CGT 370: Final Project Report

Chance Alexander, Edith Mauro, Pablo Moore

Abstract

The American sex education system is very inconsistent across state lines. In some states, sex education is not a requirement for students. This information is very troubling to read about because a lack of knowledge about healthy sexual behaviors could lead to an increased risk in teen pregnancy [1]. Our project is focused on finding a correlation or relationship between teen birth rates and the type of education in the United States. We aim to answer the questions: "why are birth rates higher in some states compared to others?", "what states have the highest and lowest birth rates?", and "how has the average birth rate in America changed overtime?" Our hypothesis is that states that either don't mandate sex education or have an abstinence-stressed based curriculum will have a higher average birth rate. In order to find a correlation, we created interactive visualizations using data from the Centers for Disease Controls and Prevention and the Guttmacher Institute. Different levels of interactivity and drill-down functionality will be available for users, and data will be displayed in a tooltip for readability. We want to create something that allows users to cross-analyze the data shown in a storytelling-based website.

Introduction

Sex is a taboo topic in many cultures. In America, less than half of the states mandate sex education according to the Centers for Disease Control and Prevention [2]. States that offer sex education have different curriculums: abstinence-stressed, abstinence-covered, and not covering abstinence. The focus of our project is to see if there is a relationship between the type of education and education requirement and teen birth rates in America. In order to find a correlation birth rate data from the Centers for Disease Controls and Prevention and sex education data from the Guttmacher Institute will be used to create interactive visualizations. To describe in detail what the project should look like, a map will be created through a JSON file downloaded from the Internet, and then we plan to use Javascript to add map interactivity. We will color-code the map accordingly to the data values that we wish to present, with a legend showing the range of values. Along with this, we want to have hover functionality with a tooltip showing the data values for that region, as well as click functionality to show specific data for each county within that state. Bar charts will also be used to display the highest and lowest ranked states for birth rates, and an area chart will be used to show time-varying data. We feel this is a strong plan to more effectively visualize differences between regions, as well as how the state data within each region compare to each other.

Literature Review

The focus of the article, *Why is the Teen Birth Rate in the United States So High and Why Does It Matter?*, is to inform the audience on the reality of the high teen pregnancy rate in America compared to other countries in the world. This article also aims to find trends in the data about teen birth rates for different states and other countries. In the article is a data table showing an international comparison of birth rates in a single bar graph, which shows that the United States has the highest birth rate (in 2009) of 37.9. In addition, the article also highlights contraceptive use across states (or lack of use). This article is related to our project because it deals with the topic of finding out why teen pregnancy occurs most in the United States. We can use our findings from our project to help back up reasons for high birth rates. This

article also justifies the importance of our research. It discusses the common negative effects on the children of the teenage mothers. [3]

The article, *Adolescent Pregnancy in America: Causes and Responses*, focuses on a similar topic to the previous article. It is centered on the causes of teen (adolescent) pregnancy, and the responses to those causes. Unlike the previous article, this one is focussed only on the psychology of the youth culture and behaviors. In other words, the factors of influence for teen pregnancy. This includes family structure, specific age of the young adults, future expectations for those adolescents, and any history of sexual abuse. The article also highlights the consequences of getting pregnant at a young age which includes having more limited job opportunities if the mother was forced to leave school and poverty. In order to combat these results, the article states that education about sex should be clearly defined in order to teach teens about safe practices. This article relates to our project because the solutions the article offers is similar to our hypothesis about this topic. The relevant part of our hypothesis is that not mandating sex education might contribute to high teen birth rates. It really encourages education in general, not just in a school setting. Programs for teens should be implemented in order for the teens to gain valuable information about a taboo topic. [4]

