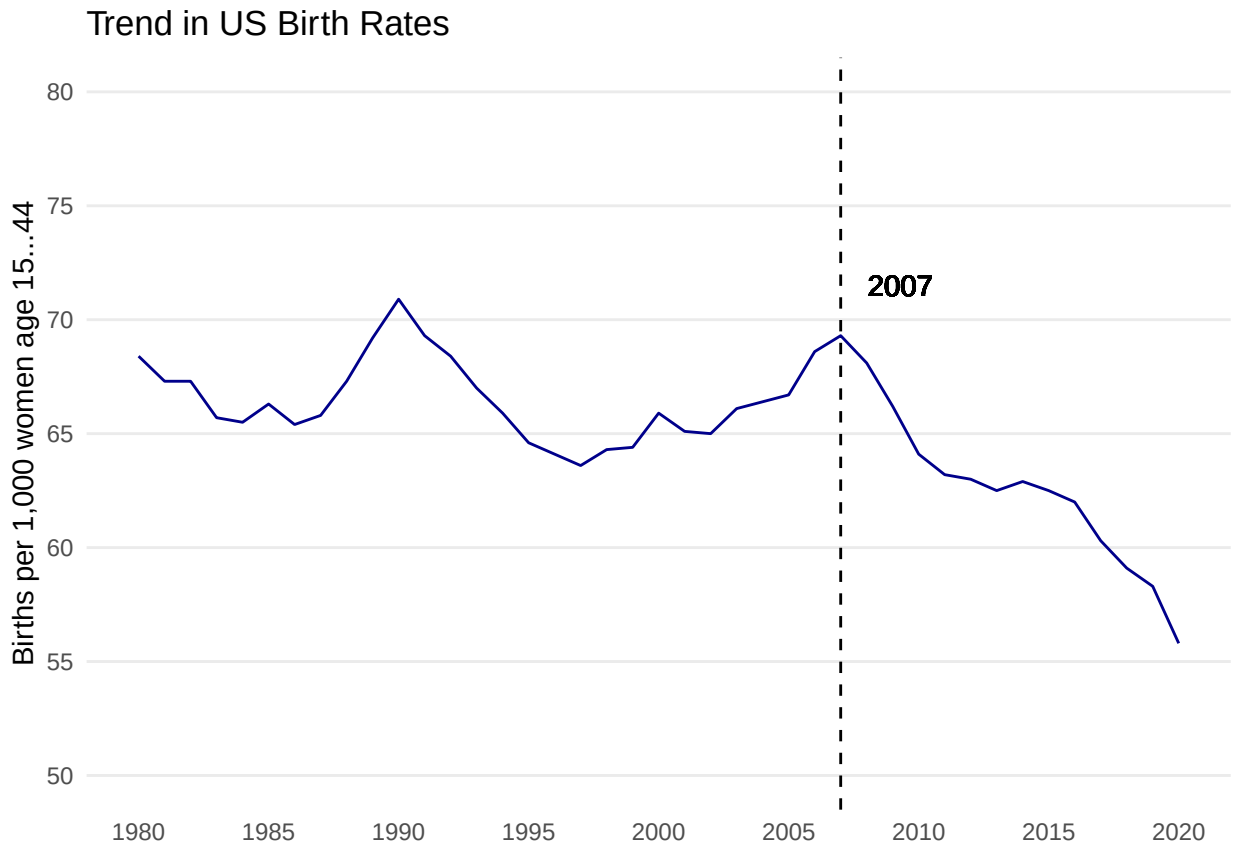

Figure 1: *Source:* Birth Rates collected from CDC Vital Statistics Births Reports for 2015, 2019 and 2020. See Data Appendix for additional details.

