

# My title\*

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## Abstract

This paper is based on Kearney's paper The Puzzle of Falling US Birth Rates since the Great Recession Between 1980.<sup>1</sup> (Kearney, Levine, and Pardue 2022) During the Great Recession, US birth rate varied between a tight range of roughly 65 to 70 birth per 1000 women between the age of 15 to 44. However, after the Great Recession, the birth rate started to decline significantly, it dropped by nearly 20 percent in 13 years. In this paper, we will expand our research on multiple countries and find out whether the level of impact from recession would be correlated with the changes in the birth rate for different countries. We will also treat the rise in the LGBT community as a potential cause for the decline in birth rate and examine its effect

## 1 Introduction

The Great Recession has been a world-wide crisis that reconstructed the economy, and was deep, synchronous and global. Canadian GDP dropped by 3.3 percent, US GDP by close to 4 percent, that of the Euro area by 5 percent and that of Japan by more than 8 percent. The impact on international trade has been severe that all G20 countries experienced serious reductions in trade(Michael Hart 2010). Apart from economic impact, the great recession also had a negative impact on country's birth rate, Figure 1 shows the US birth rate from 1980 - 2020, as we can see, the birth rate declined significantly after 2007, which is the time of the Great Recession.

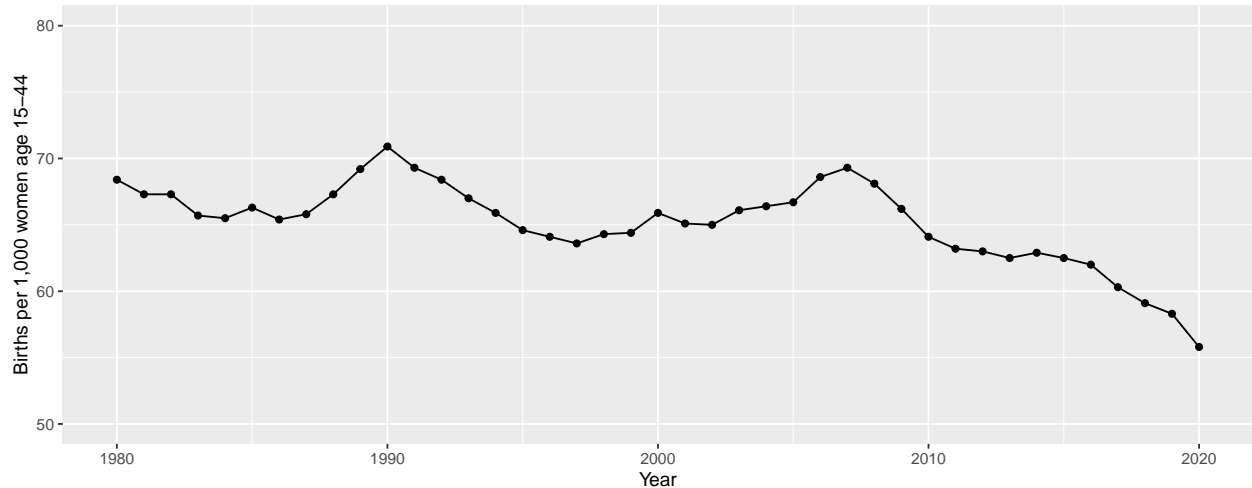


Figure 1: US Birth Rate in the past 40 years

\*Replication available at <https://doi.org/10.48152/ssrp-mbxx-jm47>. Code and data available at <https://github.com/cuilantao/Investigation-of-falling-US-Birth-Rates-since-the-great-recession>

<sup>1</sup>Original paper available at: <https://www.aeaweb.org/articles?id=10.1257/app.2.2.95>

In the United States, unemployment rates, mortgage foreclosures, and poverty rates rose while housing values fell, but the extent of these changes varied widely across local areas. Another impact from depressed economic condition is delayed childbearing, and others to hasten it. The fertility rate declined at the national level, dropping from a recent high in 2007 of 69.5 births per 1,000 women aged 15 to 44, to 63.2 for 2012.1 There was, however, great variation by state, age, and ethnicity, with younger and Hispanic women showing disproportionate decreases(Christine Percheski 2017). The significant consequence on fertility rate would make us wonder how severe is America being affected by the great recession. However, by comparing currency devaluations, equity market declines, and rising sovereign bond spreads, the U.S. is the third least affected country(URI DADUSH 2009).