Abstinence and abstinence-only education: A review of U.S. policies and programs is a review on the effectiveness of Abstinence-based educational methods. It discusses how abstinence-only sex education has a negative effect on adolescent sexual behaviors. This includes an increase in the spread of STIs, a greater risk of getting the HIV infection, and harmful psychological and social effects. The article also goes over an interesting study that is centered on the effectiveness of abstinence. "Among 28 studies of comprehensive programs evaluated in the Kirby review, nine were able to delay initiation of sexual intercourse, 18 showed no impact, and one hastened initiation of sex" [5]. This article is very relevant to our project in that it clearly expresses information on the ineffectiveness of abstinence stressed education. This information validates our hypothesis that having an abstinence centered education curriculum does not help in the reduction of teen birth rates. This type of education prevents people having knowledge about what could go wrong with sex, which would be easily prevented with a proper education.[5]

The goal of the article, *Abstinence-Only and Comprehensive Sex Education and the Initiation of Sexual Activity and Teen Pregnancy*, is to inform its audience about the role sex education plays in America in terms of teen birth and the spread of sexually transmitted diseases.

> The role that sex education plays in the initiation of sexual activity and risk of teen pregnancy and sexually transmitted disease (STD) is controversial in the United States. Despite several systematic reviews, few epidemiologic evaluations of the effectiveness of these programs on a population level have been conducted. [1]

The main conclusion from this article is that there is a correlation between abstinence stressed education (or no education) and higher teen birth rates compared to those who had an extensive sex education. Abstinence-only education teaches that sex should not happen until marriage and stresses the 'ineffectiveness' of birth control. This article, like the previous one, is related to our project because it backs up our hypothesis about the ineffectiveness of abstinence-stressed education. A proper education on topics such as sexually transmitted diseases and contraception should be covered in order for young adults to not develop unhealthy behaviors. No matter what education the teenager will experience, teenagers will still have sex. This is why it is important to teach them about sex in order to promote healthy behaviors.

Other Work Case Study

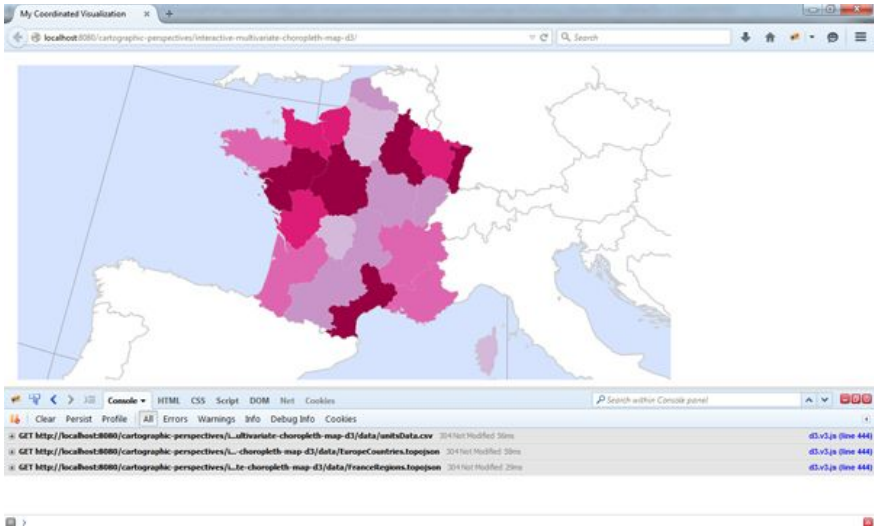

Figure 1: Interactive and multivariate choropleth map using D3 [6]

