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An Analysis of the Influence of Social Factors on State Level Covid-19 Outcomes in 2020

Olivia Teng

AN ANALYSIS OF THE INFLUENCE OF SOCIAL FACTORS ON STATE LEVEL COVID-19 OUTCOMES IN 2020

Olivia Teng

Department of Health and Society

College of Arts and Sciences

Honors College

University of Vermont

Professor Jennifer Strickler, PH.D., Sociology, Advisor

Professor Alice Fothergill, PH.D., Sociology, Committee Chair

Noah Barclay-Derman, M.P.H, Committee Member

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ABSTRACT

Population health is shaped by various social and governmental factors, many of which are determined at the state level. My thesis aims to contribute to current research by analyzing the relative importance of state health spending on Covid-19 outcomes. Using variables including state health data, state funding, and social determinants of health, I conducted a state level analysis of 2020 Covid-19 outcome data and state profiles to focus on the role these variables have on population health. Using the Covid-19 crisis as a case study, I identified the role of state funding, social factors, and public health infrastructure in protecting the population during the emergence of Covid-19. In addition, I compared of Vermont and South Dakota to further explore the role social factors had on outcome data. I was able to conclude that the influence of social factors, specifically political party affiliation, on population health held the greatest significance among data analyzed. The influence of party ideology played a role in inequalities in state responses and in the lack of a cohesive response among state governments. This research demonstrates the need for public health professionals to consider social factors when designing policies and programs for future state crisis response programs.

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CHAPTER 1: INTRODUCTION

The role of the public health field is to raise awareness of imminent health threats and minimize their potential impact by educating individuals about specific behaviors that might harm or protect them. To achieve this, campaigns and programs share information based on research and facts. Public health infrastructure has the power to save the lives of the entire population, by providing people with the knowledge they need to combat health crises.

In 2020, the Covid-19 pandemic tested the functionality of state public health infrastructure. States had to combat the virus without healthcare tools such as vaccines and Covid-19 treatments. The pandemic showed how state funding policies, the health status of individuals in each state, and social determinants of health impacted population health. Data from this health emergency showed the role states can play in addressing health outcomes. It also exposed the importance of investments in public health and a coherent, nationwide pandemic preparedness strategy.

Over the course of the pandemic, weaknesses in healthcare, public health policy and initiatives, and the government, were revealed. Covid-19 is a catalyst that should be used as an opportunity to improve performance in these areas. Addressing the problems the pandemic exposed can help us prepare for the next crisis. Evaluating the weak points and strengths to create prevention tactics is an important step in preparing for the future. Covid-19 gave policy makers a platform for change and reshaping to look at what needs to be improved.

In this thesis, I analyze how state-level factors including state public health spending and welfare spending contributed to state level Covid-19 outcomes, after controlling for social factors. Social factors include state poverty rate, income, racial composition, unemployment rate,

and political party affiliation. I aim to identify the significance of state health funding and its role in combating the Covid-19 pandemic. By examining patterns and correlations between variables, health outcomes, and state funding, I analyze the strength and significance of funding while considering individual health behaviors and social factors. My thesis brings different domains of research together to examine the overall picture of health and identify key changes that can be made with regard to state population health outcomes.

CHAPTER 2: LITERATURE REVIEW

STATE FUNDING

State funding for health and public welfare spending are two areas of public policy which may affect social determinants and health outcomes. State funding is a major contributor to resources going into healthcare, public welfare, and other health related spending (CDC, Nov. 2021). Research overall in this field has focused on Medicaid and Medicare funding, public health policies addressing social determinants, and the amount of funding allocated to public health initiatives in each state. State fiscal briefs have allowed for analysis and reflection of previous challenges and what states might need to focus on in the future (Bradley, 2016). Many studies have identified the need for public health spending not only on health care, but social services and public health (Bradley, 2016). Bradley's studies further explored state spending and concluded that on average, "for every $1 of Medicare and Medicaid spending, an additional $3 was spent on social services and public health" (Bradley, 2016)**.** Increased health spending has been shown to be beneficial in preventing illness and disease, further impacting health outcomes overall (McCullough, 2018). Funding has the ability to impact public health systems that address risks and dangers to health, ensure equity and social justice, and provide access to good quality health services (McKillop and Ilakkuvan, 2019). These interventions have been shown to impact overall health of the states (Bekemeier et al., 2012).

Public health policies contribute to how states address the impact of social factors on health outcomes (Artigia & Hinton 2019; Warren, et.al., 2021). Health outcomes regarding Covid-19 death and incidence rates have been linked to public health funding (Shadmi, et al., 2020). The variation among state Covid-19 policies has resulted in discrepancies in health

outcomes among states (Kettl, 2020). While some policies correlated with disease emergence patterns, there was systematic variation among state emergency decisions that show subtle patterns across partisan lines (US Census, 2021; Grossman et.al., 2020). Variation among states including mask mandates, health facility funding and overall public opinion have been affected by party affiliation (Deane, 2022; Grossman, 2020; Jones, 2022). Throughout the pandemic, state-level health outcomes show political disparities (Jones 2022). Initial research shows Democratic states, which tend to be more urban, were more likely to have a higher rate of Covid-19 cases than Republican states, which tend to be more rural. However, as the pandemic proceeded, by September 2020 Republican states showed higher rates of Covid-19 deaths (Jones, 2022; Deane, 2022). In the past, party affiliation was not a factor that contributed to health outcomes, but in today's social climate it seems to be.

SOCIAL FACTORS

Along with funding and state policies, many other social factors correlate with health outcomes. It is important to analyze whether the impact of access to education, health literacy, and geographic access to health resources and facilities play a role in population health. Social determinants of health, including education, social supports, poverty, and other resources contribute to the deep-rooted disparities that stem from social, economic, environmental, and structural inequality experienced by groups throughout our society (Artiga, 2019; Braveman, 2010; Hinton, 2019; Dalsania, et al., 2022; Jacquelyn, et al. 2012; Singh, 2017). Research in this field has concluded that these social factors "accounted for over one third of total deaths in the United States in a year" (Artiga and Hinton, 2018).

INCOME

Income is a social variable that contributes to an individual's health. It affects an individual's overall function physically and mentally (Wang and Geng, 2019). Low socioeconomic status correlates with a lower quality of educational achievement, poverty, and poor health (Braveman, et al., 2010; Williams, et al., 2016; Williams et al., 2010). Research has concluded that people with the lowest income are consistently the least healthy in the population (US Census Bureau; 2021). Being in poor health is "associated with increased risk of job loss, while access to affordable health insurance has a positive effect on people's ability to obtain and maintain employment," (Antonisse and Garfield, 2018). While it is unclear whether unemployment is the root cause of these negative health outcomes, research has found that due to it being a "universally negative experience," unemployment can be linked to "poor outcomes, especially poor mental health outcomes, (e.g., stability, stress, hours, pay, etc.)" (Antonisse and Garfield, 2018). As we can see, research shows poverty and unemployment as risk factors that impact health status.

RACE

Research has shown that race is a social variable that can impact health outcomes, including Covid-19 (CDC, Jan. 2022; Hill et al., 2022). Covid-19 health outcome data, including incidence and death rates, have different racial patterns. Death rates among minority groups, including Hispanics, African Americans, and American Indians, are twice as high as their White counterparts (Artiga and Hill, 2022). Incidence rates among these minority groups have also been shown to be higher than their White counterparts (CDC, 2021). These studies concluded that minorities are more likely to be of low socioeconomic status, which has been shown to correlate with a lack of resources and worse health outcomes (Flaskerud, 2012; Williams, et al.

2016). Minority racial groups are more likely to experience multidimensional poverty compared to White counterparts (Reeves, Rodrigue, & Kneebone, 2016). Research shows that, compared to their White counterparts, American Indians/Alaska Natives [AIANs], black/African Americans and Hispanics, have poverty rates that are twice as high (Singh et al., 2017). Williams et al. (2016) states that, "Racial and ethnic stigmatized peoples experience higher rates of illness, impairment, and death than the average of their societies in the U.S.,". Williams also found that racial disparities persist even after controlling for socioeconomic status (Williams et al., 2016). This is due to the idea that while socioeconomic status is an important determining factor for population health, it does not fully explain the impact systemic racism has had on certain populations in the US (Williams, et al., 2010).

EDUCATION

Education is essential for improving health outcomes, promoting healthy behaviors, preventing diseases, reducing health disparities, and improving overall health and wellbeing (Zajacova and Lawrence, 2018). Education helps people better understand health-related information, enabling them to make informed decisions about their health. Health literacy can lead to better self-management of chronic conditions, adherence to medications, and the prevention of illnesses (Zajacova and Lawrence, 2018). Education also promotes healthy behaviors such as regular exercise, proper nutrition, and avoidance of harmful substances such as tobacco and alcohol (Zajacova and Lawrence, 2018). This can reduce the risk of chronic diseases, such as obesity, diabetes, heart disease, and cancer. Educated patients may also be better able to understand their health needs, follow instructions, advocate for themselves and their families, and communicate effectively with healthcare providers (Goldman and Smith, 2002). This further helps people understand the importance of preventive healthcare measures,

such as regular checkups, screenings, and immunizations, and can help detect and treat health problems early before they become serious (Goldman and Smith, 2002).

Education can also help to reduce health disparities among different populations. People with lower education levels are more likely to experience poor health outcomes and have limited access to healthcare services (Zajacova and Lawrence, 2018). In addition, education was correlated with less economic hardship, higher attainment of greater job prestige and social rank, and better access to resources that contribute to better health (Zajacova and Lawrence, 2018). It has also been found that in today's economy a job applicant with higher educational attainment is more likely to be employed by a company that provides health promoting benefits such as health insurance, paid leave, and retirement (Baum, et al., 2013). People with less education have found to be more likely to work in high-risk occupations with few benefits (Baum, et al., 2013). Overall, education has been linked to improved health outcomes, such as lower mortality rates, increased life expectancy, and better overall health (Baum, et al., 2013).

AGE

The age of a state's population can impact health outcomes in various ways, including an increased prevalence of chronic diseases and mental health issues, and reduced mobility, cognitive, and immune system strength (Maresova, et al., 2019; Qiu, et al., 2010). As people age, their bodies undergo changes that can affect their physical and mental health (Qiu, et al., 2010). Aging can exacerbate existing health disparities, particularly for minority populations and those with limited access to health care (Ortman, et al., 2014). As the population ages, there is typically an increase in healthcare utilization, including hospitalization, emergency department visits, and long-term care services. Older adults are more likely to have functional declines that impact their daily activities. Research has also concluded that chronic diseases such as heart

disease, stroke, diabetes, and cancer become more common with age (Ortman, et al., 2014). These conditions can have a significant impact on quality of life and require ongoing medical care.

RURAL VS. URBAN

Health outcomes vary depending on whether an individual lives in a rural or an urban area. Previous studies have identified significant differences between the two (Chen, et al., 2019). Research has found rural populations are consistently less healthy than urban populations, with higher rates of chronic conditions, activity limitations, and risky health-related behaviors (Chen, et al., 2019). They are also more likely to be uninsured and less likely to receive some type of healthcare, including tests for chronic conditions (Chen, et al., 2019). Urban areas tend to have better access to healthcare because of the higher concentration of healthcare facilities and medical professionals (Lopez and Hynes, 2006).

Environmental factors also contribute to health outcomes. Highly urban areas tend to have greater availability of unhealthy food options and fewer opportunities for physical activity, leading to higher rates of obesity and related health problems (Lopez and Hynes, 2006). Rural areas may also have fewer options for healthy food and recreational opportunities, which can lead to sedentary lifestyles (Nielsen et al., 2017). Additionally, rural areas may have higher poverty rates and lower educational levels, which can contribute to poorer health outcomes (Nielsen et al., 2017). In contrast, urban areas tend to have higher levels of education and income, which can lead to better health outcomes (Lopez and Hynes, 2006). Research has also found that both urban and rural areas have environmental exposure that leads to worse health outcomes. Urban areas tend to have higher levels of air pollution, noise pollution, and

exposure to toxins, while rural areas tend to have greater levels of exposure to environmental hazards, such as pesticides and agricultural chemicals (Lopez and Hynes, 2006).