Prior research suggests that stress may be linked to riskier sexual activity. Financial hardship and poverty can negatively affect cognitive function, and shorten the time horizons over which individuals make cost-benefit determinations. Alternatively, fertility may be unaffected by economic conditions if cultural norms related to the context and timing of births are particularly influential. For example, non-marital births are more socially consequential for some racial and ethnic groups, and in some geographic areas. For some individuals, these social norms may outweigh any economic considerations(Christine Percheski 2017). The same consideration of religious belief could also be applied to other countries.

As mentioned by Kearney, Levine, and Pardue (2022), the basic approach to many economic problem is maximizing utility. This approach recognized that children bring people utility but also with associated costs including time and money. This approach to modeling the decision to have a child leads to standard predictions of price and income effects. Direct consideration of costs could be like housing and medical care. Other times the price effect is indirect, like the opportunity cost of a woman's time. Holding prices and quality constant, an increase in income will lead people to choose to have more children. This positive relationship between income and births may come as a surprise to some readers, given the negative relationship between birth rates and income or per capita GDP observed over time and place(Kearney, Levine, and Pardue 2022). However, this is enough for us to consider whether the birth rates are world-wide affected in the same negative direction after the Great Recession.

Another thing that might have affected the fertility rate is the rise of the LGBT community, the LGBT activity started at the 1920s and had huge progress after 2000s. A lot of laws that prohibited homosexual relationship were lifted and homosexual couples can get married legally and adopt kids, there are also propaganda that encourages homosexuality.

