Potential Factors of Decreasing Birth Rates in the US since the Great Recession and Beyond*

Reproduction of 'The Puzzle of Falling US Birth Rates since the Great Recession'(Kearney, Levine & Pardue, 2022)

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This paper investigates the significant decline in US birth rates between 2007 and 2020, replicating the study by Kearney, Levine, and Pardue (2022). Analyzing trends from 1980 to 2020, we explore variations in birth rates across age groups and disparities based on the race and ethnicity of mothers. While attributing the initial decline to the Great Recession, our analysis identifies unclear factors beyond this period. Furthermore, our exploration delves into socio-cultural aspects, providing an understanding of declining birth rates and contributing insights for policymakers and researchers concerned with population trends.

1 Introduction

According to the Centers for Disease Control and Prevention, the birth rate is defined as "the number of live births per 1,000 population." This rate is calculated by dividing the number of live births in a population in a year by the midyear resident population. Specifically, for census years, rates are calculated based on the unrounded census counts of the resident population as of April 1st. From an economic perspective, birth rates are an important factor that determines the growth of a country. In recent years, the low birth rate has become a conversation topic both nationwide and worldwide. Many countries are addressing this issue of declining birth rates and proposing alternative measures to compensate for the population drop. For instance, Germany's birth rate (births per 1000 people) in 2024 is 9.3, which is lower than Canada's 10.0 and the US's 12.0 (Macrotrends 2024). Germany is taking action by actively recruiting skilled workers from abroad (Grunau 2023) and reforming its citizenship law to allow dual citizenship (Knight 2024) as some measures to combat declining birth rates and overall population. Finally, the birth rate also serves as an indicator of replacement level

*Code and data are available at: https://github.com/Chay-HyunminPark/Social-Science-Study.

fertility, which in developed countries can be taken as requiring an average of 2.1 children per woman (Craig 1994). Therefore, birth rates are poised to become a key global topic in the mid to long term.

Two economists, Melissa S. Kearney and Phillip B. Levine, along with Luke Pardue, a PhD Candidate in Economics, authored a paper addressing the dramatic decline in birth rates in the United States between 2007 and 2020 and proposed possible explanations. They examined the overall reduction in the birth rate among various population groups of women, including teens, Hispanic women, and college-educated white women. While they attributed the main cause of the decline in the early part of the period to the Great Recession, they were unable to identify any other economic, policy, or social factors that have changed since 2007 to support the decline beyond the Great Recession (Kearney, Levine, and Pardue 2022). The objective of this paper is to replicate the figures and tables from the original study and to explore additional factors contributing to the declining birth rates in the US. In addition to examining the impact of the Great Recession, this paper delves into the perspectives of population subgroups, analyzing data in five-year age groups and by race and ethnicity to gain deeper insights.

This paper utilized a replication package of the original study and employed a cleaned data CSV file to reproduce the related figures and tables. This approach enabled us to draw correlations between the dataset and political, economic, and social policy measures that were not covered in the original paper. Furthermore, this paper investigates various socio-cultural aspects, including sexual education, marriage rates, financial stability among women over the age of 30, and the role of technology in healthcare.

-what was found-

First, the paper showcases the trend in US birth rates and discusses the relevant factors along with the figure. It then demonstrates trends in birth rates by population subgroup, focusing on two key areas: five-year age groups and race and ethnicity. Alongside the graphs and tables, the paper correlates various aspects including education, socio-economic factors, and finance to explain the declining birth rates.

We replicate the study by Kearney, Levine, and Pardue (2022) with a focus on the following research questions:

- What is the trend in US birth rates over the period 1980 to 2020?
- How do birth rates vary by age group?
- How do birth rates vary by the race and ethnicity of mothers?