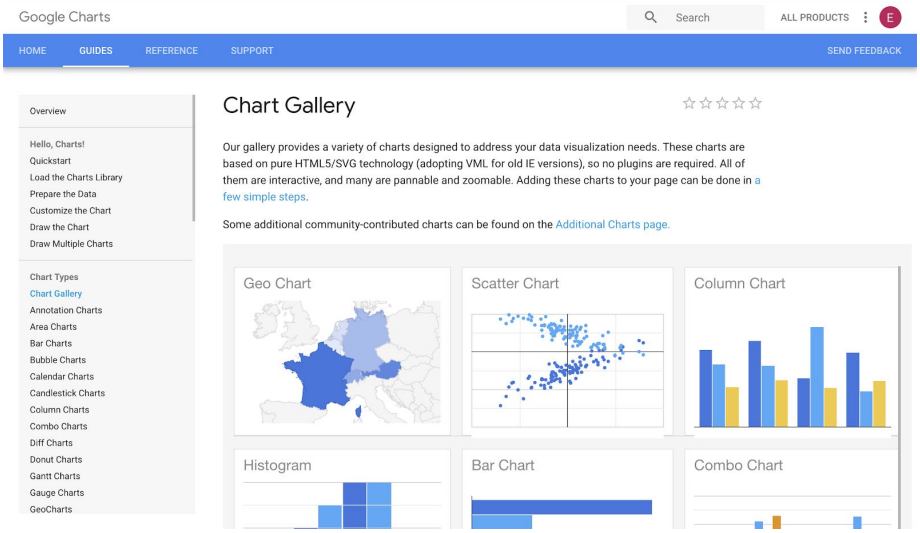

Figure 2: Google Charts Website: Chart Gallery [7]

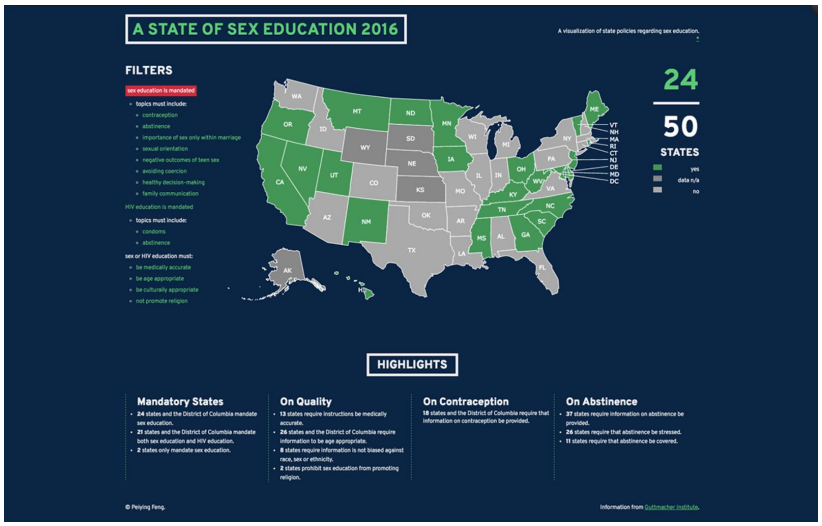

Figure 3: Visualization of State Policies Regarding Sex Education [8]

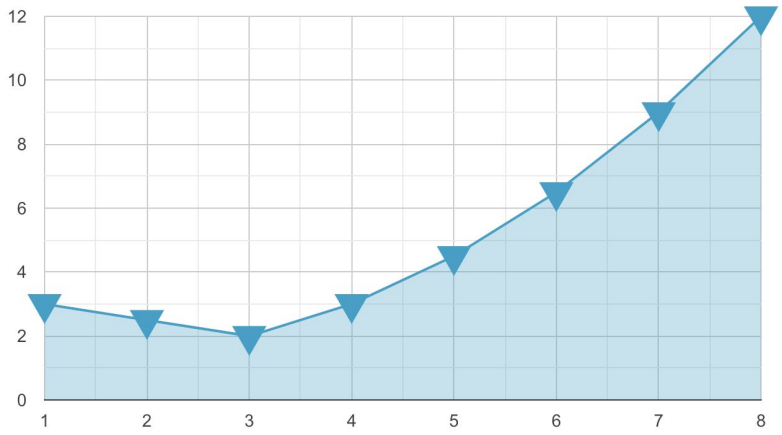

Figure 4: Customizing Charts with Rotating Points [9]