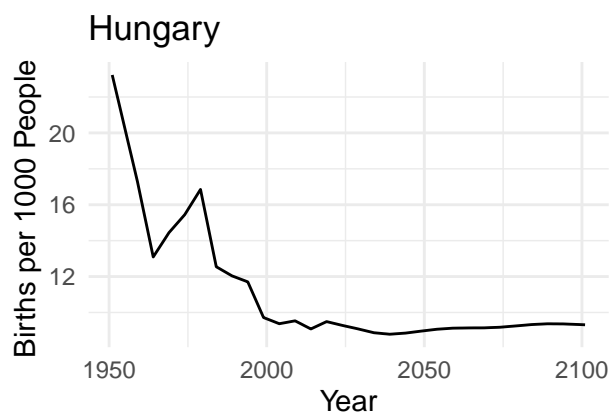
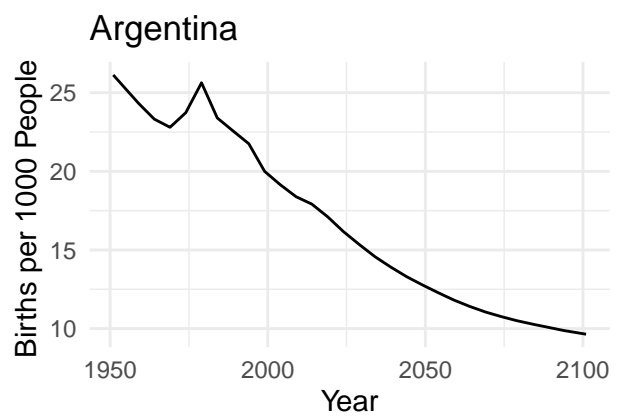
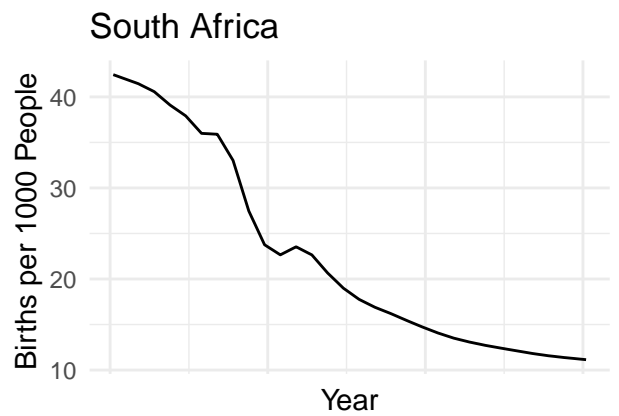
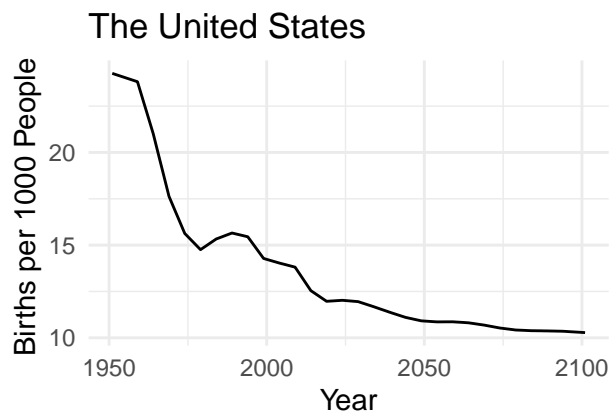
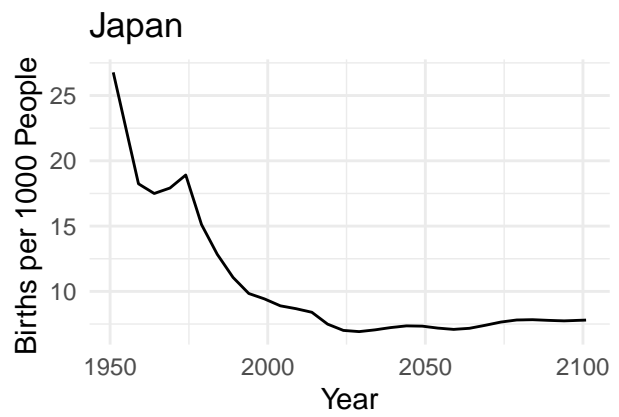
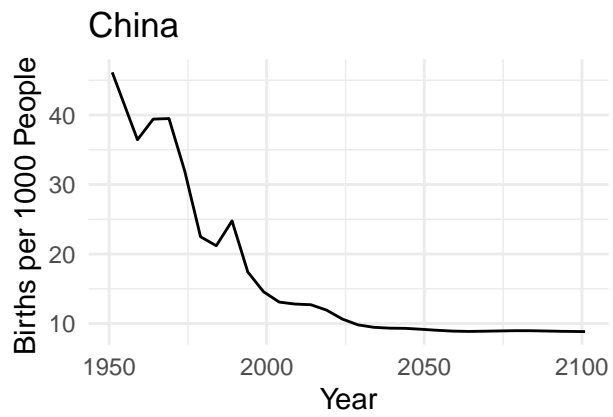
In this paper, we will investigate the effect of the Great Recession on the birth rate in different countries, and we will also explore the effect of LGBT movement on birth rate.

## 2 Data

We started our analysis by using R (R Core Team 2020), dplyr(Wickham et al. 2021), tidyverse(Wickham et al. 2019). Graphs are generated using ggpubr(Kassambara 2020) and ggplot2(Wickham 2016).

### 2.1 Data Source

We generated data from U.S. Birth Rate 1950-2022(Trends 2022). We selected top 3 countries that are affected most and least by the Great Recession according to rankings determined by comparing currency devaluations, equity market declines, and rising sovereign bond spreads These measures tend to track developments in the real economy during times of economic crisis when financial strain handicaps consumption, investment, and in many cases government spending, which limits GDP and employment growth(URI DADUSH 2009).