POLITICAL PARTY ORIENTATION

A state's political orientation influenced pandemic responses including stay-at-home orders, mask mandates, social distancing mandates and ideology surrounding health. At the individual level, this is seen in support of federal pandemic spending packages which show 41% of Republicans supporting the Covid-19 aid package compared to the support of 94% of Democrats (Pew Research Center, 2021). Mask-wearing also had political differences in spite of minimal bipartisan divide at the start of the pandemic (Deane, 2022). On average, Republicans wore masks only about 50% of the time while 73% of Democrats wore it all or most of the time when going out (Deane, 2022). Stay-at-home orders also differed by party affiliation. It was found that if stay-at-home orders were put in place, Republican governors took longer to put them into effect than Democratic counterparts (Neelson, et al. 2021). Democratic governors also were found to have longer durations of stay-at-home orders (Kosnik, et al., 2020). Over the course of the pandemic, health outcomes show discrepancies among parties (Jones, 2022). This did change as the pandemic proceeded. Republican states by September 2020 showed higher rates of Covid-19 deaths (Jones, 2022; Deane, 2022). Throughout the pandemic's timeline, party affiliation was an increasingly important indicator of how a state reacted to health problems and how much Covid-19 affected a state's population.

CHAPTER 3: STATE ANALYSIS

DATA AND METHODS OF MEASUREMENT

To determine the impact of social determinants of health and state funding policies on Covid-19 health outcomes in 2020, a database was created that included variables that can impact state population health and the risk for certain health outcomes during 2020. Database programs including Excel and SPSS (Statistical Package for Social Sciences) were used to compile state-level data from the Centers for Disease Control (CDC), Kaiser Family Foundation (KFF), Pew Research Center and the US Census Bureau. The unit of analysis is all US states, excluding the District of Columbia. The study's input variables include public health funding, social welfare funding, Medicaid expansion and party affiliation as well as social determinants of health including poverty rates, unemployment rates, racial composition, urban percentage, and age demographic. The outcome variables are Covid-19 incidence and death rates. The variables and sources of data are listed in Table 1.

Initially, information about each state was compiled into a database in Excel. From this, an SPSS file was created. To analyze state trends among data, first, descriptive data of each variable (mean, standard deviation, minimum and maximum) was looked at and compiled into Table 2. Box and Whisker plots for each variable were then created to present this descriptive data, shown in Graph Set 1. Box and Whisker plots were generated to see the distribution of the data. These five-number summaries look at components of the variables including the minimum, first quartile, median, third quartile, and maximum. In SPSS, outliers are defined as cases lying more than 1.5 box-lengths outside of the box, these are represented by a hollow dot. Extreme outliers are any data values which lie more than 3 box-lengths distant which is three times the

interquartile range below the first quartile or above the third quartile. These are represented by hollow stars. States that were found to be outliers are noted under each graph in Graph Set 1. Histogram plots of the variables were created to further show the data. Graph 2 is an example. It shows comparisons of states' Republican lean percentages.

Both dependent variables are rates per 100,000 of the population in each state. Social determinant variables, including unemployment and poverty rates, political party affiliation, individuals without a high school degree, individuals with a college degree, population over 65, urban rates, and race demographics, are all percentages of state populations. The median household income is a midpoint dollar amount in each state. For state health, all funding variables were per capita. Medicaid expenditures do not include administrative costs, accounting adjustments, or the U.S. Territories. Public health funding represents the state per capita public health funding during the fiscal year and does not include any federal funding (ex. CDC). Welfare funding includes cash assistance through Temporary Assistance for Needy Families (TANF), Supplemental Security Income, and other payments made directly to individuals, as well as payments to physicians and other service providers under programs such as Medicaid. The healthcare cost variable includes hospital care. It covers all services provided to patients. These include room and board, ancillary charges, services of resident physicians, inpatient pharmacies, hospital-based nursing homes and home health care, and any other services billed by hospitals in the United States. The value of hospital services is measured by the total net revenue, which equals gross patient revenues (charges) less contractual adjustments, bad debts, and charity care. It also includes government tax appropriations, as well as non-patient and non-operating revenues.

Using statistical methods including correlation analysis and multiple regression, models were created to analyze and identify predictors of Covid-19 case rates and death rates during 2020. Analysis started off with calculating the Pearson Correlation values to look at the relative importance of social factors and state funding polices. Then, simple, and multiple regression was done to find the significance of factors with the addition of party affiliation.

TABLE 1: DATA AND SOURCES

Dependent Variable	**Source of Data**
Covid-19 Death Rates	CDC
Covid-19 Incidence Rates	CDC
Social Determinants	**Source of Data**
State Unemployment Rates	U.S Bureau of Labor Statistics
State Poverty Rates	U.S. Census Bureau, USDA
Racial Composition	U.S. Census Bureau
Age Distribution (% over 65)	U.S. Census Bureau
Political Party Composition	PEW Research Center
Median Household Income	U.S. Census Bureau
Urban and Rural State Distribution	U.S. Census Bureau
Educational Attainment	U.S. Census Bureau
State Health Funding	**Source of Data**
Medicaid (Health Expenditures)	Centers of Medicare and Medicaid Center
State Welfare Funding per capita	U.S. Census Bureau
Health Care Spending per capita (Hospital Care)	Kaiser Family Foundation (KFF)
Public Heath Funding per capita	U.S. Census Bureau, TAFH, SHADAC

Note: See Appendix for citations

TABLE 2: DESCRIPTIVE STATISTICS (MAXIMUM, MINIMUM MEAN AND, STANDARD DEVIATION)

Variable:	Minimum	Maximum	Mean	Standard Dev.
Dependent Variables				
Death Rates Per 100k	19.65	205.00	104.35	45.86
Cases Rates Per 100k	1,084.85	11,907.42	6,321.20	2,159.37
Social Determinants				
Unemployment %	4.10	13.50	7.35	1.90
Poverty %	7.30	19.60	12.14	2.70
Republican Lean %	27.00	57.00	39.78	7.50
Democratic Lean %	25.00	57.00	42.40	7.29
No Lean %	10.00	29.00	17.84	3.14
% Without a High School Diploma	5.56	15.81	9.66	2.58
% College Grad.	23.10	46.90	33.89	5.53
% White	22.90	90.80	68.52	14.14
% Black	0.51	36.62	10.40	9.20
Population % over 65	11.70	21.80	17.42	1.96
Median Household Income	$ 47,368.00	$ 88,589.00	$ 66,626.28	$ 10,937.94
Urban %	38.70	95.00	73.59	14.56
State Health Funding				
Medicaid funding per capita	$ 5,028	$ 13,811	$ 8,617.50	$ 1,1884.01
Public Health Funding per capita	$ 7.06	$ 215.15	$ 47.00	$ 38.65

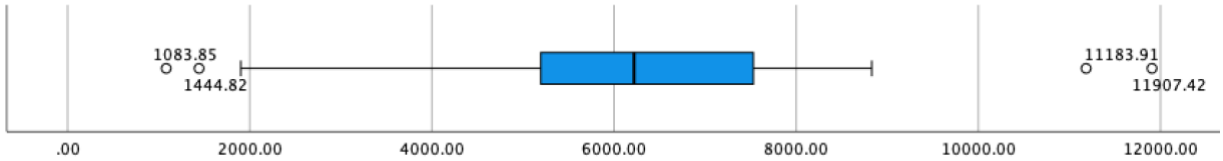
Welfare funding per capita	$ 1,067.00	$ 3,707.00	$ 2,189.22	$ 684. 94
Health Care Cost per capita	$ 2,774.00	$ 6,991.00	$ 4,105.82	$ 822.14

GRAPHS SET 1: BOX AND WHISKER PLOTS OF ALL INDICATOR VARIABLES

Death Rates

Note: Outlier = NJ

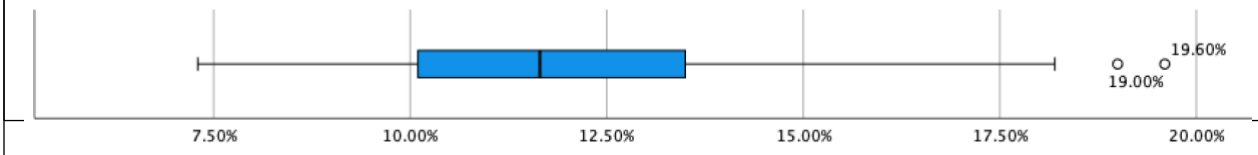
Cases Rates



Note: Outlier = HI, VT, SD, ND (from left to right)

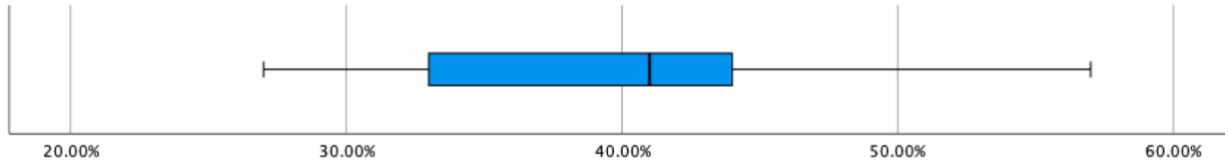
Unemployment Rates

Poverty Rates

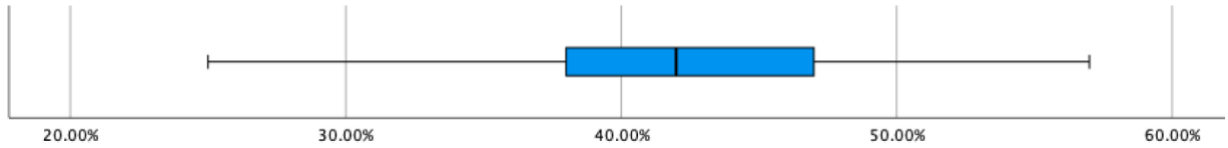


Note: Outlier = LA, MS (from left to right)

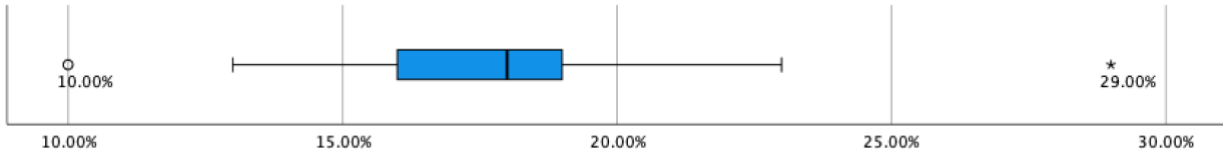
Republican Lean %



Democrat Lean %

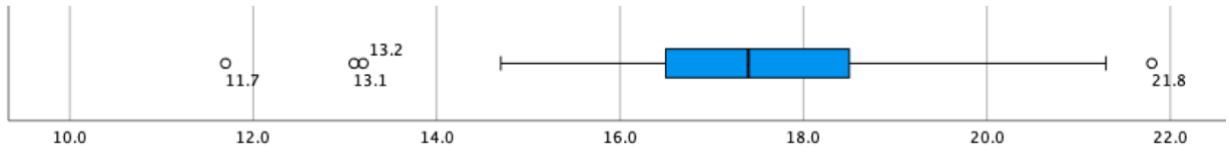


No Lean %



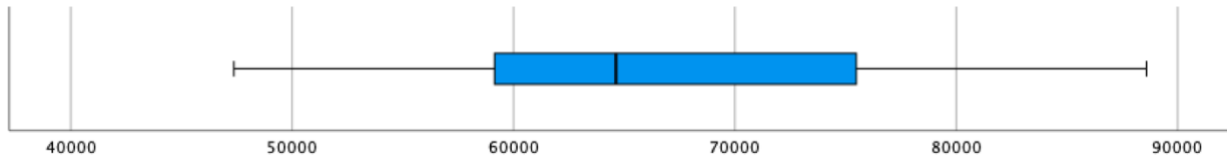
Note: Outlier = SD , Extreme outlier = AK

Population % over 65

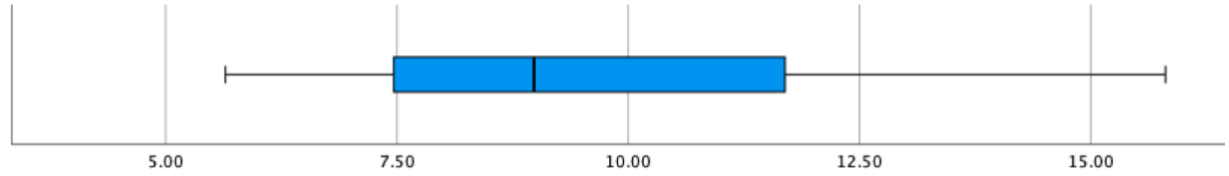


Note: Outlier = UT, AK, TX, ME (from left to right)