The original code in the replication package is written in Stata. However, this paper utilizes R (R Core Team 2020) to analyze a dataset from the replication package. Packages such as ggplot2 (Wickham et al. 2016) for creating graphical representations, kableExtra (Zhu et al. 2021) for enhancing table aesthetics, and lubridate (Grolemund et al. 2021) for handling date-related operations were employed. Additionally, the Tidyverse framework (Wickham et

al. 2019) ensures cohesiveness, while Dplyr (Wickham et al. 2021) facilitates data manipulation.

2 Data

2.1 Methodology

The data concerning the trend in US Birth Rates, measured as births per 1,000 women aged 15-44 from the period 1980 to 2020, was sourced from the CDC Vital Statistics Births Reports for the years 2015, 2019, and 2020 (Martin and Mathews 2017; Martin and Driscoll 2021; Hamilton and Osterman 2021). Additionally, trends in Birth Rates by Population Subgroup, specifically birth rates categorized by age group, race, and ethnicity, were again gathered from CDC Vital Statistics Births Reports. The original paper utilized single-age population counts across all races from 1969 to 2019 and by race and Hispanic origin from 1990 to 2019, sourced from the CDC SEER database (CDC NCI 2021). The data is freely available at https://seer.cancer.gov/popdata/download.html, with raw files located in the data/pop/ folder of the original replication package.

2.2 Features

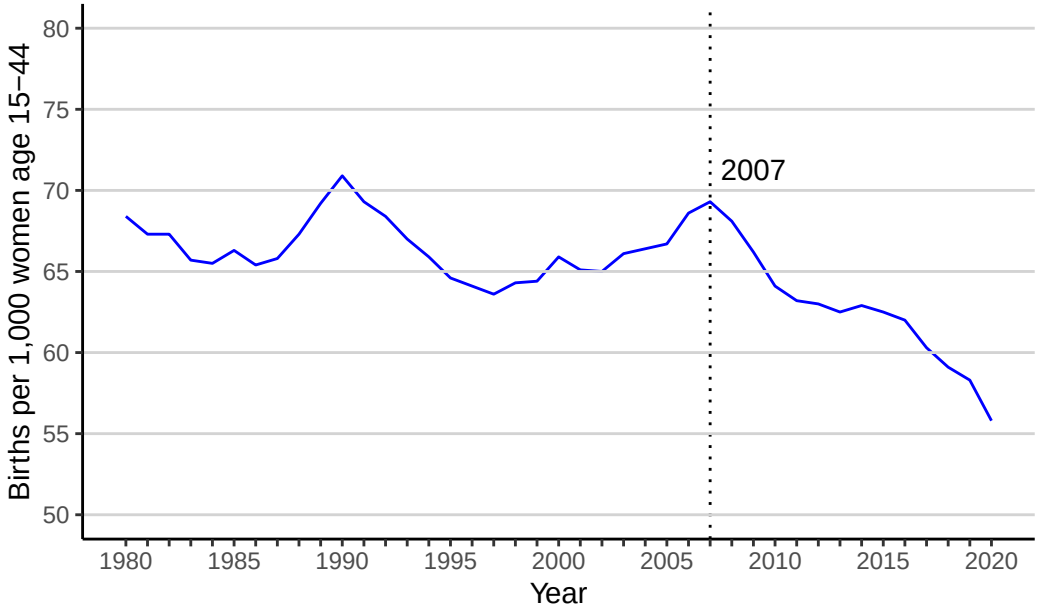
De facto population of women of reproductive age is 15 to 49 years in a country (WHO 2024). The average age of the final menstrual period (menopause) is age 51, women age in 40s, pregnancy is rare but not impossible (asrm 2012). Beginning in 1997, the birth rate for the maternal age group 45-49 includes data for mothers aged 45 and over in the numerator and is based on the population of women aged 45-49 in the denominator (National Center for Health Statistics 2023). Thus the women population in the age group 45-49 is eliminated in this paper although they fall under the reproductive age group category in a country. Birth data is comprised of births per 1,000 women age 15 to 44 over the 40 years period from 1980 to 2020. For the race and ethnicity, every white refers to non-Hispanic, caucassian population group. Every black refers to non-Hispanic, African American group. Hispanic refers to people with Hispanic ethinicity majority from south America to abberiviate.