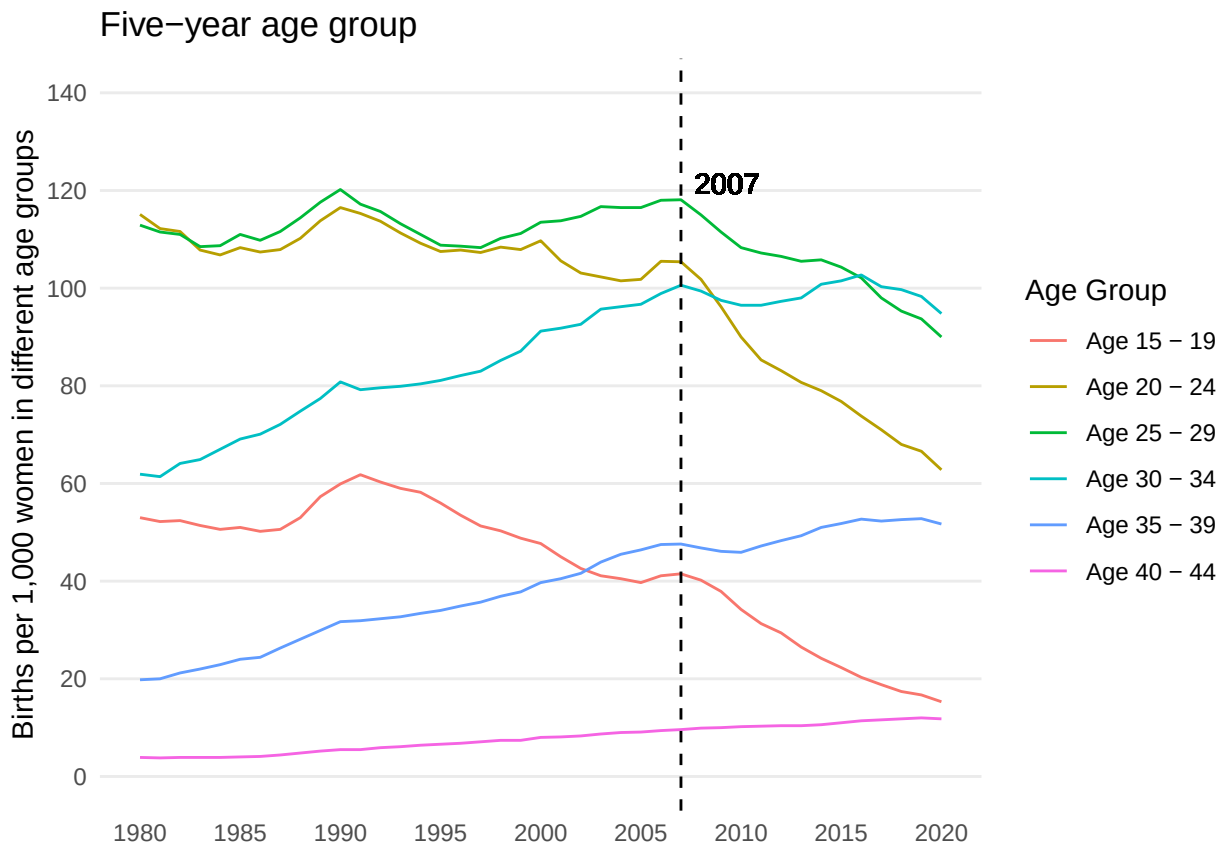

Figure 2: *Note*: Birth rates by age group are gathered from CDC Vital Statistics Births Reports. The Data Appendix provides detailed information on the specific data source.