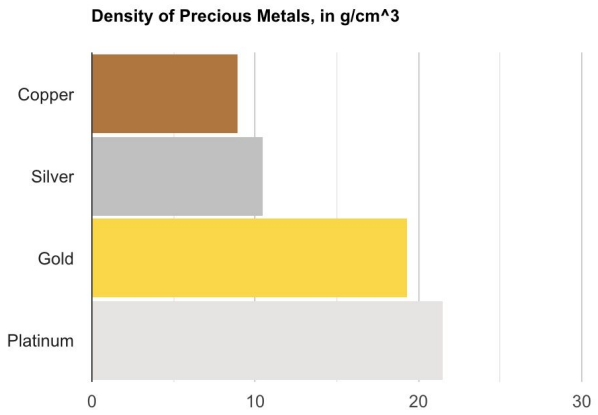

Figure 5: Customizing Bars on a Bar Graph Using Color [10]

Design

When we first came up with our project idea, there were a few features we wanted to include. First, we knew we wanted to look at teen birth rates in the United States by county and by state. We also wanted to look at how this data changed over time, analyzing whether it increased or decreased, when it do so, and to what extent. At the time, we did not have a secondary dataset in mind, but we knew we wanted to include another dataset to analyze the relationship. For the map visualization we had in mind, we wanted to color each state according to a data value (similar to previous assignments). Some of these elements are represented by a group member's Assignment 4 [Figure 6].

Features we originally wanted to include: [Figure 7]

- Slider that changes year (map corresponds)
- Image overlay that changes in scale depending on the magnitude of the data
- Color coded regions
- Top 3 statistics about data per region
- Data on sex education
- Color of state indicates whether sex education is required or not
- Area graph that shows change in average birth rate from 2003-2015

From the midterm proposal, we decided to abandon the idea of using United States regions. This proved to be difficult as we would require a .json file for the United States divided up by region. We also decided to abandon the idea of an image overlay that would scale in relation to the magnitude of a data value. We mainly scrapped this idea in the interest of time and prioritizing other features. We decided to keep the idea of a color coded map of teen birth rate data. This is our core project idea, meaning we definitely planned on keeping it. We also decided to keep the bar chart of the 3-5 states with the highest birth rates. This is because we wanted to have supplementary visualizations that would encourage the use of another dataset aside from our main dataset (teen birth rates). We decided this would be an excellent opportunity to analyze relationships between the teen birth rate and other secondary variables.