3 Results

3.1 Trend in US Birth Rates

The overall trend fluctuates over time, with the highest number of births recorded in 1990 at a rate of 70.9. The second-highest peaks occurred in 1991 and 2007, with rates of 69.3. These peaks are accompanied by valleys. However, the difference between the birth rates in

1980 and 2020 is 12.6, and the gap between the maximum and minimum points during this period is 15.1. These calculations clearly demonstrate the variation over time and suggest that there may be factors influencing the gradual negative slope of the trend. Figure 2 presents the scatter plot version of Figure 1, providing a clearer representation of the negative trend observed in the line graph.



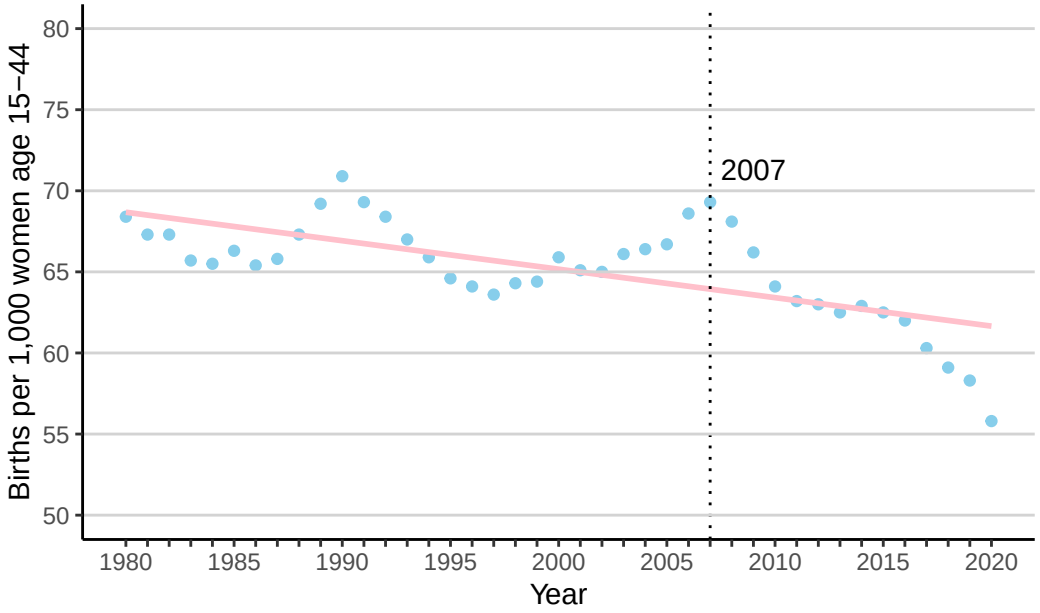
Source: Birth Rates collected from CDC Vital Statistics Births Reports for 2015, 2019, and 2020.

Figure 1: Trend in US Birth Rates

3.2 Trends in Birth Rates by Population Subgroup

Figure 2 A, abortion law applicable age ~,

Technology enhancement in medical field allows the abortion to be held more easily compared to 1980, 1990s. This change allow the young women who can afford the abortion or vice versa who can't afford giving birth to get the abortion. In the meantime, due to the advancement of technology, women at relatively old age can give the birth in their late 30s or even 40s. As well as change in child birth policy and health maintenance was eased compared to the old days in 1980s, 1990s, that promotes women at age older than 30 who are relatively financially stable have high willingness to give births, showing ascending pattern in birth rates over the 40 years.



Source: Birth Rates collected from CDC Vital Statistics Births Reports for 2015, 2019, and 2020.