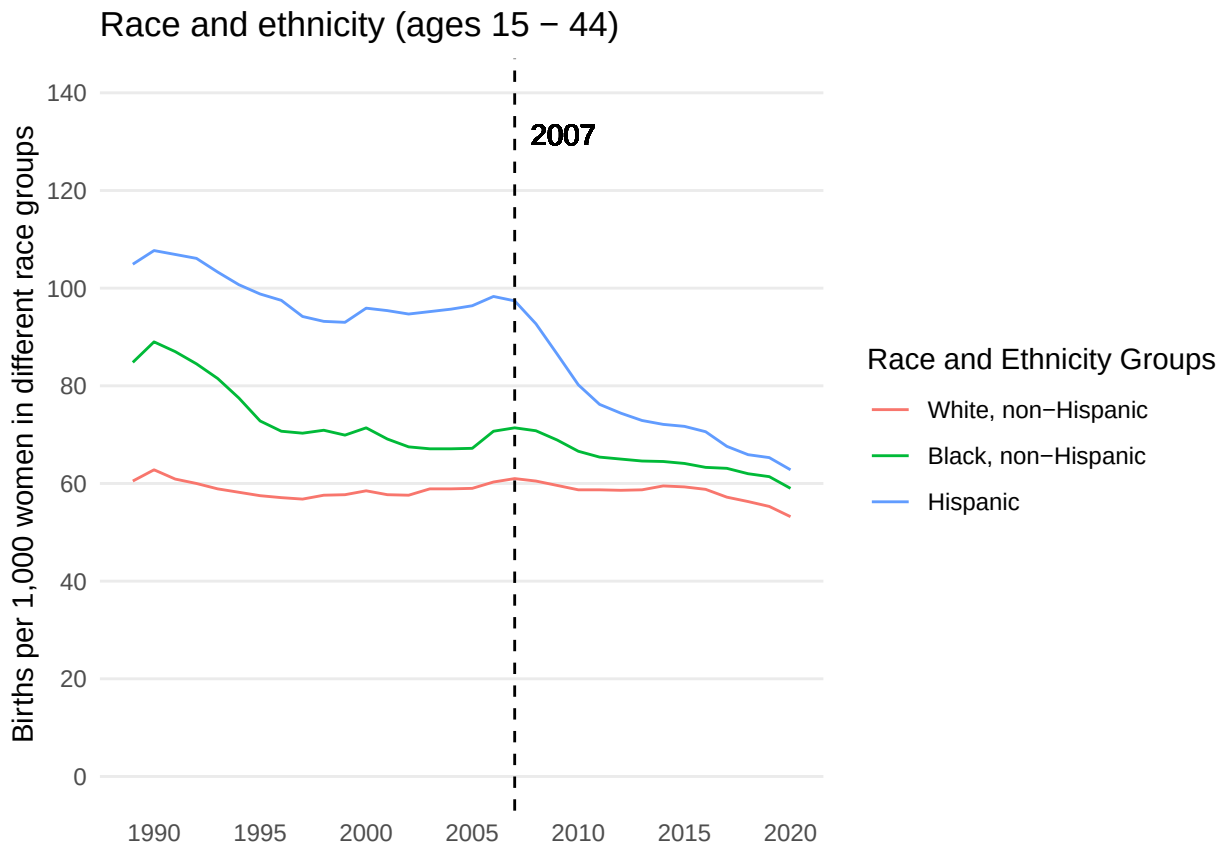

Figure 3: *Note*: Birth rates by race and ethnicity are gathered from CDC Vital Statistics Births Reports. The Data Appendix provides detailed information on the specific data source.