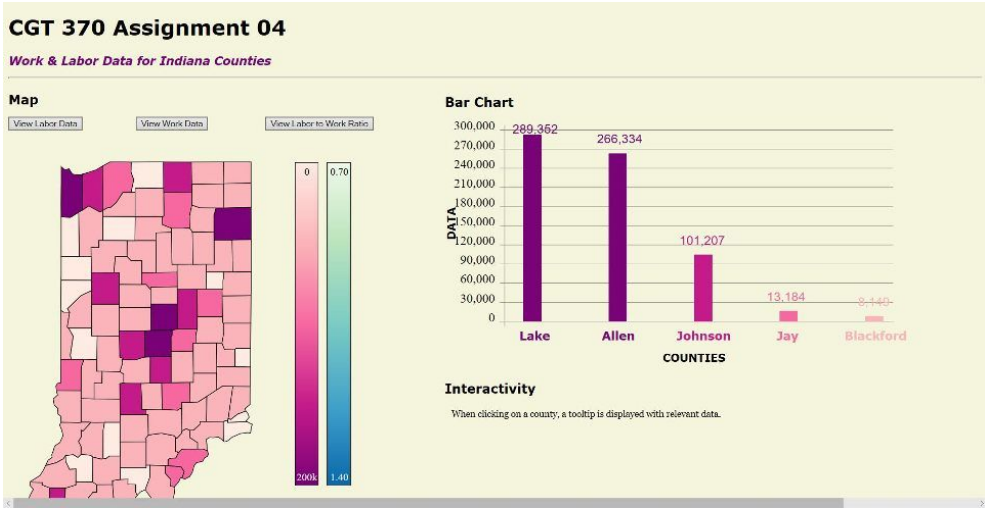

Figure 6: Assignment 4

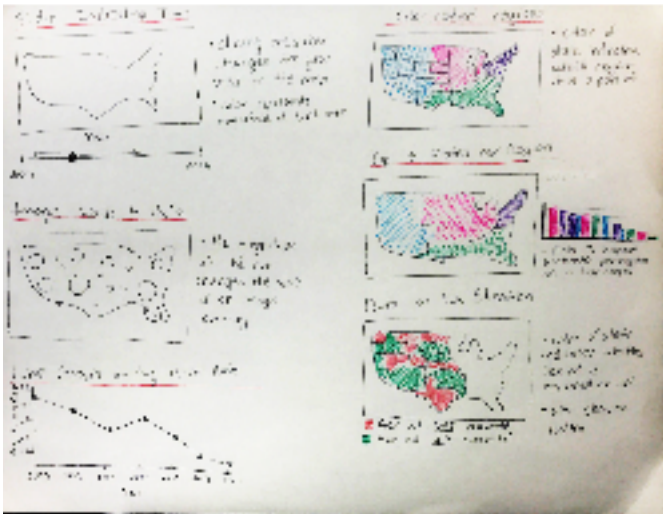

Figure 7: Original Project Midterm Sketches

Methods

Using d3.js and the Google Charts API we were able to create interactive visualizations to be used to draw insights on our project topic. We used d3.js to create two map visualizations of the United States and the counties of the states. Using a JSON file, the maps were able to be displayed with borderlines. The colors of the map visualizations correspond to a CSV file about the teen birth rates, abstinence, and if sex education is mandated. The Google Charts API was used to create both an area and bar chart. The area chart corresponds to time-varying data from a CSV file about the teen birth rates. The length of the bar charts correspond to the data about teen birth rates in the CSV file while the color corresponds to either the type of sex education curriculum or if sex education is mandated.

Final Work

Our final work is a story telling website that seeks to analyze the relationships between the United States teen birth rate and other seemingly related variables (whether sex education and abstinence are mandated). We accomplished this with a series of four visualizations and dividing these into three sections: geographical trends, historical trends, and variable correlation. We also included an Authors page so that visitors can learn more about us and a Contact page where a visitor can ask questions or make comments directly to us.

The first section of our work attempts to analyze any geographical trends that may be present. We accomplished this by creating a map visualization using d3 that displays two maps: a US map and a series of individual state/county maps for all fifty states. When landing on the main page, the user can click on one of three buttons to display a map of the US. The button that the user clicks determines what data will be shown in the map (eg. clicking on the Sex Education button will color the US map with sex education data.) When hovering over any state, that state's color changes and a tooltip appears, showing the respective data. When clicking on any state, a county map of that state appears next to the US map. This county/state map displays teen birth rate data for each county. When hovering over a specific county, the county's name and teen birth rate are displayed via tooltip. Above both sets of maps are color legends for each color scheme used. The purpose of this section is to uncover any regional or geographic trends throughout the United States in relation to the teen birth rate and underlying factors. [Figure 8]