Figure 2: Negative Trend in US Birth Rates

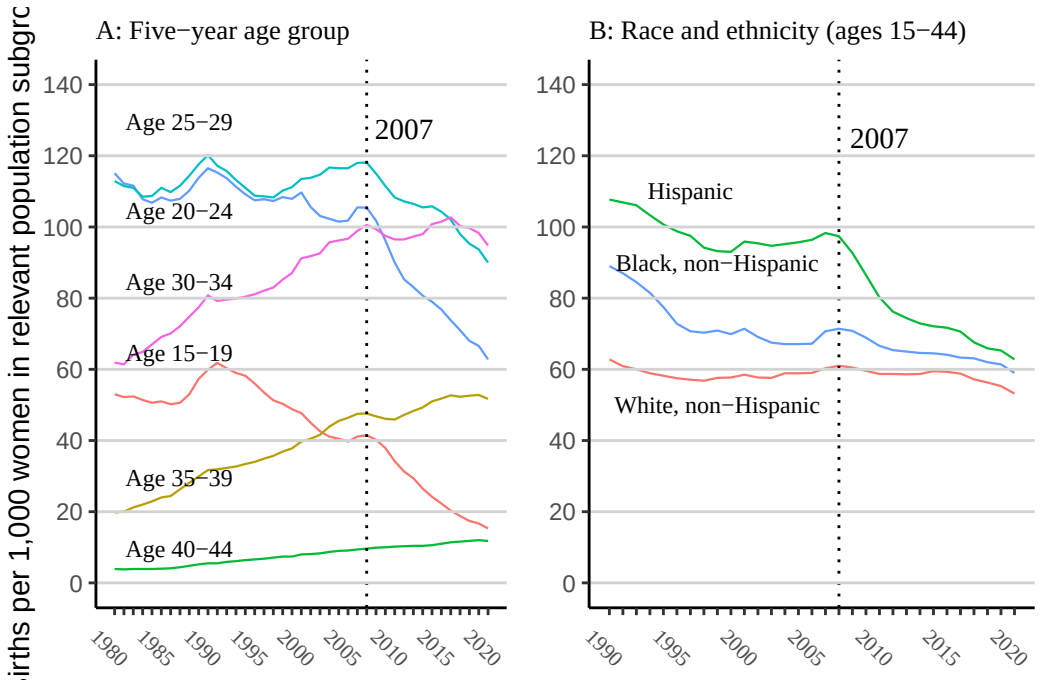


Figure 3: Trends in Birth Rates by Population Subgroup

Table 1: Trends in Birth Rates by Population Race and Ethnicity

	Births per 1,000 women		
Year	White	Black	Hispanic
1990	62.8	89.0	107.7
1991	60.9	87.0	106.9
1992	60.0	84.5	106.1
1993	58.9	81.5	103.3
1994	58.2	77.5	100.7
1995	57.5	72.8	98.8
1996	57.1	70.7	97.5
1997	56.8	70.3	94.2
1998	57.6	70.9	93.2
1999	57.7	69.9	93.0
2000	58.5	71.4	95.9
2001	57.7	69.1	95.4
2002	57.6	67.5	94.7
2003	58.9	67.1	95.2
2004	58.9	67.1	95.7
2005	59.0	67.2	96.4
2006	60.3	70.7	98.3
2007	61.0	71.4	97.4
2008	60.5	70.8	92.7
2009	59.6	68.9	86.5
2010	58.7	66.6	80.2
2011	58.7	65.4	76.2
2012	58.6	65.0	74.4
2013	58.7	64.6	72.9
2014	59.5	64.5	72.1
2015	59.3	64.1	71.7
2016	58.8	63.3	70.6
2017	57.2	63.1	67.6
2018	56.3	62.0	65.9
2019	55.3	61.4	65.3
2020	53.2	59.0	62.8

Figure 3 B, major religion of Hispanic, Black, White religious reason of each race and ethnicity.