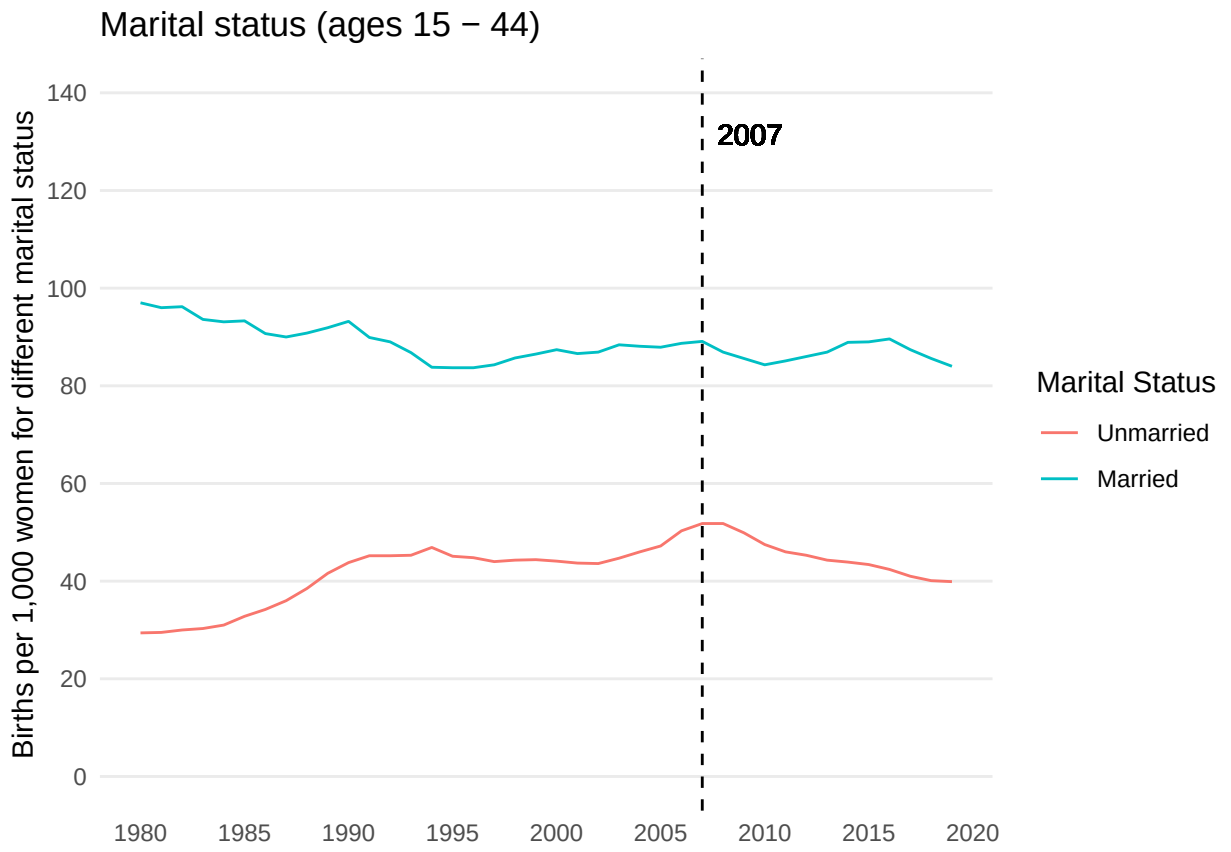

Figure 4: *Note*: Birth rates by marital status are gathered from CDC Vital Statistics Births Reports. The Data Appendix provides detailed information on the specific data source.

3 Data

In this paper, we used R (R Core Team 2020), the tidyverse package (Wickham et al. 2019), the ggplot2 package (Wickham 2016), and the knitr package (Xie 2021) to analyze the data and make plots and tables.

3.1 Data Collection & Intervention:

The data was downloaded from the website OPENICPSR (Kearney and Pardue 2022), which is a public repository. It can be freely accessed. The data was collected by considering the possible suspects behind the falling birth rates (Kearney and Pardue 2022). Specifically, the demographic groups include age, education, race and ethnicity, marital status, and birth parity (Kearney and Pardue 2022). The original article records the dramatic decline in birth rates in the US between the year 2007 and 2020 (Kearney and Pardue 2022). It also analyzes the possible causing factors for such trend.

The data for Figure1 is collected from CDC Vital Statistics Births Reports for 2015, 2019 and 2020 (Kearney and Pardue 2022). We treated the data of the universe of US births from the Vital Statistics system as the intervention. In this way, we can analyze the birth rate trends in the United States from 1980 through 2020. Figure 1 shows a steady and dramatic decline of US Birth Rates since 2007 (Kearney and Pardue 2022). Then, we divide them into different demographic groups and evaluate the effects of each group on the total decline in the birth rate. The data for Figure 2 contains Birth rates by age group, race and ethnicity, and marital status, and is collected from CDC Vital Statistics Births Reports (Kearney and Pardue 2022). The author used the NCHS Vital Statistics birth microdata, SEER population data, and the Current Population Survey to calculate the Birth rates by Hispanic subpopulation, mother's age and education, as well as by parity (Kearney, Melissa S., et al). To be specific, Figure 2 shows the line plot of birth rates for six different age groups, which are age 15-19, age 20-24, age 25-29, age 30-34, age 35-39, and age 40-44 separately. Figure 3 is a line plot showing the birth rates by race and ethnicity. It includes "Hispanic," "Black, non-Hispanic" and "White, non-Hispanic," and it observes that the "Hispanics" experienced the most dramatic declines in birth rates (Kearney and Pardue 2022). Moreover, Figure 4 displays the Marital status of mothers between ages 15 and 44. Specifically, there is a decreasing trend for the birth rates of married women and an increasing trend for unmarried women between the year 1980 and the early 1990s (Kearney and Pardue 2022). However, both birth rates have not trended very differently since 2007 (Kearney and Pardue 2022). Furthermore, the plot reveals that the decline in births is driven more by a reduction in initial childbearing than by women not having larger families (Kearney and Pardue 2022). Moreover, it states that:" the trend lines for third and higher order births are much flatter over this period" (Kearney and Pardue 2022)

3.2 Data Overview & Data Cleaning:

The source of the data contains CDC WONDER Natality Database, CDC SEER Population Estimates, Current Population Survey (CPS) Merged Outgoing Rotation Groups, CPS Annual Social and Economic Supplement, American Community Survey, Behavioral Risk and Surveillance Survey, New York Federal Reserve Bank/EQUIFAX, and Pew Research Center (Kearney and Pardue 2022). The data-set contained the information about the dramatic decrease of birth rates in the United States between the year 2007 and 2020 (Kearney and Pardue 2022). There were 16 datasets, and the population is the American birth rates. The sample units were the birth rates in the United States between 2007 and 2020. The respondents are individual woman with their demographic groups defined by age, education, race and ethnicity, marital status, as well as birth parity. The key features of this data show that it is divided into many groups, and the detailed analysis of each group can help people to decide the types of factors that are related to the trend. We didn't do data cleaning in this project because cleaning data will reduce the entire number of rows extensively.

