

Evaluating Shifts in Medicare Spending Across US States

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Abstract

In this project, we aimed to identify reasons for shifts in medicare spending from 2013-2019 across the United States. We examined different factors such as income levels, human demographics, unemployment rates, and public policy to better understand changes in medicare spending. The project utilized dataset cleaning, pandas dataframe implementation, plotly data visualization, and graphical analysis. To visualize medicare payments nationwide, we used data from the Kaiser Family Foundation to observe changes in medicare spending between 2013-2019. Medicare data was mapped across a United States grid to isolate notable changes by state. Considering previous public policy initiatives, we sought to build on prior actions by extracting demographic data to test different correlations and patterns in spending. Our results allowed us to view shifts in medicare spending across different US states and theorize the reasons behind certain shifts. Furthermore, we conducted an analysis of the party affiliation of each state to observe the impact politics had on changes in spending levels. Our work helped identify demographics that were highly correlated with increased medicare payments and let us compare the impact of different factors on spending. These results were used to contextualize the political actions that occurred during this timeframe and how states differed in viewpoints. Ultimately, we made three key conclusions: (1) shifts in medicare spending followed a general increasing trend, (2) the severity of the shifts vary among different states across the US, and (3) certain demographics had a stronger positive correlation than others with medicare spending shifts.

Introduction

Healthcare spending has consistently been a contentious political topic in the United States since the development of healthcare. Both major political parties have attempted to address the issue with various policy platforms and actions, holding different stances on how to deal with changes in spending. With the ongoing COVID-19 pandemic, hospitalization rates have gone up tremendously, reintroducing healthcare as a prominent political hot topic.

Current discourse has been focused on changes in medicare spending across the United States with federal spending levels increasing over the last few years. Medicare refers to the federal health insurance program for those over 65 and/or those with various illnesses and diseases. There are multiple parts to medicare: parts A (hospital insurance), B (medical insurance), and C/D (optional additional coverage). With the understanding that changes in spending are influenced by public policy actions, our motivation for this project was to try to gain a deeper understanding of the factors that drive key public policy initiatives towards medicare spending. At project completion, our results would deliver statistical contexts for medicare legislation and identify correlations between different demographics and shifts in spending.

Data Sources

The datasets that we used for our research were provided by a comprehensive database created by the Kaiser Family Foundation (KFF), a health policy analysis organization. KFF datasets were designed to present demographic data such as birth rates and life expectancies, as well as economic data such as medicare spending and insurance rates for populations in all fifty US states over the last decade. From the database, our research utilized state data on demographics [1] and a dataset detailing medicare spending across America [2]. In finding our demographic data, the statistics were made available from the “Health Status” section from the KFF website where data was presented in tables filtered by year. Datasets provided descriptive statistics critical to identifying the key demographic factors impacting health status across the country, reporting on birth and death rates, state populations, poverty levels, populations with pre-existing conditions, alongside other important variables (KFF [1]). The set contains demographics for each US state dating from 2013-2019, giving us sufficient data to use for visualization and analysis. The medicare spending data was retrieved from the “medicare” section of the KFF database, with the dataset detailing medicare spending per state from 2013-2019. Spending was calculated by summing up the spending of each residence in a state and reported in totality for each state (KFF [2]). We selected the KFF database due to the comprehensive information it provided about the variables we sought to examine. In particular, we wanted to analyze the role of health status and demographic factors in driving public policy and medicare spending shifts and KFF provided all of these variables in great depth. In addition to its valuable information, the data is trustworthy, provided by a

trusted corporated source and frequently updated by the organization. To better analyze the role of state politics, an additional dataset was found from OPEN ICPSR, a government data website, which examined the political affiliation of each state government. Data was separated in a table by year and state, reporting the government and the majority political affiliation of each governor and representative, which we later filtered to find the dominant political leaning for each state [3]. In all three cases, tables were downloaded into CSV files, which were read into pandas dataframe to make data easier to manipulate. Data was cleaned using pandas commands to drop extraneous columns/rows, remove null values, and perform calculations to derive desired metrics.