### 3 Model

### 4 Results

### 5 Discussion

#### 5.1 First discussion point

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#### 5.2 Second discussion point

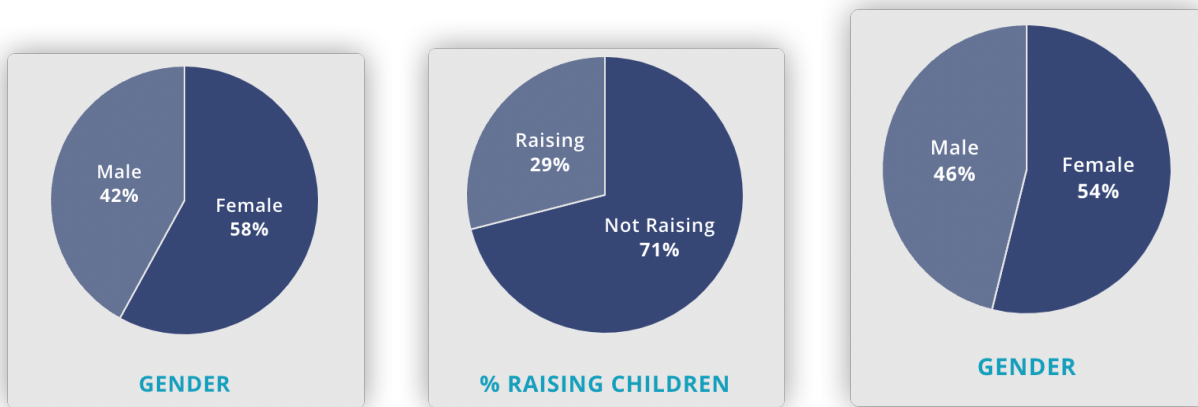
#### 5.3 LGBT Section

The percentage of LGBT (and many other gender identities) population has risen in recent years in the US, probably related to propaganda and political correctness.

Since there is not much data for other genders, and LGBT are the majorities, we will focus on LGBT population and the potential effect they bring to birth rate.

LGBT is the acronym of the following 4 gender identities, **L** for Lesbian, **G** for gay, **B** for bisexual, **T** for transgender. By definition, these genders should have a much lower birth rate than that of the heterosexual as normal births of human must depend on a male and a female. Figure 2 (b) shows the percentage of LGBT population that raise children. 71% of the LGBT population don't raise children. Then changes in birth rate and changes in LGBT population should have a negative proportional relationship (i.e. Growth in LGBT population leads to lower birth rate). Thus, the population changes in these population are very likely to make an impact on the birth rate of the US.

If we assume the simplest scenario where we ignore race, gender distribution (equal percentage of male and female) and all other factors, and assume that no LGBT or same-sex-couple population give birth to a child, then there would be a perfect correlation (perfectly proportional) between LGBT population change and birth rate (i.e. an  $x\%$  increase in LGBT population could lead to an  $x\%$  decrease in birth rate). Let's define  $\phi = \frac{\Delta \text{BirthRate}}{\Delta \text{LGBTPopulation}}$  and call  $\phi$  the BirthRate-LGBT coefficient for convenience. Basically, lower BirthRate-LGBT coefficient means lower birth rate while holding LGBT population constant. If we take other factors into account, the impact to birth rate could be even larger (i.e.  $\phi < -1$ ).



(a) LGBT Gender Distribution

(b) LGBT Percentage Raising Children

(c) Same Sex Couple Gender Distribution

Figure 2: Gender Distribution and Percentage Raising Children Distribution

Figure 2 shows the gender distribution of LGBT and Same Sex Couple as well as the percentage raising children. Figure 2 (a) and Figure 2 (c) clearly shows that more females are non-heterosexual than male are. This could cause a lower BirthRate-LGBT coefficient on birth rate as only females are able to give births (in normal situations).