3.3 Graphs & Tables:

We created a table using the kable function from the knitr package (Xie 2021) to show the first 10 observations of one of the datasets we used Table 1. We then created a line graph using ggplot2 package (Wickham 2016) to get an insight on how birth rates changed for females from different races specifically after 2007. Next, we will look at the changes of birth rates for females from ages 15 to 29 after 2007.

Table 1: First 10 rows of our dataset showing birth rate per year per age group of females

year	brate_1519	brate_2024	brate_2529	brate_3034	brate_3539	brate_4044
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

3.3.1 Showing the birth rates per year per age group of females

The variable year in this table represents the years of different age groups of females. The variable brate_1519 means the birth rates of women between the ages 15 and 19 and so on. From Table 1, we observed the birth rates of different age groups of females from 1980 to 1989. For example, for the women born in the year 1980s, the birth rate is 53% when they are between 15 and 19. Also, for the women born in the year 1981s, the birth rate is 112.2% when they are between 20 and 24. This birth rate illustrates that females in this group would have one child.

3.3.2 Birth rates by race and ethnicity since the year 2007

From Figure 5, we observed a obvious decrease in birth rates for Hispanic females since the year 2007, while the birth rates for white females and black females are relatively steady. Figure 5 indicates that the major contribution to declining US birth rates after 2007 comes from the Hispanic populations, in contrary to Figure 3 which shows that before 2007 the black population also contributed greatly to the declining birth rates in the US.

3.3.3 Birth rates for females aged 15 to 29 by age groups since the year 2007

From Figure 6, we observed that females in the US aged 15-19, 20-24, and 25-29 all experienced a steady decline in birth rates since the year 2007. This is different from before 2007 where these 3 groups of females had relatively high, steady birth rates.