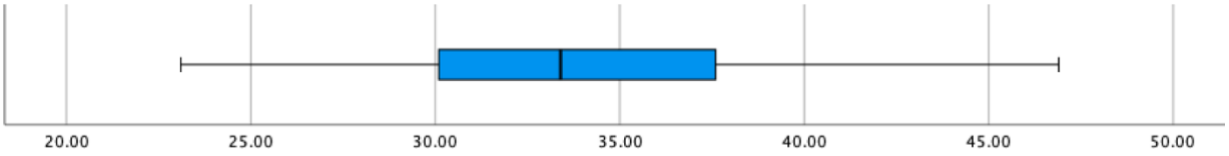
Median Household Income



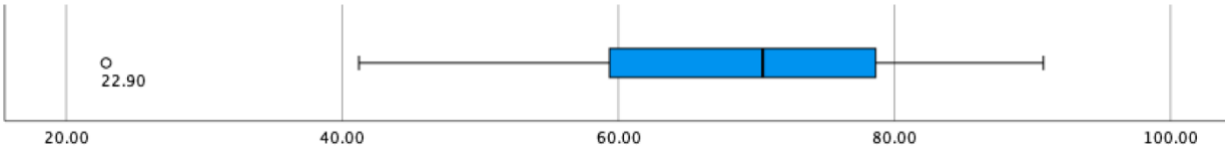
% Without High School Diploma



% College Graduates



% White

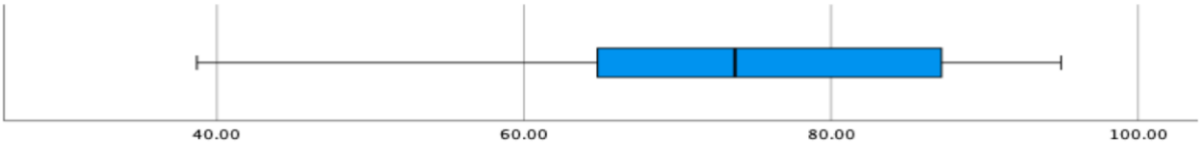


Note: Outlier = HI

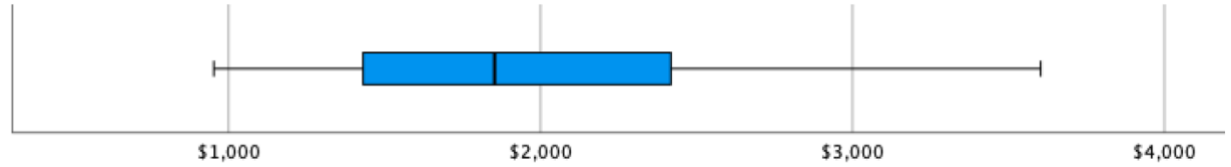
% Black

Note: Outlier = MS

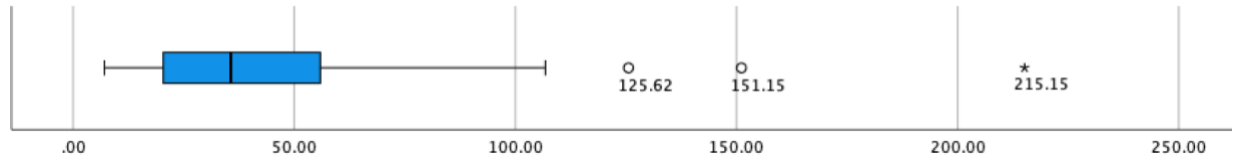
Urban Percentage



Medicaid Funding per capita

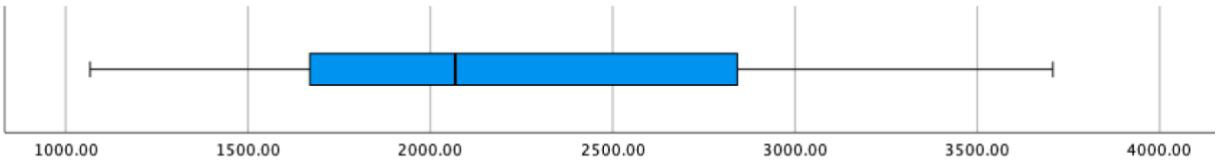


Public Health Funding per capita



Note: Outlier = HI, NM (from left to right), Extreme outlier = AK

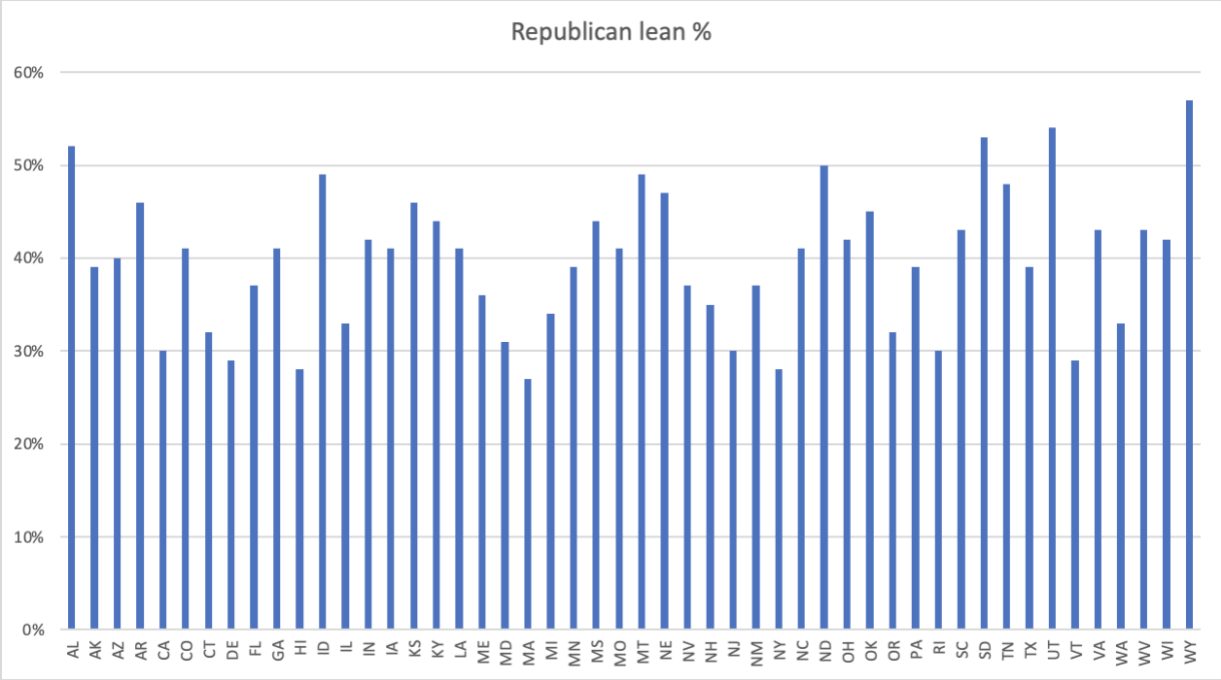
Welfare Funding per capita



Health Care Cost per capita

Note: Outlier = VT, WV (from left to right) , Extreme outlier = SD

GRAPH 1: REPUBLICAN PARTY AFFILIATION PERCENTAGE IN EACH STATE



RESULTS

REGRESSION TRENDS

The death rate variable has positive regression associations with variables such as unemployment rates, poverty rates, Democratic lean percentage, percentage of the state without a high school diploma, urban percentage, Medicaid spending, welfare funding, and healthcare cost. Negative associations were observed for death rate with variables including Republican lean percentage, college graduation percentage, percentage of the population over 65, median household, and public health funding. For the case rate variable, positive regression coefficients were found for poverty rate, Republican lean percentage, percentage without a high school degree, and Medicaid spending. Negative trends were found for unemployment rates, Democratic lean percentage, college graduation rates, population over 65 years, median

household income, urban percentage, public health funding, welfare funding, and healthcare costs.

TABLE 3: CORRELATES OF STATE LEVEL CASES AND DEATH RATES

Bivariate correlations were run to look at the association of each explanatory variable with both outcome variables. For case rate correlation, both political party affiliation variables, percent of the population over 65 years, median household income, and college graduation rates were all found to be significant with a p value less than 0.01. While they were not as highly significant, welfare funding (per capita) and unemployment had significance values that were less than 0.05. Pearson Correlation values for case rates and respective indicators can be found in Table 3. For case rates, Pearson correlation values found to be significant all had negative trends. For death rates correlation data poverty and percentage of the state population with a high school diploma were found to be the most significant indicators. Both significance values were found to be less than 0.05. Death rate Pearson Correlation values can be found in Table 3. The percentage of residents without a high school diploma had a negative correlation and poverty was found to have a positive correlation. Analyzing state trends, I was able to conclude that during the year 2020, state public health and welfare funding were not significant predictors of Covid-19 health outcomes.

TABLE 4 AND 5: MULTIVARIATE ANALYSIS

Indicators found to be significant with simple regression were further tested to see if they would be significant after controlling for party affiliation. Multiple regression was used for analysis. Tests found that with the addition of the Republican party lean indicator, few factors remained significant. For both case and death rates, coefficient, r^2, and significance values were examined. These can be found in Table 4 and 5. Only the percent of the population over 65 years

of age variable was found to be significant for case rates, with a p value less than 0.05 (Table 5). For death rates, poverty, and percentage of the population without a high school diploma were both found to be significant (Table 4). Poverty made the Republican lean variable less significant with a significance value of less than 0.01. Percentage of the population without high school diploma became the significant factor, with a value less than 0.05, and Republican lean percentage became insignificant.

GRAPH 2 AND 4: POLITICAL AFFILIATION AND CASE RATES

Graph 2 shows a scatter plot of Republican lean percentage vs. case rates in each state. There is a clear upward trend that concludes that the higher the states percentage of population that is Republican leaning, the higher the case rates were in that state during 2020. This trend correlates to the results found in Graph 4, which shows the average percentage of case rates in three different Republican lean groups. These groups are the bottom third of states with the lowest Republican lean percentages, the middle third of Republican lean percentages, and a third of states with the highest percentages of Republican lean. This graph shows an upward trend indicating the higher the state's case rates the more likely for the state to have a higher percentage of Republican support.

GRAPH 3 AND 5: POLITICAL AFFILIATION AND DEATH RATES

Graph 3 shows a scatter plot of Republican lean percentage vs. death rates in each state. While there is not a clear upward trend compared to case rates, it is important to note that five New England states, Massachusetts, New York, New Jersey, Rhode Island, and Connecticut are clustered together. These states all had low Republican lean percentages but high death rates. The lack of trend for Republican lean percentage and death rates can also be seen in Graph 5.

The graph shows the middle third of states having the lowest death rates, compared to the highest and lowest percentage Republican lean states.

TABLE 3: PEARSON CORRELATION VALUE OF CASE AND DEATH RATE WITH INDICATORS

Indicator	Pearson Correlation Value for Death rate and Indicator	Pearson Correlation Value for Case rate and Indicator
Social Determinants		
Unemployment	0.163	-0.342*
Poverty	0.336*	0.202
Republican lean	-0.31	0.657**
Democratic lean	0.152	-0.586**
% Without a High School Diploma	0.371**	0.065
College Graduation rates	-0.071	-0.451**
Population over 65	-0.042	-0.364**
Median Household income	-0.151	-0.364**
Urban Percentage	0.172	-0.048
State Health Funding		
Medicaid	0.051	0.066
Per Capita Public Health funding	-0.168	-0.076
Welfare Funding	0.015	-0.218*
Healthcare cost per capita	0.165	-0.004

Note: * = $p<.05$ and ** = $p<.01$

TABLE 4: MULTIVARIATE REGRESSION FOR SIGNIFICANCE OF INDICATORS OF 2020 DEATH RATES FACTORING IN POLITICAL PARTY AFFILIATION

Standardized Coefficient Values

	r^2 value	Poverty Percentage	High School Graduation Rate	Republican Party Lean Percent
Model 1	0.127	0.336 **		-0.122
Model 2	0.082		-0.284*	-0.020