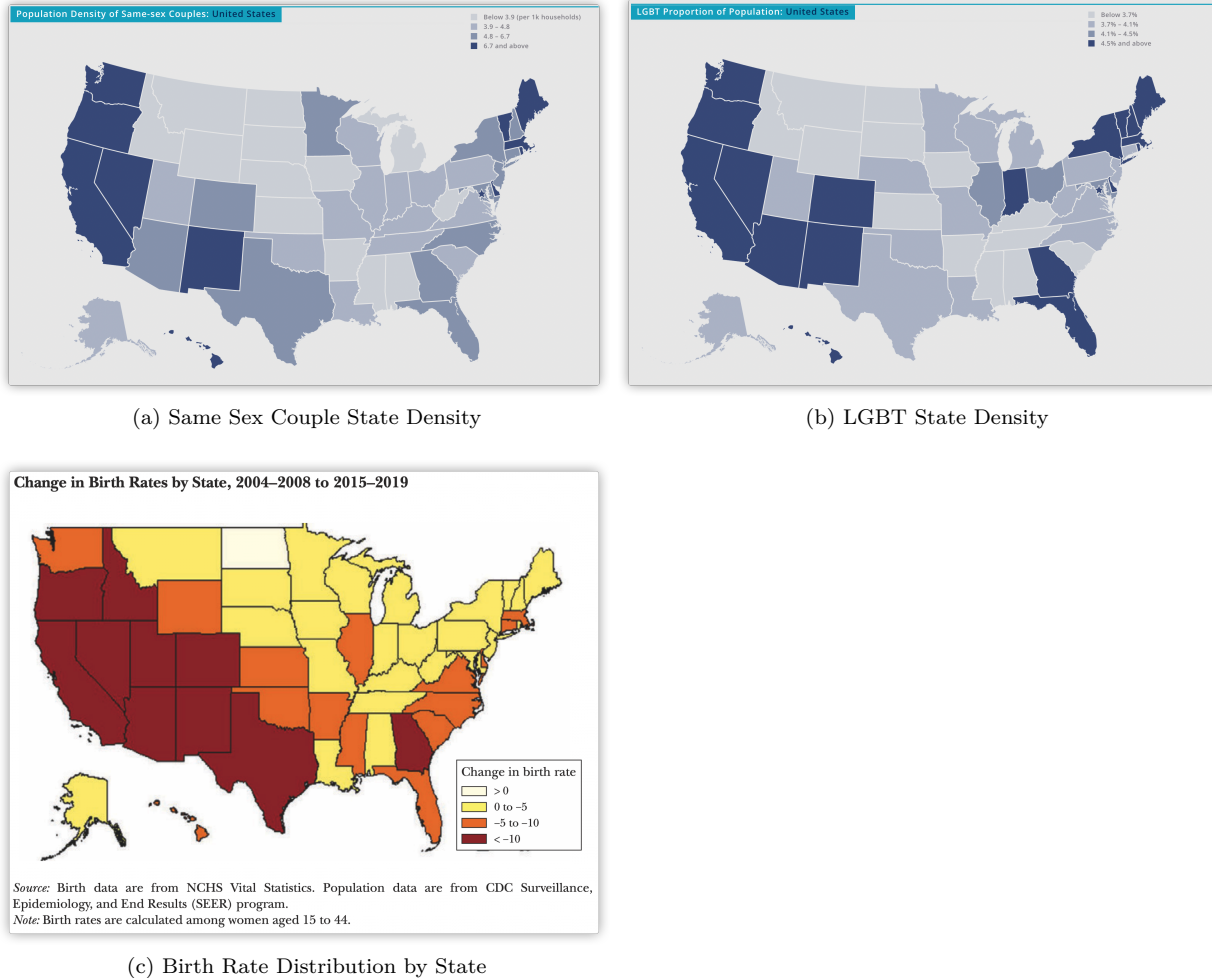
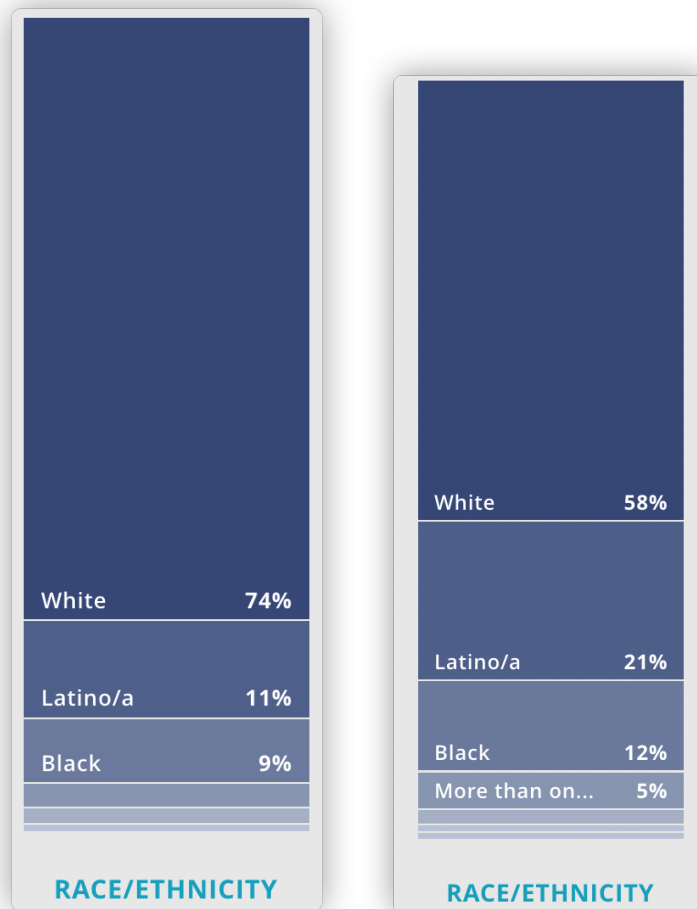