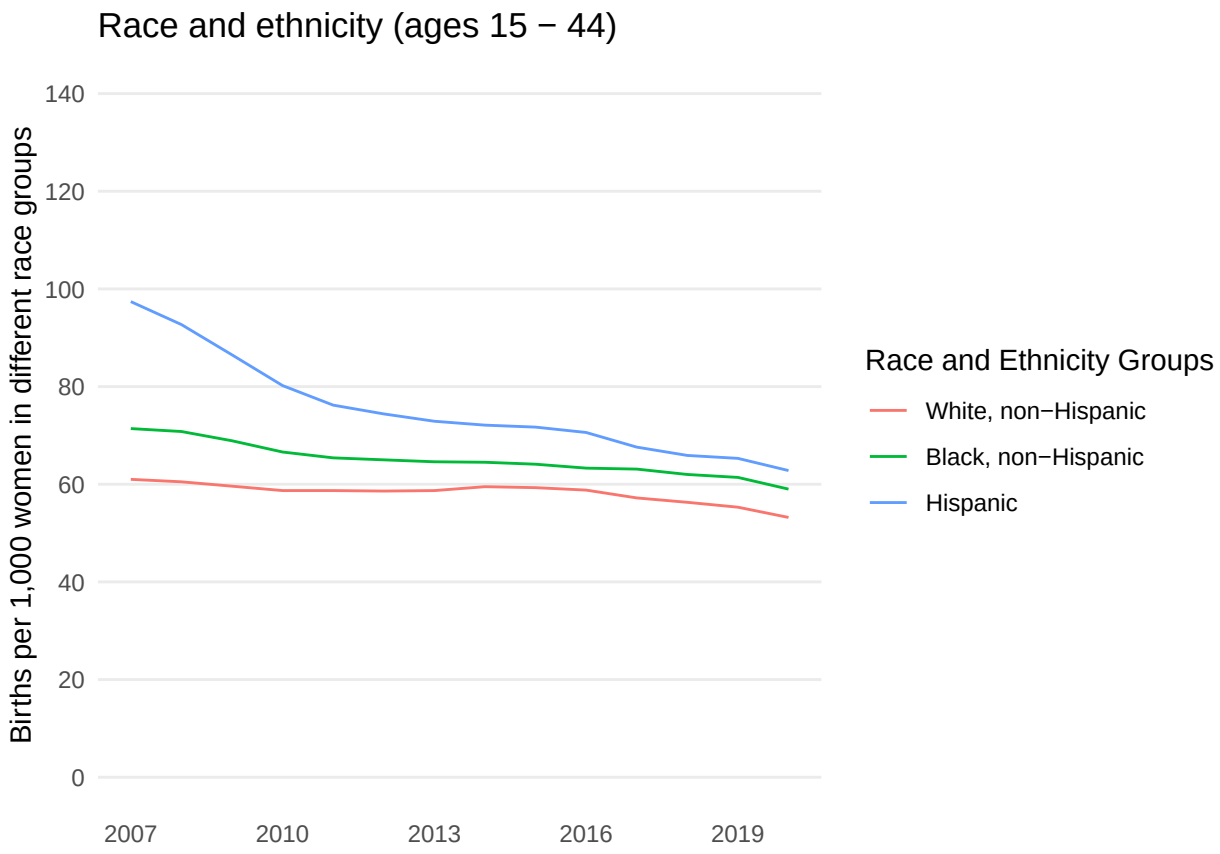

Figure 5: Birth rates by race and ethnicity since the year 2007

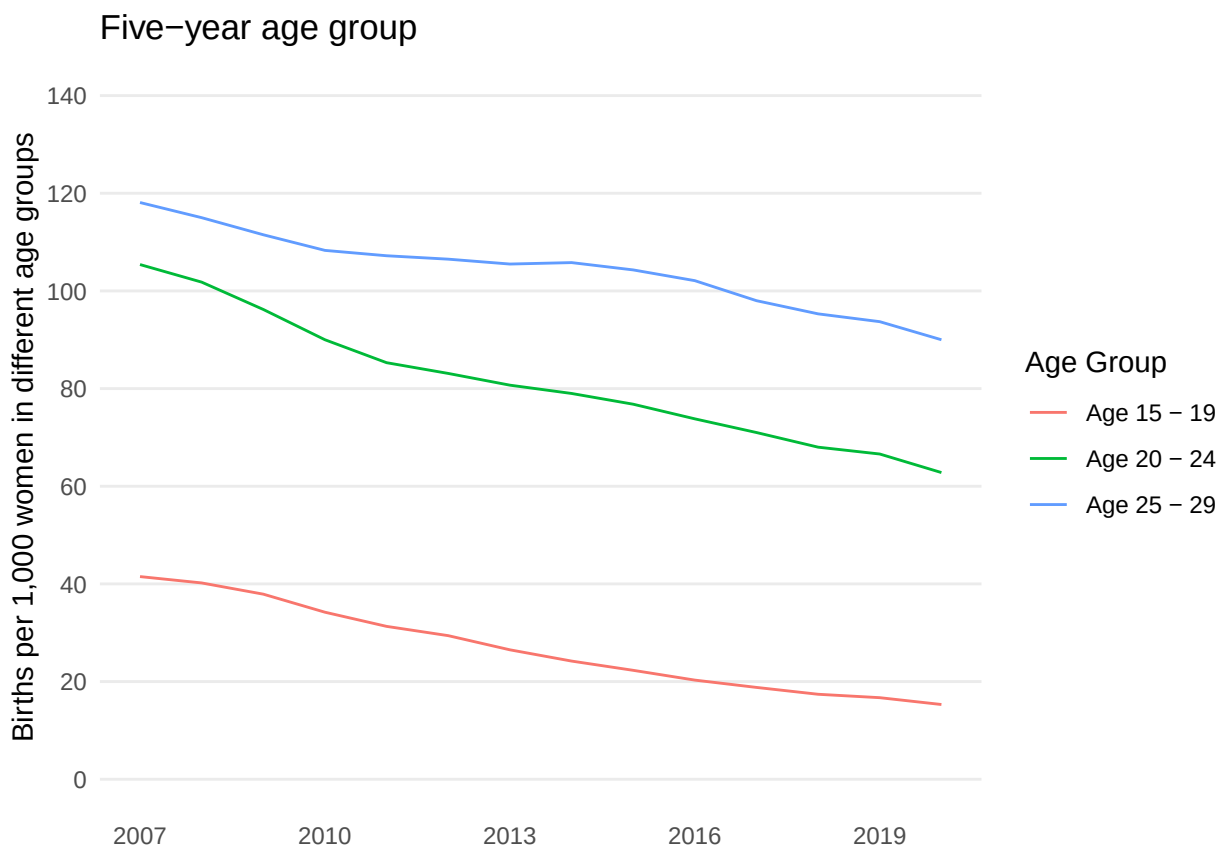

Figure 6: Birth rates for females aged 15 to 29 by age groups since the year 2007