Note: * = p<.05 and ** = p<.01

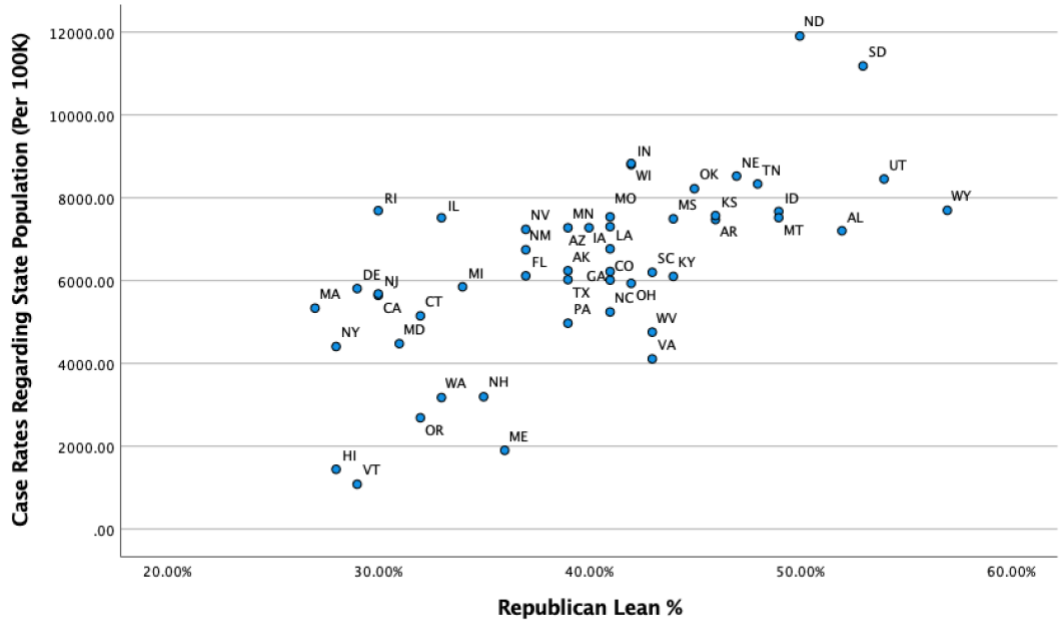
TABLE 5: MULTIVARIATE REGRESSION FOR SIGNIFICANCE OF INDICATORS OF 2020 CASE RATES FACTORING IN POLITICAL PARTY AFFILIATION

Standardized Coefficient Values

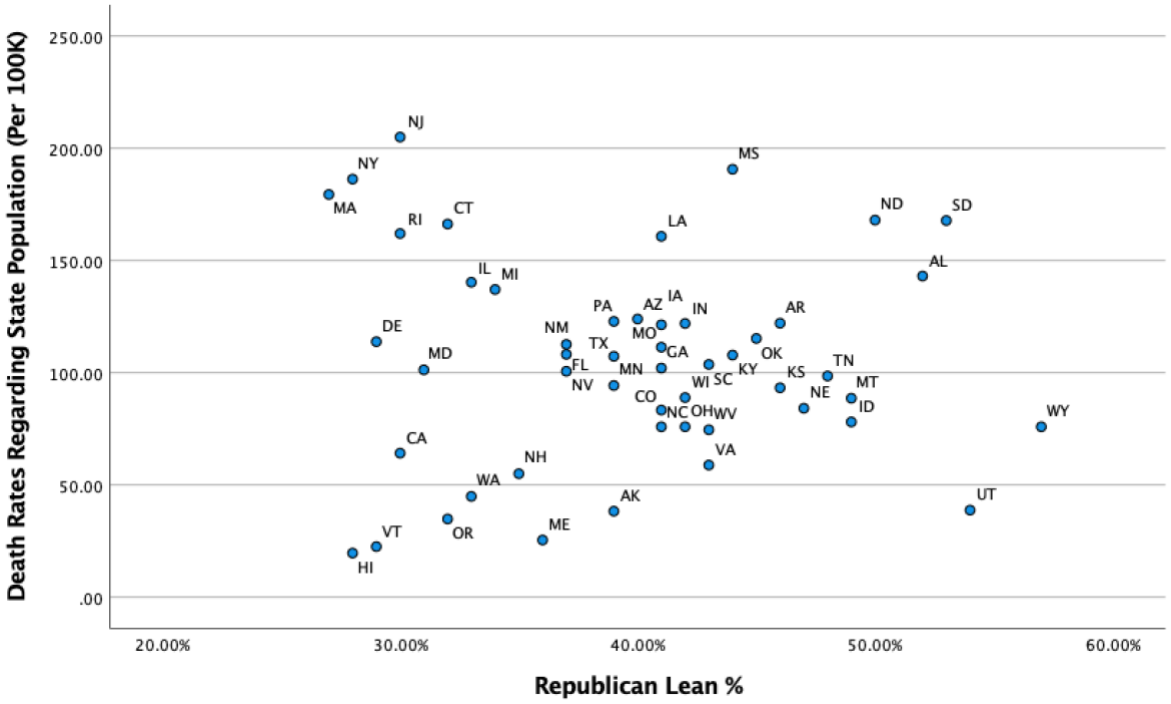
	r^2 value	Welfare Funding Per Capita	College Grad. Rate	Percent of the Population over 65	Median Household Income	Democratic Lean Percentage	Unemployment rate	Republican Party Lean Percent
Model 1	0.432	0.017						0.665 **
Model 2	0.438		-0.009					0.599 **
Model 3	0.475			-0.215 *				0.604 **
Model 4	0.432				-0.008			0.653 **
Model 5	0.432					0.054		0.706 *
Model 6	0.440						0.113	0.728 **

Note: * = p<.05 and ** = p<.01

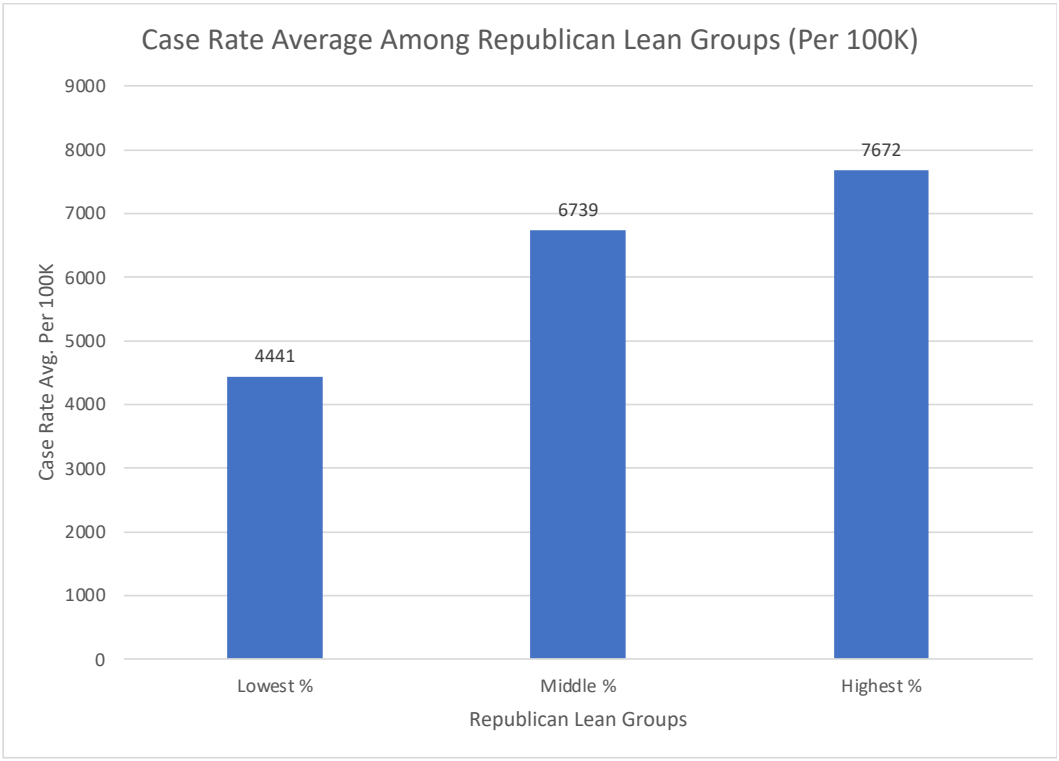
GRAPH 2: REPUBLICAN LEAN % VS. CASE RATES IN EACH STATE



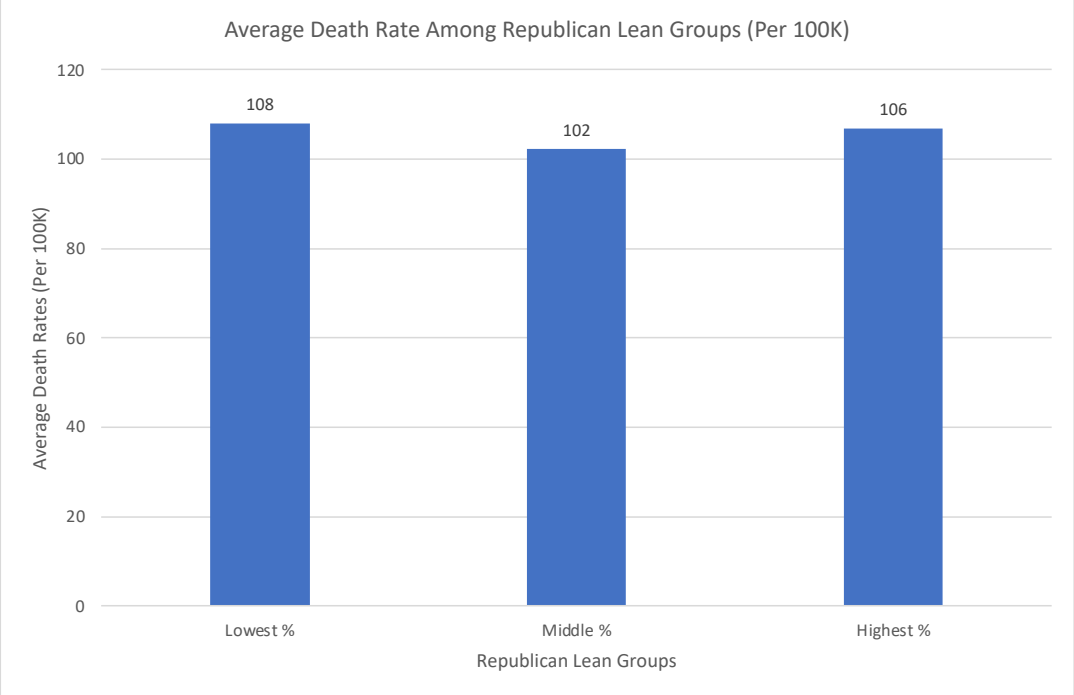
GRAPH 3: REPUBLICAN LEAN % VS. DEATH RATES IN EACH STATE



GRAPH 4: 2020 CASE RATES AMONG REPUBLICAN LEAN PERCENTAGE GROUPS



GRAPH 5: 2020 DEATH RATES AMONG REPUBLICAN LEAN PERCENTAGE GROUPS



DISCUSSION

LIMITED IMPACT OF STATE FUNDING

My research looked to identify the significance of state funding on population health in regard to state level Covid-19 outcomes in 2020. While research on the impact public health initiatives and policies can have in a community is readily available, there has been a lack of documented major health events that have tested public health infrastructures and government health policy. The Covid-19 pandemic has tested and stretched state public health infrastructures beyond their capabilities. My analysis aimed to examine whether public health infrastructure funding had an impact on a state's ability to fight the Covid-19 pandemic. Data from 2020 were used to identify if there were policies and funding that helped states succeed in combating the initial wave of Covid-19, before federal healthcare assistance and relief programs had the time to take effect.

Data from this health emergency showcased the role states can have in addressing health outcomes. Analyzing patterns and correlations between variables, I found that state spending variables did not have a significant impact on Covid-19 health outcome data, but some social factors did. These findings did not support my initial hypothesis. By looking at how state level factors including state public health spending, welfare spending, and social factors contributed to state level Covid-19 outcomes, I was able to find that social factors including unemployment, population percentage over the age of 65, median household income, and graduation rates were more statistically significant than state funding variables.

SOCIOECONOMIC STATUS AND DEATH RATES

Multivariate regression was further used to test the strength of variable significance. Poverty and percent of the population without a high school degree were two variables that were significant in both single and multivariate death rate regression tests. Both poverty and percent of the population without a high school degree caused the Republican lean percentage to become insignificant. Population over 65, when looked at using case rate multivariate regression factoring in Republican lean percentage, did not cause the other variables to become insignificant.

DEATH RATE SINGLE AND MULTIVARIATE REGRESSION

Among the outcomes, death rates were impacted the most by state poverty and percent of the population without a high school diploma. These factors in general impact individual health. Poverty can lead to reduced access to resources needed to support an individual's quality of life. This includes lack of stable housing, healthy foods, safe neighborhoods, and limited access to educational and employment opportunities (Phelan, 2010). Limited access to needed resources leads to disproportionate health outcomes. A New York City study found that Covid-19 death

rates in poor neighborhoods were more than 2.5 times higher than in wealthier neighborhoods (Leopold, 2020). Poverty's impact on health is an important factor that should be continued to be acknowledged in future studies and health initiatives. If states can address lack of access to needed resources, the impact of future health crisis might be able to be prevented or lessened.

High school graduation rates relate closely to poverty. Not graduating from high school is linked to a variety of factors that can negatively impact health. This includes limited employment prospects, low wages, and poverty. Individuals who do not complete high school may experience poor health and premature death (Krueger, et al., 2015). These individuals are more likely to report suffering from at least one chronic health condition including asthma, diabetes, heart disease, high blood pressure, stroke, and stomach ulcers, compared to students who have graduated (Vaughn, et al., 2014). Along with health impacts finishing high school has been known to correlate with higher lifelong earning potential and an increase in employment prospects (Prus, 2011). It was found that full-time workers with a high school degree, compared to individuals without a high school degree earned about 24 percent more (US Department of Labor, 2019). The impact having a high school degree has on health is closely related to the opportunities it can lead to for an individual.