Here we are dissecting the cultural and religious difference between the races among the population subgroup. Hispanic, majority catholic, White, christian, catholic, etc Black, christian, catholic, etc

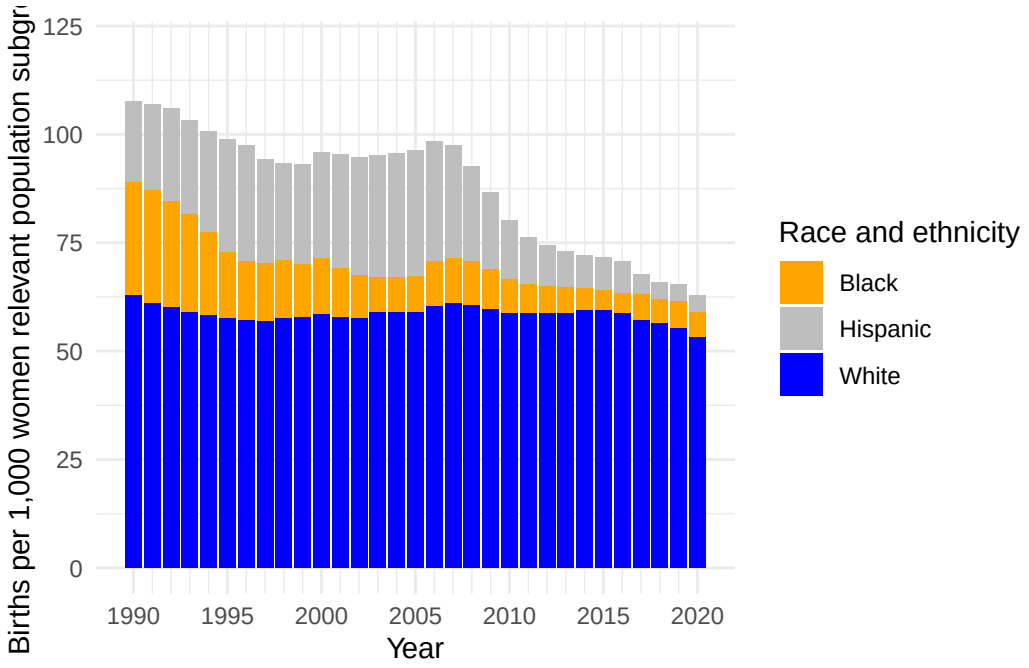


Figure 4: Trends in Birth Rates by Population Race and Ethnicity

It is prevailed that certain religion does not allow the abortion, saying that it disobey the words of God or whatever.

-whether they accept the abortion or not, cultural perspectives, whether marriage affects the decision of keeping a child or not.<- financial reason

Might include Map or not depending on the sources and references I find, see how long it'll gonna be.

4 Discussion

Figure 1 Trend in US Birth Rates, not just the Great Recession was there another events? abortion law, law enforcement dates, economic crisis other than great recession

4.1 Findings

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

4.2 Ethical Implication

4.3 Accounting for bias

4.4 Limitation

Beginning in 1997, the birth rate for the maternal age group 45-49 includes data for mothers aged 45 and over in the numerator and is based on the population of women aged 45-49 in the denominator (National Center for Health Statistics 2023). However as the dataset is missing for the population of women aged 45-49 before 1997 and the paper counts the data from the period 1980 to 2020, the women population in the age group 45-49 is eliminated.

As mentioned in the original paper, the population subgroup can be diverged as they mix over the time. It is hard to sort out the race completely once they start to mixing it up. Therefore, over the time, we don't know the population subgroup Hispanic, Black, White are purely Hispanic, Black, White throughout the period.

Therefore, the data might be skewed due to aforementioned reasons.

4.5 Future Research

It might be interesting to expand the research worldwide, not just limiting ourselves into the US data. It is broadly known that Chinese and Indian population are growing exponentially while the birth rate in other developed countries continue to grow small. It might be interesting to research more what's behind.

References

American Society for Reproductive Medicine. 2012. "Reproductive Aging in Women." 2012. https://www.reproductivefacts.org/news-and-publications/fact-sheets-and-infographics/reproductive-aging-in-women/.

Best Countries. 2023. "U.S. News Best Countries - Canada." https://www.usnews.com.