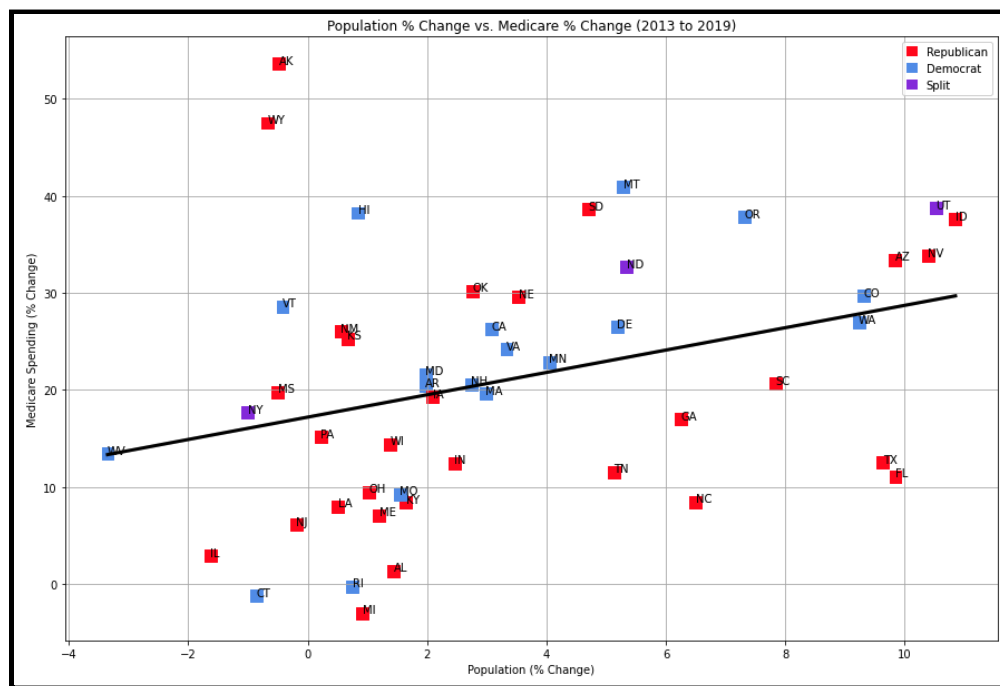
Methodology

To analyze the driving forces behind public policy actions, our project observed demographic attributes across all fifty US states over a period of seven years. The inspiration for this approach stems from a study by the US Institute of Medicine, which emphasized the benefits of studying trends in population demographics when analyzing the future of public health [5]. Their research pointed towards successful correlations between studying demographic changes and predicting trends in genetic research, leading to an endorsement of this methodology in the conclusion of this study. Further support for a demographic-centric approach was given in a 2017 release by Loretta Mester of the Federal Reserve. In her speech, Mester highlighted the importance of studying demographics in analyzing past and present economic policy actions [4]. Using these two studies as a baseline for our methodology, we decided to apply the study of demographic attributes to political actions taken before the pandemic to get a measure of how medicare spending shifted in “normal” periods. Demographics were studied from 2013-2019 as we aimed to analyze a more recent time period, but also study the impacts of major policy in the field such as Obamacare and the Affordable Care Act, which were both passed in 2010. By giving policy 2-3 years to impact spending, we can gauge the impact of these key policies. In selecting our attributes, we identified political ideologies, population changes, income levels, poverty, and other key variables that may contribute to changes in spending.

For our coding methods, we started by reading our CSV data files into pandas dataframe to properly clean values. Data was cleaned to remove missing values, irrelevant

columns (e.g. non US territories), and organize the data for easier use. After cleaning each dataframe, we focused on medicare spending by isolating the value for each state and year. This provided a clean representation of medicare spending nationwide. The changes between values in total medicare spending between the years 2013 and 2019 were what comprised our visualizations. We focused on each state's total medicare spending and used the package plotly to visualize the percent change in total medicare spending between 2013 and 2019. To analyze the role of politics, we manipulated a dataset listing the political affiliation of representatives from all US States. We filtered through the data for the relevant time frame using pandas commands to find the dominant ideology for each state. The results of this analysis were used as data labels on our visualizations, which showed changes in spending vs. changes in population to provide further context on our data points.