High school graduation rates impact state population health because education contributes not only to low levels of unemployment and poverty in a state but increased levels of health literacy. Health literacy is important because everyone should be able to understand and use health information and services (CDC, 2023). Education gives individuals the tools to seek out needed information and use what they have learned. This is important when in a health crisis because people need to understand what the illnesses might entail and what they can do to stay heathy. Studies have found that increased health literacy leads to prevention of comorbidities.

Comorbidities including hypertension, cardiovascular disease, and diabetes were common among deaths due to Covid-19 (Djaharuddin, et al., 2021). More than half of patients throughout the pandemic suffered from two or more comorbidities (Djaharuddin, et al., 2021). During a health crisis individuals need to be knowledgeable of how to prevent comorbidities and stay healthy. Being at peak health can help lessen the impact of illness.

MAIN FINDINGS ON CASE RATES

The percentage of a state's population over 65 years was another significant indicator of health outcomes among the data in both single and multivariate regression. Multiple studies have found that the outcome and severity of Covid-19 mostly depends on patient age (Mueller et al., 2020; Romero et al., 2020; CDC MMM, 2020). This age group is more likely to have comorbidities including cardiovascular disease, diabetes, and obesity, which can increase the risk of severe illness. It was found that the over 65 population represented 80% of hospitalizations and was 23 times more likely to die than those under 65 (Mueller, et al., 2020). While this population died at a disproportional rate, a negative trend was found when running both single and multivariate regression tests. The percentage of the population over 65 was also the only indicator for case rates that was significant when party affiliation was considered in the multivariate model. This is a significant finding because it is interesting to note that during the first couple of months of the pandemic, incidence rates were highest among adults aged ≥80 years (CDC MMWR, 2020). The negative correlation found could be due to my data using annual totals. By the end of June, incidence rates had increased in all age groups, but young adults aged 18–24 years had the most rapid rate of increase and highest overall incidence and continued to increase over the year 2020 (CDC MMWR, 2020).

GRAPH 3

Graph 3 shows the impact of disease progression because on the top left corner of the model there is a cluster of states that need to be acknowledged. Massachusetts, New York, New Jersey, Rhode Island, and Connecticut are all Democratic northeastern states, that were impacted early on in the pandemic. If Graph 3 accounted for time and progression of illness, both death and case rates would have upwards trends. In the first two months of the pandemic New York had around 200,000 laboratory confirmed cases, which was one of the highest in the world at the time (Thompson et al., 2020). My findings have shown that Democratic leaning states have lower rates of poverty and unemployment, and higher rates of education and income. Research has found that Democrats are more likely than Republicans to represent urban and diverse communities (Mitchell, 2020). They were also the places hit the hardest early on in the pandemic.

POLITICAL POLARIZATION AFFECTS CASE RATES

As the pandemic progressed there was growing evidence that the public and governmental responses to the virus became highly politicized in the US. My analysis found political party affiliations to have the highest statistical significance among indicators tested. Recent studies have corroborated that the higher the exposure to conservatism on each of these political metrics, which included "political ideology of US federal elected representatives in the House or Senate, their lack of support for 4 Covid-19 relief bills, and Republican trifectas (Governor, State House, and State Senate under the same political party control)," the higher death rates were (Krieger, 2022). Differences in core response programs between the party heads increasing were shown throughout the pandemic. Where in the past party affiliation was not a factor that contributed to health outcomes, during the pandemic it was.

CHAPTER 4: VERMONT VS. SOUTH DAKOTA

INTRODUCTION

In addition to the state level statistical analysis, I specifically looked further into Covid-19 policies and social demographics of two states: Vermont and South Dakota. This state pair was analyzed further because their demographics are very similar on a superficial level. Both states have similar population sizes, age and race demographics, median household incomes, urban percentages, and education demographics, but had very different responses to the Covid-19 pandemic (Table 6). The big difference is that the states' party affiliation demographic percentages are essentially reversed. This created two very different state responses to the Covid-19 crisis. Even with both states having Republican governors, there was a difference in prioritization of public health and the economy when comparing each state's response to the Covid-19 health crisis.

Vermont's Governor Phil Scott placed many restrictions and mandates on the state population, while South Dakota's Governor Kristi Noem preferred a more relaxed approach with no mandates or restrictions. Scott said in a public briefing, "My decisions throughout this pandemic, from the closures and other mitigation steps in March and April, to the methodical reopening of our economy, hospitals and schools, has been based on the data, the science and the recommendations of our health experts," (Tupper, 2020). While Gov. Noem stated in a press release, just as the U.S. had passed 500,000 deaths, "I've been saying for months … that the media and Democrats were using this virus to promote fear and a political agenda," (Tupper,

2020). These very different responses illustrate how public health initiatives like mask mandates, social distancing, and stay-at-home orders limited the amount of people who contracted the illness.

METHODS AND DATA COLLECTION

The US Census Bureau, Centers for Disease Control (CDC) and Pew Research Center were used to collect this additional state data which included age and racial composition, median household income, population totals, education completion percentages, unemployment and poverty rates, income per capita, and urban percentage. In addition to comparing state profiles, I also examined state policies to look at government mandates, state ideology and reactions surrounding Covid-19, and the timeline of policy put in place. This comparison of Vermont and South Dakota during the Covid-19 pandemic is used to illustrate how public health prevention methods impact health outcomes.

RESULTS

Timelines for both states' responses are shown in Table 6.

TIMELINE: VERMONT

Governor Phil Scott issued a stay-at-home order from March 24, 2020, to May 15, 2020, and a 318-day mask mandate from August 1, 2020, to June 14, 2021 (State of Vermont, 2021). The statewide mask mandate required people older than the age of two to wear masks in public places. On May 1, 2020, Scott lifted the outdoor mask requirement in settings where social distancing was possible (State of Vermont, 2021). On May 14, 2021, Scott announced that fully vaccinated individuals would no longer be required to wear masks while indoors (State of

Vermont, 2021). On June 14, 2021, Scott ended the statewide mask requirement for everyone, including unvaccinated people (State of Vermont, 2021).

A travel restriction was imposed on March 30, 2020. Scott concluded that unvaccinated out-of-state travelers and returning residents had to quarantine for 10 days or present a negative Covid-19 test upon arrival on May 14, 2021 (State of Vermont, 2021). Gov. Scott issued an addendum to Executive Order 01-20, on March 30, 2020, which required all residents and non-residents to travel to Vermont to self-quarantine for two weeks. Those traveling for essential purposes were exempt from this order. Essential purposes were defined as traveling for safety, food, beverages, medicine, healthcare, and care for others (State of Vermont, 2021). Scott also asked potential travelers to postpone their travel to Vermont if they were presenting with symptoms or coming from an area with high Covid-19 infection rates. On June 5, 2020, Gov Scott announced that the quarantine requirement would be lifted for out-of-state travelers from counties across New England with similar Covid-19 caseloads to Vermont starting June 8 (State of Vermont, 2021). The Agency of Commerce and Community released a map identifying quarantined and non-quarantined counties. Additionally, Vermont residents were allowed to travel to non-quarantined counties and return home without quarantine for 14 days. Beginning on July 1, out-of-state visitors arriving from low-risk counties in Pennsylvania, New Jersey, Delaware, Maryland, Washington D.C., Virginia, and West Virginia in a personal vehicle were no longer required to quarantine for 14-days after arriving in Vermont. Vermont residents who visited those counties and then returned home were also not quarantined (State of Vermont, 2021). On November 11, 2020, Gov. Scott issued an order requiring all visitors to Vermont to quarantine for 21 days upon arrival. Visitors were tested for Covid-19 and could end quarantine early if they test negative. Visitors engaged in essential travel were exempt from the quarantine

requirements (State of Vermont, 2021). Gov. Scott then announced that beginning on February 23, 2020, fully vaccinated residents traveling to other states were not required to quarantine upon returning to Vermont (State of Vermont, 2021). Scott also stated that fully vaccinated out-of-state travelers would not need to quarantine if they can provide proof of vaccination. On June 14, 2021, Gov. Scott lifted the mask mandate (State of Vermont, 2021).

TIMELINE: SOUTH DAKOTA

In contrast, South Dakota's Governor Kristi Noem did not put into to effect any stay-at-home orders or mask mandates. She left any decisions to the local governments in South Dakota. Noem did release a plan to the state that was a list of recommendations residents were encouraged to follow. On April 29, 2020, Gov. Noem released the outline for this Back to Normal plan. On March 23, 2020, Noem released a statement that discussed the following recommendations in regard to the Back to Normal plan (South Dakota Gov., 2020):

1. To reduce the likeliness of the spread of disease, Noem recommended CDC hygiene practices.
2. For eight weeks or more there will be a "difficult and limited social environment," because Covid-19 is not a short-term challenge.
3. Noem encouraged residents to innovate and continue entrepreneurial excellence in this "difficult and uncertain environment".
4. She encouraged staff to telework and recommended implementation of social distancing measures, the limit of unnecessary work gatherings and non-essential travel, and to consider CDC guidance health checks.
5. Recommended, if possible, for essential stores to offer special shopping times and access periods for populations particularly susceptible to Covid-19.

6. Recommended social distances and outdoor dining for enclosed retail business that promotes public gatherings (bars, restaurants, breweries, cafes, casinos, coffee shops, recreational or athletic facilities, health clubs, or entertainment venues).
7. As recommended by CDC guidance, if possible, suspend or modify business practices involving ten or more people in an enclosed space where social distancing 6 feet apart is not possible.
8. Continue offering or consider offering business models that do not involve public gatherings, including takeout, delivery, drive-through, curbside service, off-site services, social distancing models, or other innovative business practices that do not involve public gatherings in an enclosed space.
9. Consider business arrangements and innovative ideas intended to support the critical infrastructure sectors, as defined by the Department of Homeland Security.

On March 17, 2020, schools in the state were closed to in-person instruction. Noem decided to permanently close schools for the remainder of the 2019-2020 academic year, on April 6, 2020. This was the only state mandate closure that Noem had implemented.

STURGIS MOTORCYCLE RALLY

From August 7-16, 2020, the Sturgis Motorcycle Rally took place. Due to the lack of mandates and restrictions that South Dakota had, the rally became a Covid-19 epicenter. It was the largest public gathering to take place in the U.S. since the start of the pandemic in 2020 (Dave et al., 2021). The rally shows the impact of factors that contribute to the spread of

infectious diseases. From August 7–16, 2020, approximately 500,000 motorcycle enthusiasts traveled to Sturgis, South Dakota (Firestone et al., 2020). There were no mask mandates or other requirements to prevent the spread of the disease. Research has found that rallies have led to an increase in case rates by 6.4–12.5% (Dave, et al., 2021). There were 463 primary cases reported within two weeks of the rally, and another 186 were identified as secondary contacts, making 649 total cases traced back to the event (Firestone et al., 2020). The CDC reported that the rally had many characteristics of a superspreading event.

The CDC conducted a study on the outbreak (Firestone, et al., 2020). It was found that in Meade County, where Sturgis is located, the 14-day testing volume rose 199% and incidence rates increased from 5% to 8% from August to September (Firestone, et al., 2020). The CDC reported that the rally resulted in 649 cases, 17 hospitalizations, and one death. Of the reported cases, 56 % were reported in South Dakota and bordering states including Minnesota, Montana, North Dakota, Nebraska, and Wyoming. After further investigation, it was found that 86 Minnesota Covid-19 cases were associated with the South Dakota motorcycle rally, and approximately one-third of the counties in Minnesota reported at least one case that had a link to the rally (Firestone, et al., 2020). These findings highlight the impact that gatherings in one area may have on another area. The Sturgis Motorcycle Rally not only had a direct impact on the health of attendees but also led to subsequent infections among household, social, and workplace contacts of rally attendees upon their return to their respective states (Firestone, et al., 2020).