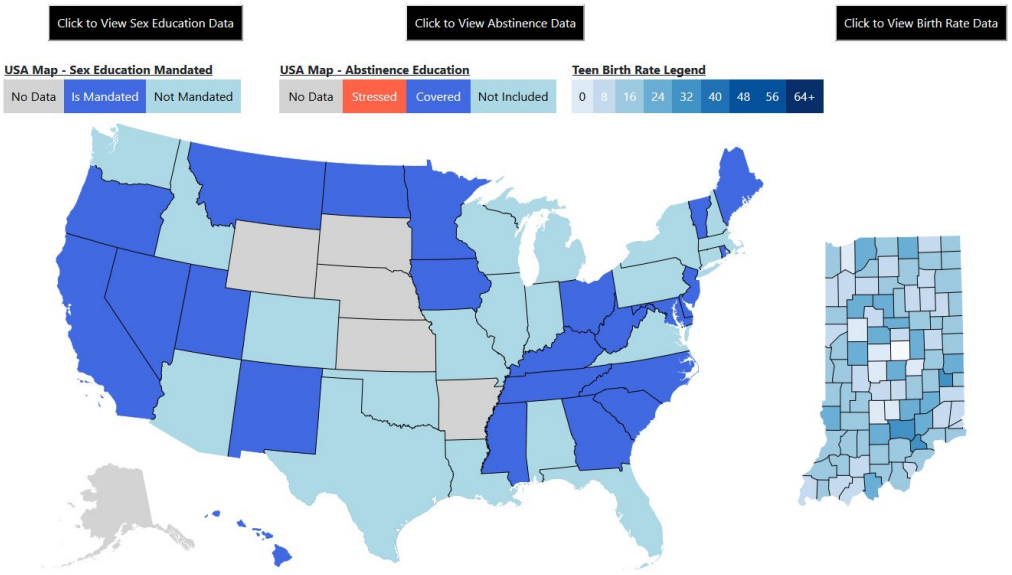

Figure 8: d3.js Map Visualization

The next section of our work is the historical trends. This features an area chart visualization that plots the change in teen birth rates from 2003 to 2015. Each point on the chart can be clicked on to view that year and the respective teen birth rate via a tooltip. This tooltip will remain on the screen until that point or another point is clicked. There is also a trend line that displays the overall (downward) trend from 2003-2015. The purpose of this section is to analyze and visualize the changes in the teen birth rate in the United States over a period of time and to what degree these changes occurred. [Figure 9]

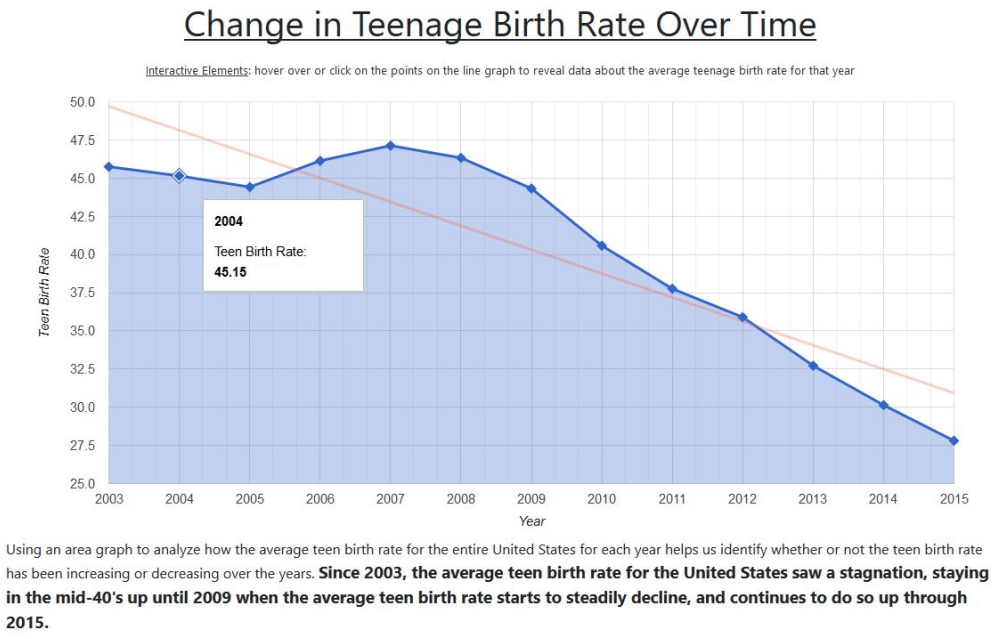

Figure 9: Google Charts: Area Chart showing time-varying data

The final section of our work is a set of bar charts that attempts to uncover a relationship between variables. There are two subsections here: sex education and abstinence, each focusing on a different variable. Each set of visualizations display two bar charts, one displaying the 5 states with the highest teen birth rates and the other displaying the 5 states with the lowest teen birth rates. The bars are color coded to represent sex education requirement in the first subsection and abstinence stress in the second subsection. Each bar can be hovered over to show a tooltip that displays the birth rate for that state. Below the visualization is a legend that indicates what each color means.

