

Modeling Health Outcomes Using Voter Turnout Data

Applied Linear Modeling

Clair Antoine

Joe Steensma, PhD

George Warren Brown School of Social Work

Washington University in St. Louis

Executive Summary

Health greatly impacts many facets of people's lives, and for those who are eligible to vote, participating in the democratic process is no exception. A lack of voter turnout- and thus a lack of political representation- could negatively impact communities by reducing funding allocated to their needs or stifling their ability to communicate those needs via the ballot box. Gollust & Rahn (2015), explain this could then impact their health and exacerbate already debilitating health disparities such as chronic disease, which already disproportionately impact racial minorities and those with lower socioeconomic standing. They go on to say more definitively that "being in poor health significantly reduces the propensity to turn out to vote, even controlling for many of the demographic and political factors that influence voting behavior" (Gollust & Rahn, 2015, p. 1117). This came into sharper focus with the beginning of the current COVID-19 pandemic as many eligible voters attempted to exercise their right cast their ballot during local elections in spring of 2020. Those with pre-existing conditions may have had concerns about voting in-person and a study by Flanders, Flanders, and Goodman (2020) found that voting in-person in the spring was associated with increased transmission in some states (though one limitation of this study was that states sometimes reported total votes cast rather than just in-person voting data).

These two studies highlight the importance of implementing potential alternatives to in-person voting, either to prevent health from deteriorating from a new disease or to support those who are already experiencing a condition which may impede their ability to exercise their right to vote. As a result, this analysis was conducted to examine if a linear relationship between counties with worse overall health outcomes and voter turnout existed, which direction that relationship might lean, and to what degree the two variables were potentially related (Missouri Secretary of State, 2018; Robert Wood Johnson Foundation & University of Wisconsin Population Health Institute, 2018). A simple bivariate correlation was conducted to assess this relationship and found a statistically significant and negative linear relationship between health outcomes and percent of voter turnout for the 115 counties included in the analysis. However, a very important caveat to stress here is that, upon conducting tests for normality of the distribution for both variables, it was found that- though the variables each seemed to demonstrate normal tendencies in their descriptive statistics- the Shapiro-Wilks tests for normality both came back for these variables as deviating significantly from a normal distribution. Therefore, this data cannot be used for interpretation and the correlation should not be used to draw any conclusions about potential actions to take.

This deviation from normality is, of course, the largest limitation of this analysis. The second limitation is the small number of counties available in the state- cropping the sample size to just 115. Third, analysis of total population was not included here- simply the number of registered voters versus those who registered and turned out to vote. Excluding the general population ignores the many people who are unable to even register to vote, which could (in some instances) also be related to health. Lastly, given a larger scope and time to analyze health outcome and voter turnout data from all counties across all 50 states, it might have been possible (or even probable for that large of a dataset) that the data would have fallen along a normal distribution, though the correlations may not have held true given the inclusion of extra data points. This additional data could have also been used for analysis with broader implications than just the state level, but this breadth of analysis was outside of the scope of this assignment.

Had the analysis been valid, the (digital) [media & engagement packet](#) included with this paper would have been appropriate to issue to Missouri constituents interested in contacting state representatives in support of legislation loosening current restrictions on absentee voting—specifically “no-excuse” absentee voting and removing the notary requirement for any absentee voting. This packet provides an easy-to-follow script for voters to send to legislators in hopes of influencing them to propose this type of legislation and social media materials for voters to post in order to gain public traction for the issue. Special attention was directed in the letters to legislators who serve on senate and house committees that hear bills regarding local government and elections.

Statistical Analyses

RQ: Is there a statistically significant linear relationship between county health outcomes and county voter turnout for registered voters?

Ha: There is a statistically significant linear relationship between county health outcomes and county voter turnout for registered voters.

H0: There is not a statistically significant linear relationship between county health outcomes and county voter turnout for registered voters?

Assumptions: two continuous variables, distributed normally

Descriptive Statistics (Table 1.)

There were 115 instances assessed in this data (n=115).