TABLE 6: VERMONT AND SOUTH DAKOTA COVID-19 TIMELINE

Date	**Vermont**	**South Dakota**
March 15, 2020	Initial school close.	
March 17, 2020		Initial school close.
March 23, 2020		Noem made state guideline recommendations.
March 24, 2020	Stay-at-home order was put in place	
March 26, 2020	In-person school instruction was closed for the remainder of the 2019-2020 academic year.	
March 30, 2020	Travel restrictions put in place.	
April 6, 2020		In-person school instruction was closed for the remainder of the 2019-2020 academic year.
April 29, 2020		Back to normal plan was released and outlined.
May 15, 2020	Stay-at-home order lifted	
June 5, 2020	Quarantine requirements for out of state residents in similar case load states	
June 26, 2020	Travel by car, no 14-day quarantine.	
August 7-16, 2020		Sturgis Motorcycle Rally
November 11, 2020	Order required all visitors to Vermont to quarantine for 14 days upon arrival but added that after 7 days, visitors can take a Covid-19 test and end their quarantine early if they test negative.	
February 19, 2021	Scott announced that fully vaccinated residents who travel to another state will no longer need to quarantine when returning to Vermont	
May 14, 2021	Vermont Gov. Scott ended the requirement that unvaccinated out-of-state travelers and returning residents quarantine for 10 days or present a negative Covid-19 test upon arrival	
June 14, 2021	Mask mandate lifted	

STATE COMPARISON

TABLE 7: ECONOMIC DIFFERENCES

Vermont and South Dakota residents experienced very different environments created by mandates and policies over the pandemic. Both states pride themselves on the recovery their economies had seen after the pandemic. Vermont experienced a higher unemployment rate during 2020 than South Dakota (Table 7). Vermont ranked closely behind South Dakota in national categories, like unemployment rates, where South Dakota ranked second, with 4.1 %, and Vermont ranked third, with 4.2 %. This was a major topic of discussion among political leaders in each state.

This could have been due to the stay-at-home order that was in place at the time, especially because South Dakota had only recommended their residents to stay-at-home but there was no official state mandate requiring people to stay home. The states had very similar trends and ultimately at the end of 2020 had returned to unemployment rates that represented normal pre-pandemic percentages.

TABLE 7, GRAPHS 6 AND 7: SPREAD OF COVID-19

Differences in the spread disease in Vermont and South Dakota stemmed from variation in the state responses. Vermont experienced a low infection rate in 2020, around 4% with a death rate of close to 1% while, South Dakota experienced a higher infection rate, around 17%, with a death rate closer to 11%. Graphs 6 and 7 show the differences seen in outcome data. These trends could be due to Vermont having a 318-day mask mandate and a 51 day stay-at-home order, and South Dakota not putting in place any restrictions (State of Vermont, 2021). Vermont also had extensive travel restrictions for both residents and non-residents. In contrast, South Dakota had no travel restrictions and as previously stated in the results section had allowed a

"super spreader" event without placing any limitations, like mask wearing or social distancing guidelines.

MESSAGE AND THE SPREAD OF INFORMATION

The two governors had different approaches to informing people, but both held press conferences. Gov. Scott held daily press conferences at the start of the pandemic and then twice a week as the pandemic progressed (State of Vermont, 2021). Gov. Noem during the initial wave of the pandemic had sporadic weekly meetings when needed to address the question people had, but as the pandemic progressed Noem started to do press conferences less frequently (Covid-19 News South Dakota, 2023). How each governor communicated and framed information presented to people in their state was contrasting. Gov. Scott's focus was on the health of the individuals and adhering to guidelines being mandated. Gov. Noem focused on guidelines that her residents should follow, although she would not mandate these guidelines. Noem stressed the importance of freedom and autonomy in Covid-19 responses. As the pandemic progressed, Noem encouraged people to see Donald Trump when the president attended a fireworks display at Mount Rushmore (July) and to attend the Sturgis motorcycle rally (August). Noem even states, "I trusted my people, they trusted me, and South Dakota is in a good spot in our fight against COVID-19. The #Sturgis motorcycle rally starts this weekend, and we're excited for visitors to see what our great state has to offer!" in a tweet on August 6, 2020 (Twitter Kristi Noem, 2020). This was very different from the message that Phil Scott preached. Gov. Scott focused on science and providing his residents with an understandable version of the current updates circling at the time (State of Vermont, 2021).

TABLE 7: VERMONT AND SOUTH DAKOTA STATE DEMOGRAPHICS IN 2020

Variable	Vermont	South Dakota
Population[1]	643,077	886,667
Age Demographics (above 65) [1]	20.6%	17.6%
White %[1]	89.8%	80.9%
Black %[1]	1.4%	2.0%
Median Household Income[1]	$67,717	$61,149
% Without a High School degree [3]	6.1%	7.5%
% With a College Degree[3]	40.9%	30.0%
Unemployment Rates[4]	5.6	4.3
Poverty Rate[1]	10.2%	11.9%
Income Per-Capita[1]	$40,016	$35,135
Urban Percentage[1]	38.9%	56.7%
Republican Lean[2]	29.0%	53.0%
Democratic Lean[2]	57.0%	37.0%

Note: All data can be found at corresponding notated websites.

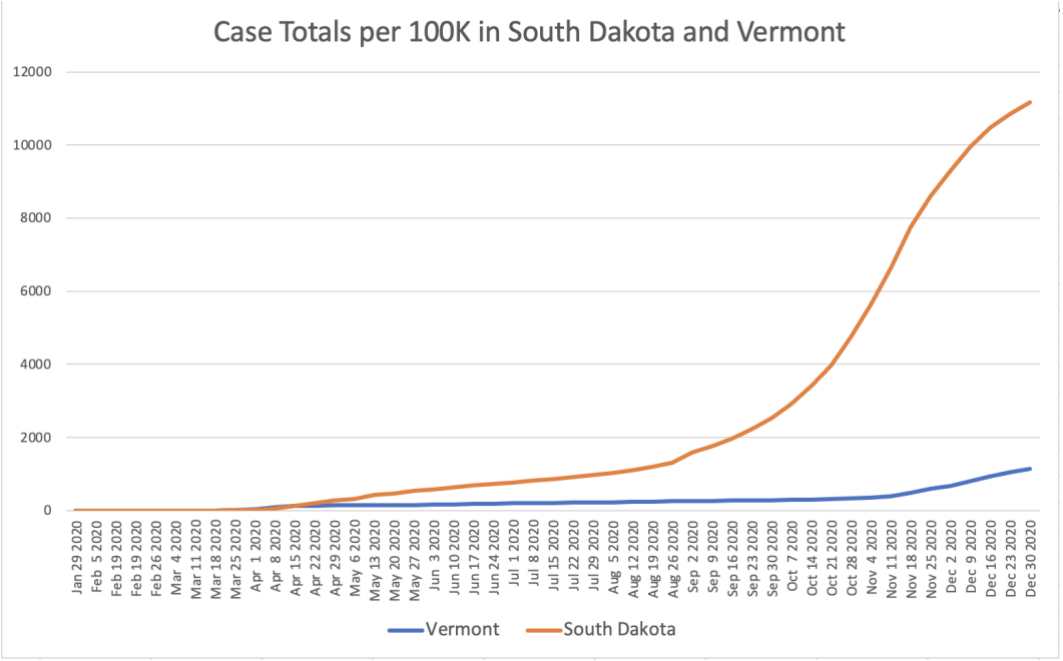
1: U.S. Census Bureau: https://www.census.gov

2: Pew Research Center: https://www.pewresearch.org/religion/religious-landscape-study/compare/party-affiliation/by/state/

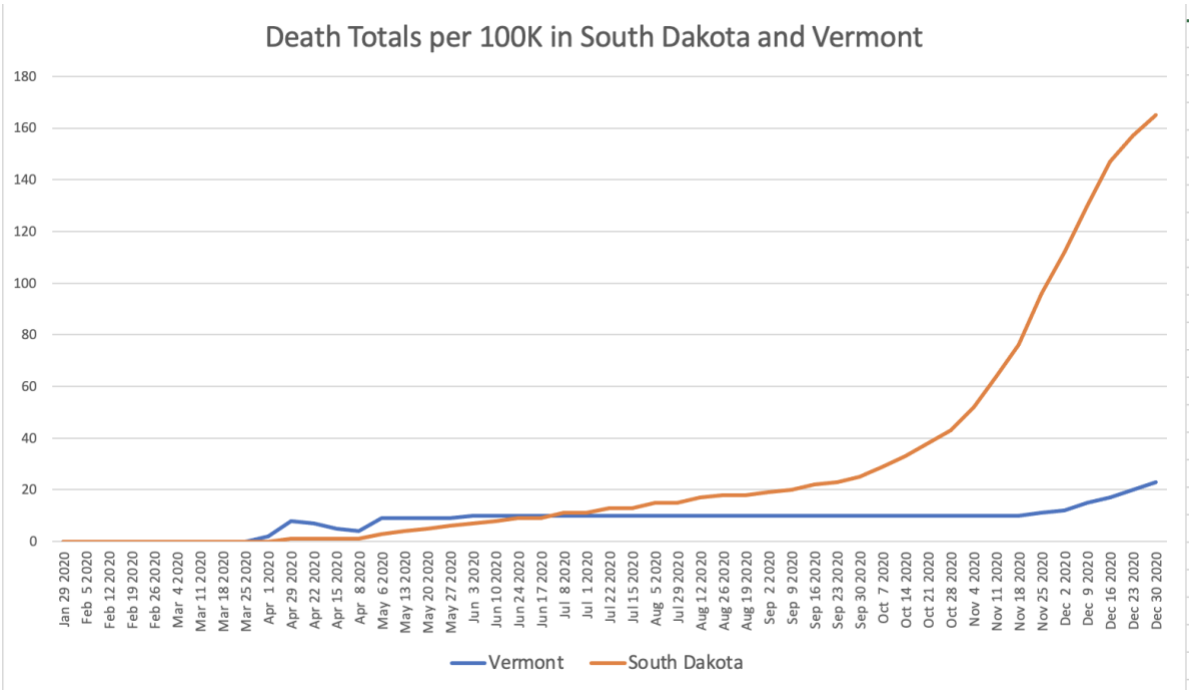
3: USDA: https://data.ers.usda.gov/reports.aspx?ID=17829

4: U.S Bureau of Labor Statistics: https://www.bls.gov/lau/lastrk20.htm

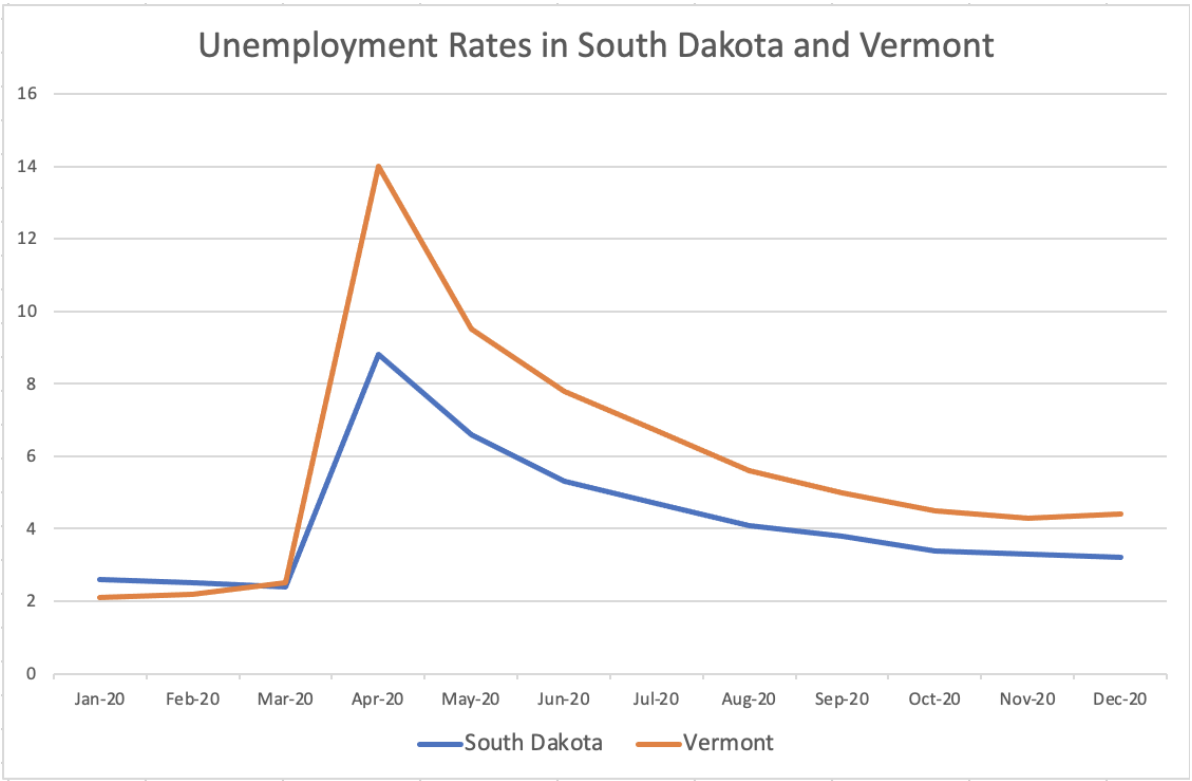
GRAPH 6: COVID-19 INFECTION TOTALS PER 100K IN SOUTH DAKOTA AND VERMONT THROUGHOUT 2020



GRAPH 7: COVID-19 DEATH TOTALS PER 100K IN SOUTH DAKOTA AND VERMONT THROUGHOUT 2020



GRAPH 8: UNEMPLOYMENT RATES IN SOUTH DAKOTA AND VERMONT THROUGHOUT 2020



DISCUSSION

Unemployment rates were a major topic of discussion in South Dakota because South Dakota's Governor prides herself on having one of the best state financial recoveries after the pandemic. Compared to South Dakota, Vermont climbed to a higher rate of unemployment while having lower infection and death rates. Without a large population loss, Vermont was able to recover financially at a faster rate. Governor Phil Scott said in a press release that he attributes this to his focus on science rather than politics (Scott, April 2020). He believed that he, "could reopen the economy and do the appropriate public health measures for the pandemic in parallel" and that the state "didn't have to sacrifice one for the other," (Scott, April 2020). He further stated, "My decisions throughout this pandemic, from the closures and other mitigation steps in March and April, to the methodical reopening of our economy, hospitals and schools, has been based on the data, the science and the recommendations of our health experts," (Scott, April 2020). There was a clear difference in responses between the states. Governor Kristi Noem stated in a press release, "I'm opposed to a statewide mask mandate…I've been clear about that."(Dimock, 2020).