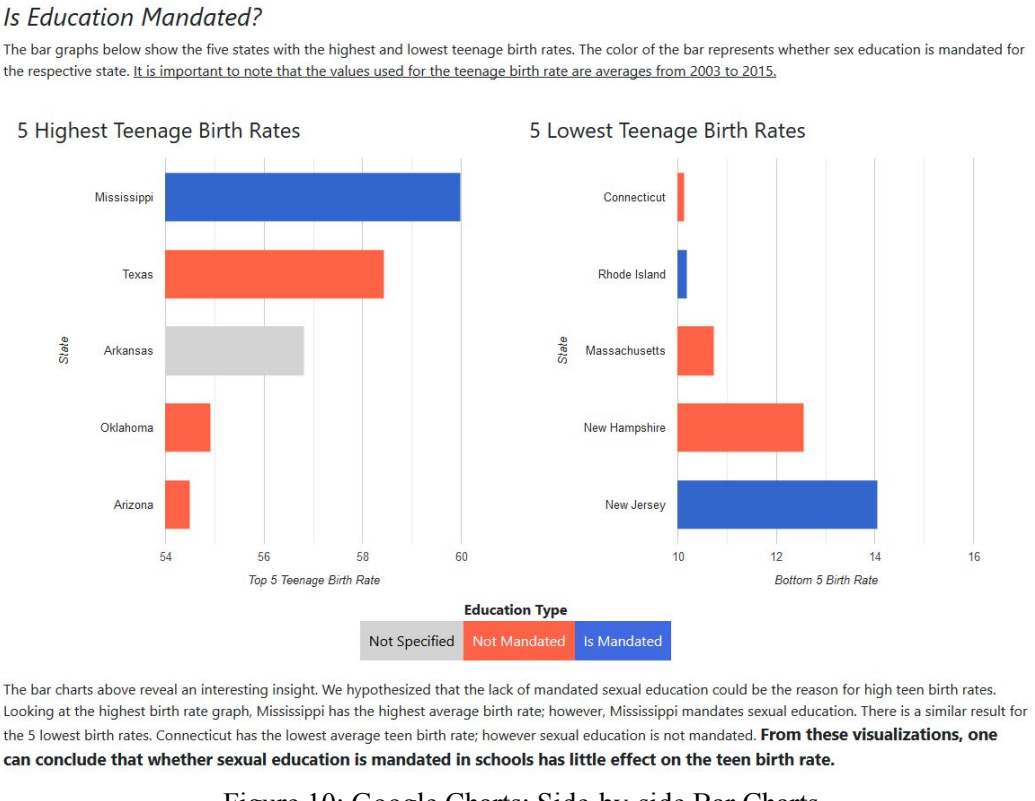

Figure 10: Google Charts: Side-by-side Bar Charts

Limitation and Future Work

Some limitations we faced were the lack of worldwide data and missing data. The teen birth rate dataset we used only contained data for the United States. This limited us to that country specifically. The sex education and abstinence dataset was also missing data for a few states. This meant that any conclusions drawn would have to be taken with a grain of salt as the missing data could have affected these conclusions.

We initially wanted to make this a regional visualization, looking at predefined regions of the United States, such as the South, the West, the Midwest, and the Northeast. Our original plan was to display the map divided by regions and allow the user to click on each region to view individual state data. We also would have liked incorporate a slider that allows that user to change the year being used. This would have generated even more insights as the user would have been able to view 12 times the data we currently have. In the future we hope to use a more extensive data set to discover more correlations between teen birth rates and other factors such as poverty rate, average income, and more.

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