Variable: Percentage of Voter Turnout (indicated in red on tables 1 & 2)

Mean is very slightly smaller (difference<.01) than median indicating a negative skew of the data.

Kurtosis was reported as 1.64 which falls within the acceptable range when assessing for normality of distribution. Skewness was -1.042 which is also acceptable for an assumption of normality. Review of the histogram also indicated general assumption of normality was met for this variable. Based on just these factors, the assumption of normality was met for this variable.

However, a test for normality was also conducted. The sample size is 115 so Shapiro-Wilks test for normality was conducted (as opposed to Kolmogorov-Smirnov, which is more appropriate for much larger sample sizes) to assess normality. The test showed a significant departure from normality, $W(115) = .942, p < .01$

Variable: Health Outcomes (indicated in green on tables 1 & 2)

- Mean is about three times larger than the median, indicating a positively skewed distribution.

- Kurtosis is reported at .648, which is within an acceptable range when assessing for normality of the distribution. Skewness was .731 which is also acceptable for an assumption of normality. Review of the histogram also indicated general assumption of normality was met for this variable. Using just these factors, assumption of normality is met for this variable.

A test for normality was also conducted. The sample size is 115 so Shapiro-Wilks test for normality was conducted to assess normality. The test showed a significant departure from normality, $W(115) = .963, p < .01$.

Table 1. Descriptive Statistics

			Statistic	Std. Error
Percentage of Voter Turnout	Mean		.57222	.004043
	95% Confidence Interval for Mean	Lower Bound	.56421	
		Upper Bound	.58023	
	5% Trimmed Mean		.57497	
	Median		.58050	
	Variance		.002	
	Std. Deviation		.043352	
	Minimum		.415	
	Maximum		.651	
	Range		.236	
	Interquartile Range		.055	
	Skewness		-1.042	.226
	Kurtosis		1.640	.447
Health Outcomes	Mean		-.00474	.078482
	95% Confidence Interval for Mean	Lower Bound	-.16021	
		Upper Bound	.15073	
	5% Trimmed Mean		-.03604	
	Median		-.15761	
	Variance		.708	
	Std. Deviation		.841629	
	Minimum		-1.755	
	Maximum		2.805	
	Range		4.560	
	Interquartile Range		1.066	
	Skewness		.731	.226
	Kurtosis		.648	.447

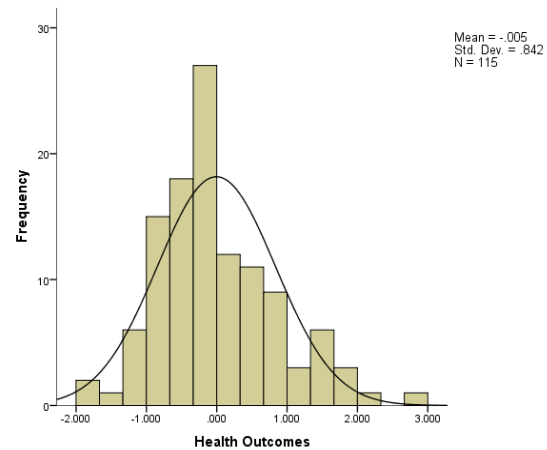
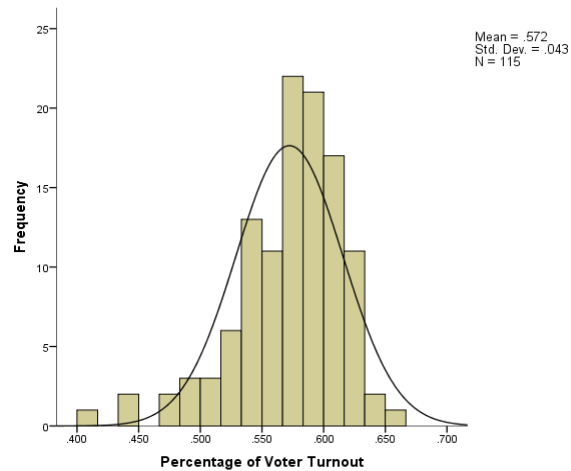