The states took a very different approach in protecting people. While Vermont put in place mandatory shutdowns, Governor Noem stated on Fox News, "I believe in our freedoms and liberties. What I've seen across the country is so many people give up their liberties for just a little bit of security and they don't have to do that. If a leader will take too much power in a time of crisis, that is how we lose our country," (Kaplan, 2020). This statement was made around the time Covid-19 case totals in South Dakota were drastically increasing. Major breakouts had appeared at larger recreational and work-related gatherings. Factories became breeding grounds for outbreaks. The South Dakota Smithfield pork supplier factory, one of the largest in the

country, was forced to close indefinitely in April 2020, due to over 700 employees contracting Covid-19 (Aratani, 2020). Around the same time, Scott had imposed a statewide mandate and donated over 300,000 cloth face coverings to “towns, school nurses, community action agencies, the Vermont Department of Health Equity Team and district offices, emergency response agencies, the Vermont National Guard and food distribution sites,” (Scott, August 2020). Scott stated in his, August 13 press release, “I'm asking you to look at the data — the real data, not just something you see on Facebook — and realize that the science is real," Scott said, "and that wearing a mask will not only protect the gains we've made, but also help your family members and friends stay healthy,” (Scott, August 2020).

Noem claimed in many press conferences that stay-at-home orders would not have prevented outbreaks seen in her state. Even if these were essential workplaces, mask mandates and social distancing prevention initiatives would have decreased the rates of Covid-19 outcomes that the state had seen. Vermont is an example of this concept. The state had a mask mandate and stay-at-home order. Graphs 6 and 7 show the major differences seen over `time in state case numbers. Both states initially started off with similar totals, but in June 2020 a split between South Dakota and Vermont outcome data was observed. The summer of 2020 marked a clear place in the data where Vermont cases and deaths had a constant incline, and South Dakota outcomes rose rapidly. Clearly, Vermont’s prevention measures saved lives and led to fewer cases and deaths compared to South Dakota.

CHAPTER 5: INTERPRETATION AND CONCLUSION

LIMITATIONS

My research is not without limitations. Having a small sample size has a higher risk of not being a true representation of population statistics. A small sample size has a lack of precision because it is affected by chance data. Using state data, individualistic conclusions cannot be drawn from the data. State level data limits conclusions to connections between factors without addressing specifics on why something may have a connection. A key limitation of the current state Covid-19 research is its cross-sectional nature, which limits the inferences that can be made regarding the effects indicators have on health outcomes. Other limitations that I found were the fast pace changing characteristics of the pandemic. The timeline of disease progression in each state was different. This led to discrepancies in data due to collection of totals being from December 31, 2020. Only analyzing at a year can limit the inferences being made about the data collected because one year does not paint the whole picture of the pandemic.

While these limitations need to be acknowledged for the purpose of this paper, state data was used to show the broader picture and potential impact of variables on outcome data. Looking at populations who may be more or less susceptible to Covid-19 helps draw connections for policy and program making. State level state can identify risk factors that go beyond the individual. Being able to create a program that helps close inequity gaps in certain populations is a step the public health field can take with state level data.

THE IMPACT OF DISEASE PROGRESSION ON COVID-19 OUTCOME DATA

The progression of the pandemic was different for each state. Parts of the country had surges of illness earlier than others. Larger cities were early epicenters for Covid-19. In March and April the first spike in deaths was seen in New York City and the surrounding areas. The states were averaging more than 50-150 new deaths every day (Atske, 2023). Throughout the U.S. new deaths fell in May and June, then rose again at the beginning of July. This is when Northeastern states, who had been hit the hardest throughout the beginning of the pandemic, started to see decreases in case rates. This was the opposite for states in the South and Southwest. Texas, Florida, and Arizona reported record numbers of new deaths during the summer months (CDC Museum, 2023). At the start of the pandemic deaths were concentrated in a few heavily urbanized cities (CDC Museum, 2023). As it progressed, deaths increased in suburban and rural areas. During August and September there was a decrease in overall new deaths nationwide, but by October there was another spike in cases. This spike was concentrated in the Midwest and mountain states. Montana, for example, averaged less than one death per day prior to October with a total of 179 total deaths in the first seven months of the pandemic (CDC Museum, 2023). By November Montana was seeing daily death totals of around 500 people. This geographical progression throughout the pandemic is important to acknowledge because there were changes to illness outcome rates every month for each state.

As the pandemic proceeded, where epicenters were emerging changed geographically. Research has found that from March 2020 to early June 2020, Republican leaning states had lower Covid-19 incidence rates than Democratic leaning state (Neelon, et al., 2021). It was further found that in June of 2020 the association reversed, Republican leaning states had a

higher incidence rate. This trend continued through early December 2020. For death rates, Republican leaning states had lower rates early in the pandemic but higher rates from July through December 2020 (Neelon, et al., 2021). My data looking at 2020 does not account for the peaks and valleys seen throughout the data. Analyzing the entirety of the pandemic timeline could allow us to understand the dynamics better.

POLITICAL POLARIZATION

Analyzing the initial wave of the pandemic in 2020 has increasingly shown the importance of social sciences in evaluating public opinion and the impact of non-medical interventions, "such as mask wearing, social distancing, hand washing, and self-isolation," (Van Bavel, et al., 2020). With the absence of vaccines or effective antiviral treatment at the beginning of the pandemic, analysis of ideology and behavior can show how effective health policy will work. Following the pandemic, the Director General of the WHO warns that increasing political polarization has the ability to be a direct threat to the effectiveness of pandemic disease management (Kerr, 2021). In today's climate, political affiliation and ideology is not only an indicator of trust and understanding of science but the support for key Covid-19 health policies (Rutiens, et al., 2021). A study found that "compared to liberals, conservatives will show significantly less trust in, and support for, science that identifies the environmental and public health impacts of economic production," (McCright, et al. 2013). Other researchers add to this statement by implying that some research suggests that the aversion is not inherent to science, but rather to what the science implies for public policy (Campbell and Kay, 2014). These differences pose a problem in regard to pandemic health policy.

Democratic governors, when asked about what lessons the country can learn from the pandemic, were more likely to talk about the need for better preparation, greater trust in public health guidance, and faster responses to a crisis (Pasquini and Saks, 2022). While better preparation was also a common response among Republicans, research has found that responses differ in tone and include low trust in government officials. Along with the push to avoid shutdowns, and need for individual freedom (Pasquini and Saks, 2022). Narratives play a significant role in how political parties use their platforms when informing their constituents. The public narrative stances that the Republican and Democratic parties have taken have also significantly impacted potential policy solutions. Parties' differing perspectives have become major health threats during the pandemic. Throughout February and March 2020, President Trump consistently downplayed the virus, describing it as "mild" and "under control," while opposition leaders warned that the crisis was far worse (Glueck, et al., 2020). In fact, Bernie Sanders described the pandemic as, "on the scale of a major war" (Glueck et al., 2020). A Pew research poll from March 2020 reported that "78% of Democratic party supporters considered the virus a major threat to the health of the US population, compared to only 52% Republicans," (Pew, 2020).

Social media platforms, such as Twitter, Instagram, and TikTok, have always been used for mass communication. During the pandemic, instead of being used to spread their normal content they began to be used by many to push a polarized narrative. A recent large-scale analysis of tweets by members of the U.S. House and Senate during the Covid-19 pandemic confirms high levels of polarization in elite communication to the public. Congressional Democrats discussed the pandemic more frequently and emphasized threats to public health more than Republicans (Green et al. 2020). Two national studies reported that conservative

political ideology is significantly linked to greater trust in government authorities to manage the Covid-19 pandemic, lower trust in scientists, specifically the WHO, and a lower perceived risk of the virus. It also stated that these ideological differences are significantly associated with behaviors such as wearing a mask or handwashing, which fewer conservatives reported compared to liberal counterparts (Green, et al. 2020). In April 2020, President Trump tweeted "LIBERATE VIRGINIA, and save your great 2nd Amendment. It is under siege!" as part of a controversial attempt to encourage conservative protestors to roll back stay-at-home orders in three states with Democratic governors (Martelle, 2020). This was at a point in the pandemic where both cases and deaths were rising rapidly in most states and the head of the U.S. government was driving a narrative opposing science. While President Trump's lack of regard to Covid-19 impact was an extreme narrative seen among the Republican party heads, the lack of support and acknowledgement of the pandemic was common among members of the Republican party.

Political motivation for health policy can have a negative influence on population health if polarization continues. Reports show that liberals, compared to conservatives, express greater concern over risks that pose a threat not only to the individual but to society as a whole, such as for example, smoking, pesticides, and handguns (Choma, et al., 2013). For future population health decisions, policy makers need to take into consideration social factors, specifically political motivation. Prioritizing addressing the impact of political affiliation on population health can lead to lessening the impact of a health crisis on state populations.

Major decisions made regarding population health during the pandemic were left to state governments (Parmet, 2022). Differences among responses and policy implantation showed that party affiliation can have an impact on state decisions. The pandemic is a great example of what

happens when national health crisis decisions are left to the state. Differences in mandates and policies led to variations among outcomes in states. Having national strategies for prevention and crisis response is important. Disaster responses often involve coordination among multiple levels of government as well as public and private sector collaborations (Pollack, et al., 2018). When emergencies raise health concerns, governments must include public health and health care systems in their response (Pollack, et al., 2018). The federal government is more equipped in my opinion to handle these situations specifically for Covid-19 due to the large scale of the crisis. Due to a lack of cohesive responses, such as limited cooperation and partisan polarity, the U.S. is increasingly unable to meet the nation's health threats. While most health threats do not require a nationwide solution, Covid-19 showed the importance of having a cohesive national response because of its large-scale impact. Disparities in Covid-19 outcomes raise the question of the need for a cohesive response. The public health field needs to push for a national crisis response. This should include policies that mandate states to respond to certain health crises with specific programs and policies. While this idea pushes the boundaries between federal and state powers, there is a need for a consistent crisis response.

IDEOLOGY

Political ideology played a big part in outcomes seen throughout the pandemic. Even though Vermont and South Dakota both have Republican governors, different political ideologies were represented. The results seen in both states showed the importance of ideology in crisis prevention as well as public health overall. While party affiliation has shown to be significant, there are other factors that contribute to it. Party ideology played a big part in how populations reacted to Covid-19. Depending on what party an individual supported influenced

the beliefs and ideas they had about Covid-19. While the influence of political ideology on health behaviors may not be widely considered in public health research or policy making, there is research that finds a correlation between party affiliation and an individual's habits regarding diet, exercise, and other health behaviors (Kannan, et al., 2018). Ideas shape an individual's belief system (Prinja, 2010). An individual's health related attitudes, beliefs, and behaviors have been found to have a dependence on their ideological community. Political communities can be a highly influential space for someone. Many rely on their immediate community as well as groups they may identify with for information as well as behavior norms. While health attitudes and behaviors look at ideas of personal risk, during the pandemic we have seen how political ideology and affiliation strongly influence health behaviors. People rely on social groups they identify with, to make the determinations for them as to how they should act or behave (Nimmon, et.al., 2019). This is because most individuals only have a limited understanding of complex issues.