Figure 3: Density by State

Figure 3 (a) and Figure 3 (b) shows the population density of Same Sex Couple and LGBT by States in the US. Figure 3 (Kearney, Levine, and Pardue 2022) (c) shows the birth rate distribution by State in the US. Darker color means higher density or larger negative change in birth rate. From these plots we can see that the states with higher LGBT density and same sex couples generally have larger negative change in birth rate. States on the west generally have darker color in all three plots. We cannot conclude whether LGBT population has a large or direct impact on US birth rate based on these plots yet, but there should be some correlation between birth rate and gender identity of Americans.

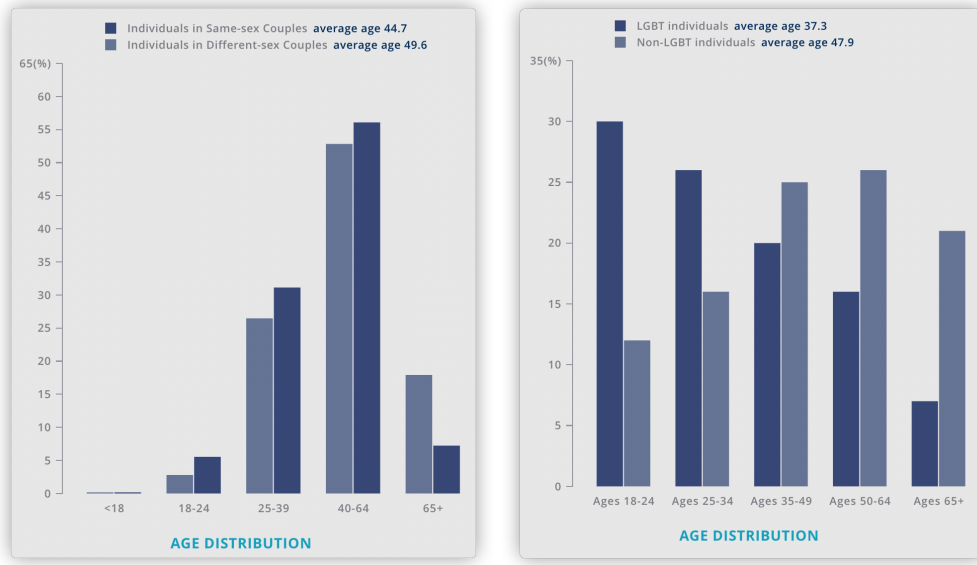
From 4 we can see that White population takes up the majority of the population of LGBT and Same Sex Couple. White is also the majority of the population of the US. Thus, larger LGBT population could lead to a even larger decrease in birth rate ( $\phi < -1$ , lower BirthRate-LGBT coefficient).