Figure 1. Histogram for Percentage of Voter Turnout variable Figure 2. Health Outcomes

Table 2. Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Percentage of Voter Turnout	.096	115	.010	.942	115	.000
Health Outcomes	.111	115	.001	.963	115	.003

a. Lilliefors Significance Correction

Scatter Plot:

When plotted using a scatter plot- with Health Outcomes as the x variable, and Percent of Voter Turnout as the y variable- we see what appears to be a negative linear relationship between the x and y variables. Line of best fit indicated in red on the scatter plot in figure 3 below. There is one data point which seems particularly anomalous on the scatterplot; it is highlighted in the red square in figure 3 below.

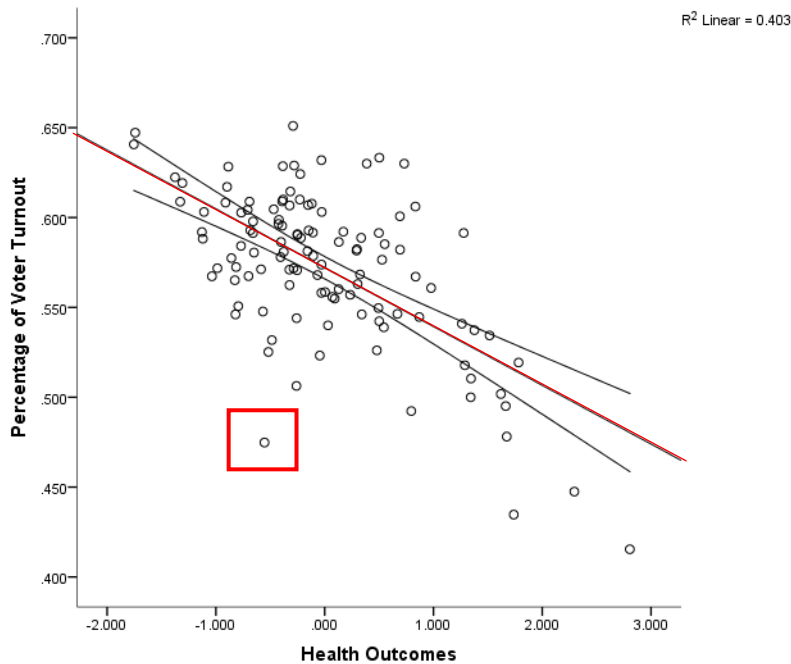


Figure 3. Scatter Plot with line of best fit and 95% confidence intervals for Percent of Voter Turnout and Health Outcomes variables

Correlation:

When a bivariate correlation analysis was run, a strong and statistically significant negative correlation was found (Pearson Correlation= -.635, $p < .01$) between the two variables. However, this finding cannot be used to make interpretations of the data as the data itself is not on a normal distribution (as per the Shapiro-Wilks test referenced above).

Table 3. Correlations

		Health Outcomes	Percentage of Voter Turnout
Health Outcomes	Pearson Correlation	1	-.635**
	Sig. (2-tailed)		.000
	N	115	115
Percentage of Voter Turnout	Pearson Correlation	-.635**	1
	Sig. (2-tailed)	.000	
	N	115	115

** . Correlation is significant at the 0.01 level (2-tailed).

References

- Gollust, S.E., Rahn, W.M. (2015). The Bodies Politic: Chronic Health Conditions and Voter Turnout in the 2008 Election. *Journal of Health Politics, Policy and Law*, 1 December 2015; 40 (6): 1115–1155. doi: <https://doi.org/10.1215/03616878-3424450>
- Flanders, W.D., Flanders, W.D., Goodman, M. (2020). The association of voter turnout with county-level coronavirus disease 2019 occurrence early in the pandemic, *Annals of Epidemiology*, Volume 49, 2020, Pages 42-49, ISSN 1047-2797, <https://doi.org/10.1016/j.annepidem.2020.06.011> .
- Missouri Secretary of State (2018). 2018 General Election. *Missouri Secretary of State*, Jefferson City, MO. Retrieved from https://www.sos.mo.gov/elections/s_default
- Robert Wood Johnson Foundation & University of Wisconsin Population Health Institute (2018). County health rankings & roadmaps: 2018 Missouri data. Author. Retrieved from <https://www.countyhealthrankings.org/app/missouri/2020/downloads>
- Link to Digital Media and Engagement Packet:
<https://drive.google.com/drive/folders/1oUDjsakzjc6HrQYqDkHyPQaYPh-R15hp?usp=sharing>