Democrats and Republicans have several fundamental differences in their overall party ideology. The Democratic Party is generally associated with more progressive policies (Silver, et al., 2022). They are in favor of the federal government and play a larger role in social affairs. With regard to social and human ideas, Democrats placed importance on equality as well as social and community responsibility (Silver, et al., 2022). Democrats typically advocate for the civil rights of ethnic and religious minorities and support a safety net for individuals. These safety nets include various social welfare programs including Medicaid and food stamps (Silver, et al., 2022). Democrats often endorse funding programs and initiatives through taxation. Some major programs most Democrats tend to support are environmental protection programs, gun control, less-strict immigration laws, and worker rights (Webster and Abramowitz, 2017).

In comparison, Republicans tend to advocate for smaller government by pushing for reduced taxes, advancing individual economic freedom, and they generally support conservative social policies (Silver, et al., 2022). Republicans' political ideology tends to emphasize the importance of individual freedom, rights, and responsibilities (Silver, et al., 2022). Republicans also tend to push for an economy with fewer government regulations and government-funded social programs (Silver, et al., 2022). Regarding foreign policy, the Republican Party has traditionally supported a strong national defense. Many Republicans also support states' rights over the power of the federal government (Webster and Abramowitz, 2017). Studies have found that Republicans are more likely than Democrats to cite religion as a source of meaning in their lives and are more likely (12% vs. 6%) to bring up freedom and independence as something that gives their life meaning compared to Democratic counterparts (Silver, et al., 2022).

During the pandemic people looked up to Governors and other social figures to get their information (Nadeem, 2023). This could be an explanation of reactions to the pandemic in not only Vermont and South Dakota, but the rest of the country. Party affiliation carries deeply rooted ideology, attitudes, beliefs, and values (Geana, et al., 2021). When a specific group commits to a belief or idea, especially during a crisis, it can be highly influential. This was seen in an individual's belief of the existence of pandemic and Covid-19, as well as willingness to participate in prevention measures like wearing a mask or social distancing.

Most people looked to party heads and news outlets to help relay needed knowledge (Anwar, et al., 2020). A majority of individuals during the pandemic did not take the time to learn the Covid-19 disease's complexities such as the details of transmission and infection rates of the virus. This opened up many people to be influenced by their ideological community, who tend to teach with bias. When people get information from media, whether it is a news outlet or

social media, they expect creditable information. Mass media played a huge role in circulation of information and the influence of public behavior, specifically toward the spread of disease (Anwar, et al., 2020). Spread of information was rapid during time periods of shut down and early on in the pandemic, when most of the information about Covid-19 was unknown. Any information that was in circulation was taken as truth. This led to many misconnections about the virus and some media outlets using their platform as a push for distrust in pandemic science. Opposing narratives became a big part of pandemic news among politics. These oppositions led to an increase in polarization, especially when dealing with a health crisis.

Along with ideology and belief, trust and distrust of scientific information throughout the pandemic stemmed from the amount of knowledge individuals were given. It was fueled by the amount of access individuals had to the correct information. Vermont was a prime example of this because Governor Scott had daily press conferences throughout the beginning of the pandemic (State of Vermont, 2021). These press conferences covered all incoming information about Covid-19. Scott made the information digestible to lay people without losing important scientific ideas. Being open and communicative of the new information gave Vermonters a clear idea of the impact the virus had and what they could do to be safe. Being exposed to the correct information can be very important because it leaves less room for individuals to go and seek out the wrong facts. This was seen in South Dakota. Governor Noem held some press conferences, but even when she did, they were focused more on the economy rather than population health.

This shows the influence of health literacy and access to correct information. People need to be able to decipher misconceptions from facts, while having access to knowledge that will improve their health outcomes. When an individual does not listen to science that proves mask and social distancing helps prevent spread of disease, lack of trust and the impact of influence

from opposing ideology is represented. Health literacy is important because individuals at some point need to be able to look for, understand, and use health information and services (CDC, 2022). Being able to understand what the pandemic might entail and what individuals need to do to stay healthy is important.

To combat and prevent health crises, the public health field needs to account for political ideology and how people react to information. Looking at what contributes to how people are influenced could be a key step in getting individuals to comply with mandates during a health crisis. Influence from social networks and heath literacy are important ideas that should be taken into consideration. When designing programs and initiatives to promote health behavior, ask questions about the population: *Who are people going to listen to?* and *How are they going to take the information being given to them?* can be helpful. The importance of these questions can be seen in the impact of influence among state figure heads.

PREPARING FOR THE NEXT PANDEMIC, WHAT THE PUBLIC HEALTH FIELD CAN DO?

Covid-19's presentation and impact on the population over the past three years has been unique. Although there are many viruses like it, there has not been a disease that has held the same amount of weight and impact. We must prepare for the next step in the future. Covid-19 has shown us how easily one outbreak can become a pandemic with detrimental effects. This health emergency showcased the role programs and the public health field can have in addressing health outcomes while exposing the importance of investments in public health and a nationwide pandemic preparedness strategy. Public health professionals play an important role in influencing the policies of local, national, and international organizations. The pandemic showed that we

need to focus on the consequences of inequalities in state responses and the lack of a cohesive unit in the face of a crisis.

Social influence is something that the public health field must take into account when designing policy and response programs for future crises. We need to find ways to understand how people process and use information that they might not necessarily understand or want to hear. Many people are affected by misconceptions and the beliefs of the people they surround themselves with. This can be dangerous especially with regard to health behaviors. The public health field needs to consider their audience when creating policy and programs. Social influence and how an individual may react, plays a role in whether people will listen to what is being said. One question that needs to be asked is: *How can the public health field use social influence as an advantage instead of the disadvantage or roadblock that it currently is?* Many individuals in the U.S. will only listen to certain people in their circles. Ideology and influence could be a resource public health programs use when looking to present a population with important information.

Public health policy especially in a crisis, needs to look at what influences how people make decisions and health behavior choices. People listen to their peers and community leaders. Targeting this tendency could be key to success of prevention methods and future public health policies. Using influence is an advantage that can shape information being presented into something that is digestible and catered to specific groups. Catering the delivery of information is one way the public health field can help more people and boost population health.

Governor Phil Scott is an example of how the public health field can use party heads to influence behavior and beliefs in certain populations. Scott was successful throughout the pandemic due to his duality between the major political parties. He appealed to people from both parties because while he is a Republican, Scott's actions lean more towards the political actions

of a Democrat. I think he was successful because he was able to depolarize the pandemic and make it about the disease rather than big party politics that were trending at the time. Scott pushed for support of science while providing resources to people in Vermont. He used the government to provide for people without making his platform feel like the controlling power some people view it as. While he supported the scientific evidence when rolling out Covid-19 pandemic responses, Scott also showed his support for the economy when the people of Vermont questioned the impact the pandemic would have on businesses. He catered to both groups of people in his state and because of this, he was able to have a united response that most people in the state supported.

Vermont is a perfect model for the country to learn from because Phil Scott showed how Democrats and Republicans could work together to save people. Vermont has a very large liberal backing in its urban cities as well as a large conservative population in its rural communities. Even with these opposing demographics Vermont had one of the lowest case and death rates in the country for most of the pandemic and as well as one of the lowest unemployment rates by the end of 2021. Scott's political duality allowed him to serve as the connecting piece in Vermont's government and appealed to people of all backgrounds in his state. Phil Scott is a great example, on a smaller scale, of what the U.S. would have benefited from in regard to having a cohesive Covid-19 response. Vermont's pandemic response and recovery showed how even if wellbeing and health is prioritized, a state's economy can recover. Phil Scott's successful pandemic response highlights the need for the U.S. government to learn how to compromise during a health emergency.

Using social influence as an advantage is an important step that public health programs can take when trying to create initiatives directed at populations that might not listen to

information when it is delivered in a traditional way. Finding nontraditional ways of communicating information might be the next step public health programs should take. This approach can get people to listen to science and change health behaviors to keep state populations healthy during a crisis. Using community groups to spread information could be a way to implement this. If the information comes from someone the individual trusts, they will be more likely to listen and not immediately shy away from the information. Would the pandemic have had a different impact if Republican party heads had shown more support? If Democrat and Republican parties worked together? While I think Covid-19 would still have a huge impact on the U.S., we might have had a better chance of combating the virus as a united force rather than a highly polarized society. Having a united front to combat the virus would have led to less variation in responses and outcomes. These variations in care and outcomes highlight the importance of the public health field. Public health workers advocate policy changes, the creation of a united front, and equity of care and prevention for everyone. To prevent and prepare for the next pandemic, the U.S. must fight for a more controlled and unified response program. Without these programs, future health crises may have a greater impact on the population than Covid-19 did.

CHAPTER 6: APPENDIX & RESOURCES

APPENDIX: TABLE 1

Data and Sources Citations

Dependent Variable	**Source of Data**
Covid-19 Death Rates	CDC Centers for Disease Control and Prevention. (n.d.). *CDC Covid Data tracker*. Centers for Disease Control and Prevention. Retrieved from, https://covid.cdc.gov/covid-data-tracker/#trends_totaldeaths_select_01
Covid-19 Incidence Rates	CDC Centers for Disease Control and Prevention. (n.d.). *CDC Covid Data tracker*. Centers for Disease Control and Prevention. Retrieved from, https://covid.cdc.gov/covid-data-tracker/#trends_totalcases_select_01
Social Determinants	**Source of Data**
State Unemployment Rates	U.S Bureau of Labor Statistics U.S. Bureau of Labor Statistics. (n.d.). *Unemployment rates for states*. U.S. Bureau of Labor Statistics. Retrieved from, https://www.bls.gov/lau/lastrk20.htm
State Poverty Rates	U.S. Census Bureau, USDA Shrider, E. A. (2022, June 9). *Income and poverty in the United States: 2020*. Census.gov. Retrieved from, https://www.census.gov/library/publications/2021/demo/p60-273.html *Poverty*. USDA ERS - Data Products. (n.d.). Retrieved from, https://data.ers.usda.gov/reports.aspx?ID=17826
Racial Composition	U.S. Census Bureau

	Bureau, U. S. C. (2022, August 18). *Race and ethnicity in the United States: 2010 census and 2020 census*. Census.gov. Retrieved from, https://www.census.gov/library/visualizations/interactive/race-and-ethnicity-in-the-united-state-2010-and-2020-census.html
Age Distribution (% over 65)	U.S. Census Bureau Index of /programs-surveys/popest/datasets/2020-2021/state/ASRH. (n.d.). Retrieved from, https://www2.census.gov/programs-surveys/popest/datasets/2020-2021/state/asrh/
Political Party Composition	PEW Research Center Pew Research Center. (2022, June 13). *Religious landscape study*. Pew Research Center's Religion & Public Life Project. Retrieved from, https://www.pewresearch.org/religion/religious-landscape-study/compare/party-affiliation/by/state/
Median Household Income	U.S. Census Bureau Shrider, E. A. (2022, June 9). *Income and poverty in the United States: 2020*. Census.gov. Retrieved from, https://www.census.gov/library/publications/2021/demo/p60-273.html
Urban and Rural State Distribution	U.S. Census Bureau Bureau, U. S. C. (2023, March 1). *Urban and rural*. Census.gov. Retrieved from, https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html
Educational Attainment	U.S. Census Bureau, USDA Bureau, U. S. C. (2022, July 4). *Educational attainment*. Census.gov. Retrieved April 11, 2023, from https://www.census.gov/topics/education/educational-attainment.html *Education*. USDA ERS - Data Products. (n.d.). Retrieved from, https://data.ers.usda.gov/reports.aspx?ID=17829
State policy	**Source of Data**
Medicaid (Health Expenditures)	Centers of Medicare and Medicaid Center

	State (residence). CMS. (n.d.). Retrieved from, https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsStateHealthAccountsResidence
State Welfare Funding per capita	U.S. Census Bureau Bureau, U. S. C. (2023, March 9). *Annual survey of State and local government finances*. Census.gov. Retrieved from, https://www.census.gov/programs-surveys/gov-finances.html
Health Care Spending per capita	Kaiser Family Foundation (KFF) *Health care expenditures per capita by service by state of residence*. KFF. (2022, September 13). Retrieved from, https://www.kff.org/other/state-indicator/health-spending-per-capita-by-service/?currentTimeframe=0&sortModel=%7B%22colId%22%3A%22Hospital+Care%22%2C%22sort%22%3A%22desc%22%7D
Public Heath Funding per capita	U.S. Census Bureau, TAFH, SHADAC *National Health Expenditure Data*. CMS. (n.d.). Retrieved from, https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData *Investing in America's health: A state-by-state look at public health funding and Key Health Facts*. TFAH. (2020, April 8). Retrieved from, https://www.tfah.org/report-details/investing-in-americas-health-a-state-by-state-look-at-public-health-funding-and-key-health-facts-1/ *Rank: Per person state public health funding: State health access data assistance center*. Rank | Per person state public health funding | State Health Access Data Assistance Center. (n.d.). Retrieved from, https://statehealthcompare.shadac.org/Data

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