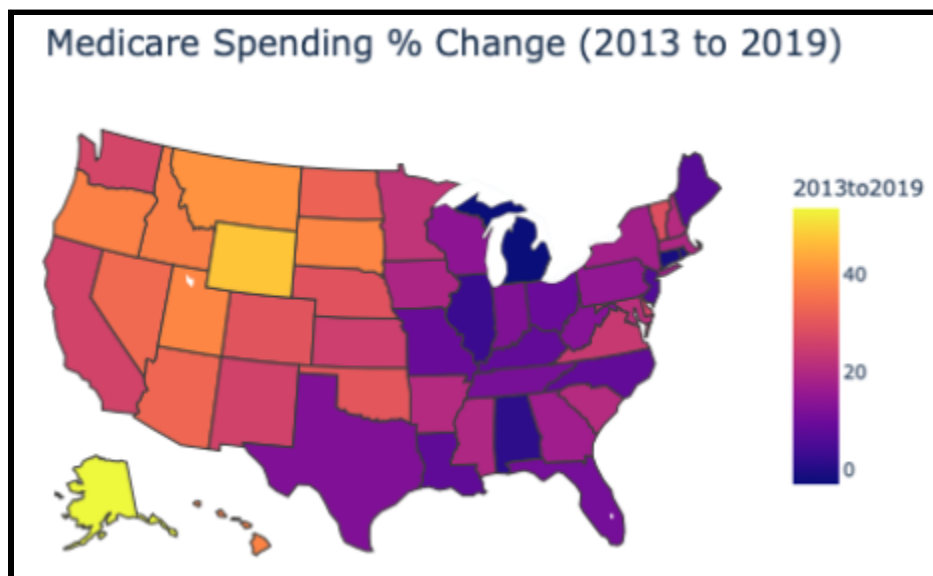
Analysis/Results



To output this visualization, we calculated the percentage change per state from 2013 to 2019 for population and total medicare spending. The x-axis shows the population percent change and the y-axis shows the medicare spending percent change. Each of the points on the scatter plot represents a state and is labeled with its abbreviation. The color coding of the state is dependent on the political party affiliation of the governors within the timeframe of 2013 to

2019. Red represents a Republican leaning state. Blue represents a Democratic leaning state. Purple represents a state that has had an equal number of Republican and Democratic governors within the time period.

Based on the visualization, we can see that there are more red-squared points underneath the line of best fit. This means that these states underneath the line of best fit are not increasing their medicare spending as much as the states above the line of best fit in regards to population growth.



To output this visualization we used a package called plotly. To get the percent of medicare spending percent change for each state we used the percent change formula $((2019-2013)/2013)$. States that were purple saw little to no change in their medicare spending, while more orange and yellow states saw percent changes over 20%. Wyoming saw an increase of 47% and Alaska saw an increase of 54%. Michigan saw a decrease of 3% (-3%) and Connecticut saw a decrease of 1.2% (-1.2%).

Conclusions

Our key conclusions from our research were three-fold. We found that shifts in shifts in medicare spending followed a general increasing trend, largely due to political action and demographic change. In comparing changes in population and spending, we highlighted the positive correlation between the variables, alongside our understanding that medicare

spending was increasing over time. Our second conclusion addressed that the severity of the shifts varied among different states across the US. While federal medicare spending increased, state spending increased at a different rate, varying by state. States such as Wyoming and Alaska exhibited higher medicare spending shifts, whereas states such as Connecticut and Michigan saw little increase. Supplementary research showed that states with lower population density often saw higher medicare spending shifts, a trend backed up by our research and a 2016 healthcare study from the US Healthcare Institute [6]. Additionally, political action in these states was slower-moving, whereas larger assemblies in Connecticut and Michigan more effectively targeted initiatives to lower spending. Finally, some demographic attributes showed stronger positive correlations. Attributes such as population, gross state product, and death rate were closer related than variables such as insurance coverage, poverty rates, and percent of population with a mental restriction (Appendix #1).

Overall, our project achieved the goals we aimed for before starting. We were successful in identifying correlations between demographics and medicare spending, we visualized changes in spending across the country, and our results successfully added political context to spending shifts through our study of political affiliation and notable events. Despite our success, our work is fairly limited as improvement is possible. Future improvements could be made by adding a wider timeframe, analyzing more demographics, and taking a more concrete focus on the role of individual political actions. Ultimately, however, we felt our project was successful and would be useful to health policymakers looking to identify demographic and political links to healthcare spending.