Table 2: Summary statistics for US birth rates of different groups of females from 1980 to 2020

	mean	median	sd	min	max
brate_1519	42.792683	47.70	13.687173	15.3	61.8
brate_2024	99.414634	106.80	15.428781	62.8	116.5
brate_2529	110.058537	111.00	6.745627	90.0	120.2
brate_3034	86.541463	91.20	12.828873	61.4	102.7
brate_3539	38.563415	39.70	10.689545	19.8	52.8
brate_4044	7.760976	8.00	2.713566	3.8	12.0
brate_whitenh	58.571875	58.70	1.807910	53.2	62.8
brate_blacknh	70.284375	69.00	7.653425	59.0	89.0
brate_hisp	88.568750	94.45	14.019191	62.8	107.7

4 Results

We created a table showing the birth rates of different age groups of women in each year. It shows that younger women tend to be more affected by the Great Recession, which fell by an amount of 30-40 units (per 1000 women). However, older age groups decrease slower after 2007. Also, we made a line plot to display the pattern of birth rates based on different race and ethnicity groups, which shows that Hispanic people's birth rate fell from 97.4 in 2007 to 62.8 in 2020. The birth rate of non-Hispanic people fell by less than 5 units. Moreover, we analyzed the birth rates for females aged between 15 and 29 by age groups since the year 2007. Then, we displayed the summary statistics by Table 2.

4.1 Summary statistics

For the summary statistics, we would analyze the properties of our US birth rates data. Table 2 illustrates the the mean, median, standard deviation, minimum, and maximum birth rates for different groups of females from 1980 to 2020. Specifically, the highest mean of US birth rates is in the group of females aged from 25 to 29, which is around 110%. The lowest is in the age group between 40 to 44, and this is reasonable. The highest and lowest medians of birth rates are also in these two groups respectively.

Below is Table 2, which we created to show summary statistics of properties of our US birth rates data.

From the summary table above, we could observe the mean, median, standard deviation, minimum, and maximum birth rates for different groups of females from 1980 to 2020.

5 Discussion

5.1 First discussion point

In this paper, we replicated some of the data plots in the original paper (Kearney and Pardue 2022). Then we created some plots ad tables to analyze the data. We also concluded some of the factors that could influence the US birth rates. From this paper, we learned that since 2007, there is a dramatic decrease of US birth rates. Also, according to the graphs of Birth rates by age group, race and ethnicity and marital status, teens and women in their 20s contribute most to the main decline in birth rates. Moreover, for race and ethnicity, the most dramatic reduction in birth rates occurred in Hispanics. Furthermore, there is a slight decease of birth rates for married women and a slight increase for unmarried women. We also learned the two reasons that are possible to cause the decrease of birth rates.

5.2 Second discussion point

The first reason is called "shifting priorities." The original paper states that: "the three cohorts of women who entered their young adult years in 1992, 1997, and 2002, all had similar childbearing age profiles. Then, the cohort of women who entered young adulthood in 2007, had fewer children throughout their 20s and their 30s" (Kearney and Pardue 2022). This means that young women would possibly sweat themselves out on other important things, instead of having children. The other reason could be urbanization. Based on the website, urban residence would likely increase the costs of raising children because they are more expensive (White 2008).

5.3 Third discussion point

Furthermore, it is possible that urbanization is associated with ideological change such as beliefs and attitudes surrounding large families (White 2008). In addition, urban residents have better methods to control birth,and this allows them to act on reducing childbearing more effectively (White 2008).

5.4 Weaknesses and next steps

The weakness is that we didn't analyze the the effects of Hispanic sub-population, Mother's level of education, Parity and so on. Thus, our findings may be incomplete. The things that are left to learn include the ways to scientifically improve the urban birth rates, as well as the factors that cause the shifts of priorities.

References

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