Centers for Disease Control and Prevention (CDC). 2024. "National Center for Health Statistics (NCHS) - Sources and Definitions for Birth Rate, Death Rate, and Infant Mortality Rate." United States: National Center for Health Statistics. 2024. https://www.cdc.gov/nchs/hus/sources-definitions/rate.htm.

Deutsche Welle. 2024a. "DW - Changes to Germany's Skilled Immigration Rules Take Effect." Germany: Deutsche Welle. 2024. https://www.dw.com/en/changes-to-germanys-skilled-immigration-rules-take-effect/a-67458940#:~:text=The%20reworked%20Skilled%20Immigration%20Act,effect%20starting%20November%2018%2C%202023.

———. 2024b. "DW - Germany Reforms Citizenship Law." Germany: Deutsche Welle. 2024. https://www.dw.com/en/germany-reforms-citizenship-law/a-63987066.

Friendly, Michael, Chris Dalzell, Martin Monkman, and Dennis Murphy. 2020. *Lahman: Sean "Lahman" Baseball Database*. https://CRAN.R-project.org/package=Lahman.

Gebru, Timnit, Jamie Morgenstern, Briana Vecchione, Jennifer Wortman Vaughan, Hanna Wallach, Hal Daumé Iii, and Kate Crawford. 2021. "Datasheets for Datasets." *Communications of the ACM* 64 (12): 86–92.

Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. *Rstanarm: Bayesian Applied Regression Modeling via Stan*. https://mc-stan.org/rstanarm/.

Grolemund, Garrett, and Hadley Wickham. 2021. *Lubridate: Make Dealing with Dates a Little Easier*. https://CRAN.R-project.org/package=lubridate.

Horst, Allison Marie, Alison Presmanes Hill, and Kristen B Gorman. 2020. *Palmerpenguins: Palmer Archipelago (Antarctica) Penguin Data*. https://doi.org/10.5281/zenodo.3960218.

Kearney, Melissa S., Phillip B. Levine, and Luke Pardue. 2022. "The Puzzle of Falling US Birth Rates Since the Great Recession." *Journal of Economic Perspectives* 36 (1): 151–76. https://doi.org/10.1257/jep.36.1.151.

MacroTrends. 2024. "MacroTrends - Germany Birth Rate." United States: MacroTrends. 2024. https://www.macrotrends.net/countries/DEU/germany/birth-rate#:~:text=The%20current%20birth%20rate%20for,a%200.09%25%20decline%20from%202021.

R Core Team. 2022. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Statista Research Department. 2021. "Crime in Canada - Statistics & Facts." Statista. https://www.statista.com/topics/2814/crime-in-canada/#dossierKeyfigures.

Toronto Police Services. 2023. "TPS Crime Statistics - Victims of Crime." https://data.torontopolice.on.ca/datasets/TorontoPS::victims-of-crime-asr-vc-tbl-001/about. https://data.torontopolice.on.ca/.

United Nations. 1994. "PubMed - Replacement Migration and Replacement Fertility." *Population Bulletin of the United Nations* 38 (39): 25–48. https://pubmed.ncbi.nlm.nih.gov/78

34459/#:~:text=When%20a%20country%20reaches%20replacement,and%20migration%20has%20no%20effect.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. https://CRAN.R-project.org/package=ggplot2.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2021. *Dplyr: A Grammar of Data Manipulation*. https://CRAN.R-project.org/package=dplyr.

World Health Organization. 2024. "Women of Reproductive Age (15-49 Years) Population (Thousands)." 2024. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/women-of-reproductive-age-(15-49-years)-population-(thousands)#:~:text=Definition%3A.

Xie, Yihui. 2014. "Knitr: A Comprehensive Tool for Reproducible Research in r." In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman & Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595.

Zhu, Hao. 2021. *KableExtra: Construct Complex Table with 'Kable' and Pipe Syntax*. https://CRAN.R-project.org/package=kableExtra.