From 5 (a) we can see that most same sex couples fall in the age group 25-64. This period overlaps with the majority of the childbearing age. From 5 (b), we can see that LGBT population decreases as age increases starting from the age or 18, which is the beginning of women's childbearing age. Around 90% of the LGBT



(a) Same Sex Couple Race Distribution      (b) LGBT Race Distribution

Figure 4: Race Distribution



(a) Same Sex Couple Race Distribution

(b) LGBT Race Distribution

Figure 5: LGBT and Same Sex Couple Age Distribution

population have their age between 18 and 64, which covers almost all of the child bearing ages. These 2 evidences also indicate that, growth of LGBT population could lead to a larger decrease in birth rate ( $\phi < -1$ , lower BirthRate-LGBT coefficient).

With these information, we can conclude that the growth of LGBT population is able to cause a negative change in birth rate.

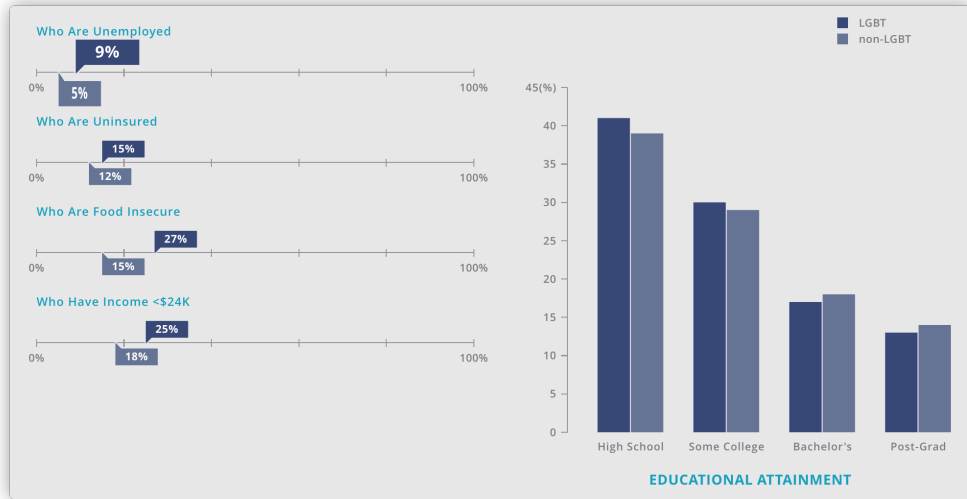


Figure 6: Socioeconomic Indicators

Figure 6 shows some Socioeconomic Indicators classified by sexual orientation (LGBT or not), such as employment status, income level education level, and whether or not being insured and food insecure. Darker color represents LGBT, lighter color represents non-LGBT. From the plots, we can extract some socioeconomic indicators of LGBT. Comparing to non-LGBT population, LGBT are more likely to be unemployed, uninsured, being food insecure, having a low income (lower then \$24k), and having a lower education level (percentage

of LGBT population with Bachelor's or post-grad degree is lower than that of the percentage of non-LGBT population).



## Appendix

### A Additional details

## References

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