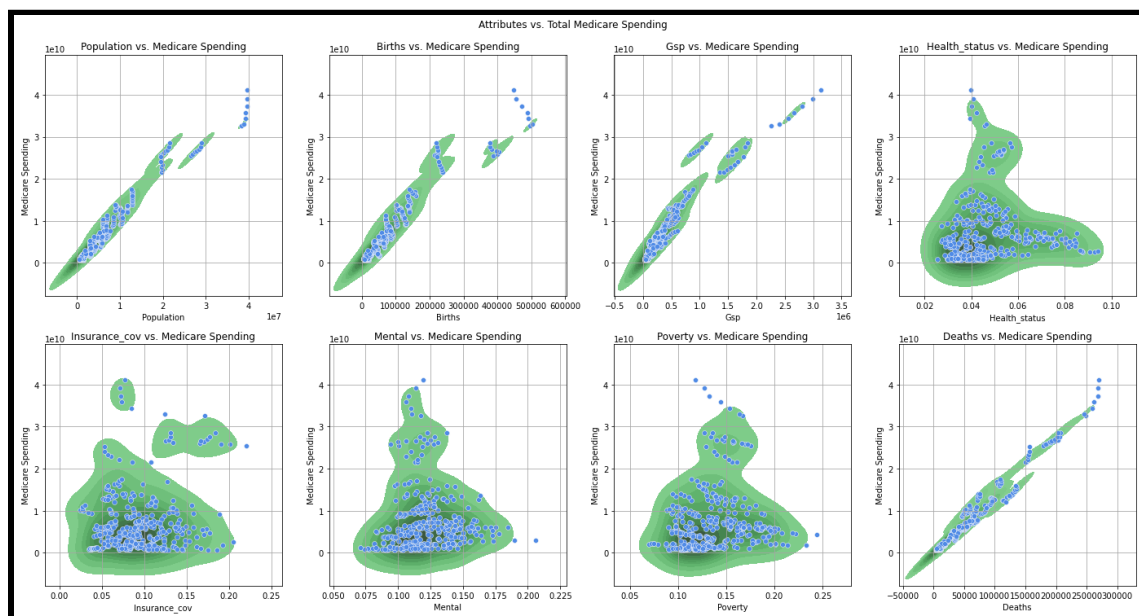
Project Contributions

Throughout our project process, the team collaborated effectively and evenly distributed tasks to lessen individual burdens. Vishnu Kasireddy held a critical role in guiding the group through each step of the process as a true leader. Vishnu meticulously planned out each step of the project and devised our comparative visualizations which compared population and spending, also aiding with plotly data visualization and filling the presentation. Alisa Posner was instrumental in finding our dataset and coming up with our project focus. She assisted heavily by cleaning our data, reading in the data, generating our maps, and adding to the presentation and final paper. Jaeson Pyeon contributed by filling out the introductory

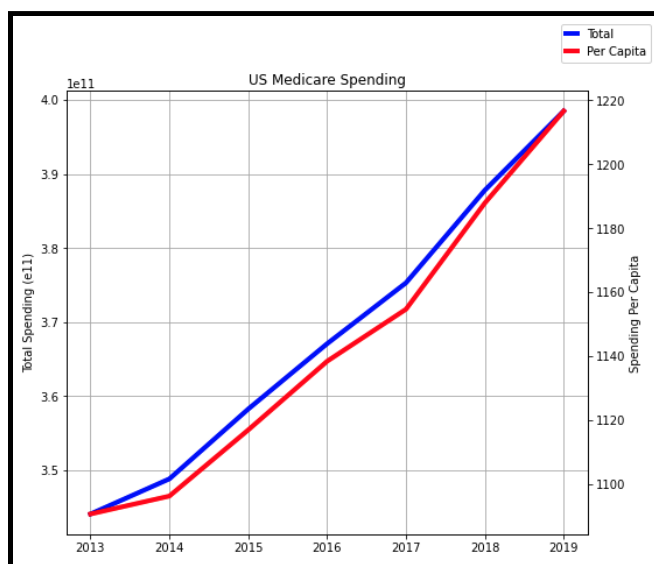
sections of our presentations and assisted with the filtering and cleaning of the data for our visualizations. Finally, Aayush Joshipura was heavily involved with the report and presentation alongside coding contributions, writing five sections and building the presentation. Additionally, Aayush was integral in project planning and aided with data research and initial manipulation. Overall, our group worked cohesively and efficiently via zoom and in person meetings.

Appendix (Additional Visuals)

(1)



(2)



Works Cited

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