Appendix

Table 1. Descriptive Statistics

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	Kurtosis		.648	.447

*Table 1. Descriptive Statistics for Percent of Voter Turnout and Health Outcomes Variables**Table 2. Tests of Normality*

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Percentage of Voter Turnout	.096	115	.010	.942	115	.000
Health Outcomes	.111	115	.001	.963	115	.003

a. Lilliefors Significance Correction

*Table 2. Shapiro-Wilk Test for normality**Table 3. Correlations*

		Health Outcomes	Percentage of Voter Turnout
Health Outcomes	Pearson Correlation	1	-.635**
	Sig. (2-tailed)		.000
	N	115	115
Percentage of Voter Turnout	Pearson Correlation	-.635**	1
	Sig. (2-tailed)	.000	
	N	115	115

** . Correlation is significant at the 0.01 level (2-tailed).

Table 3. Pearson Correlation for Health Outcomes and Percentage of Voter Turnout variables

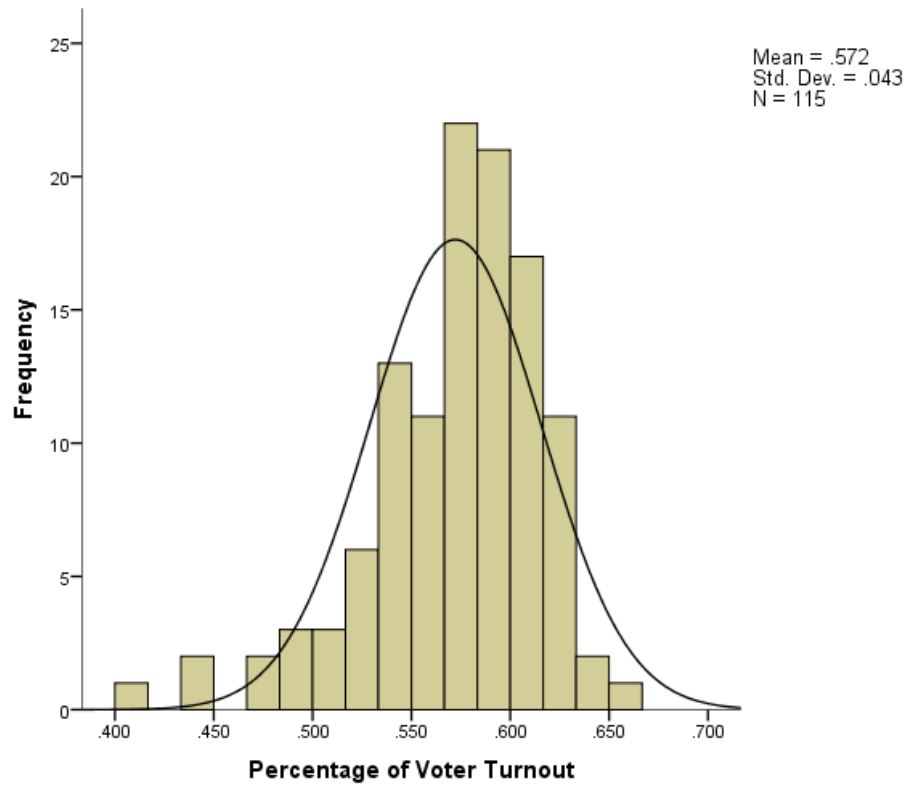


Figure 1. Histogram for Percentage of Voter Turnout

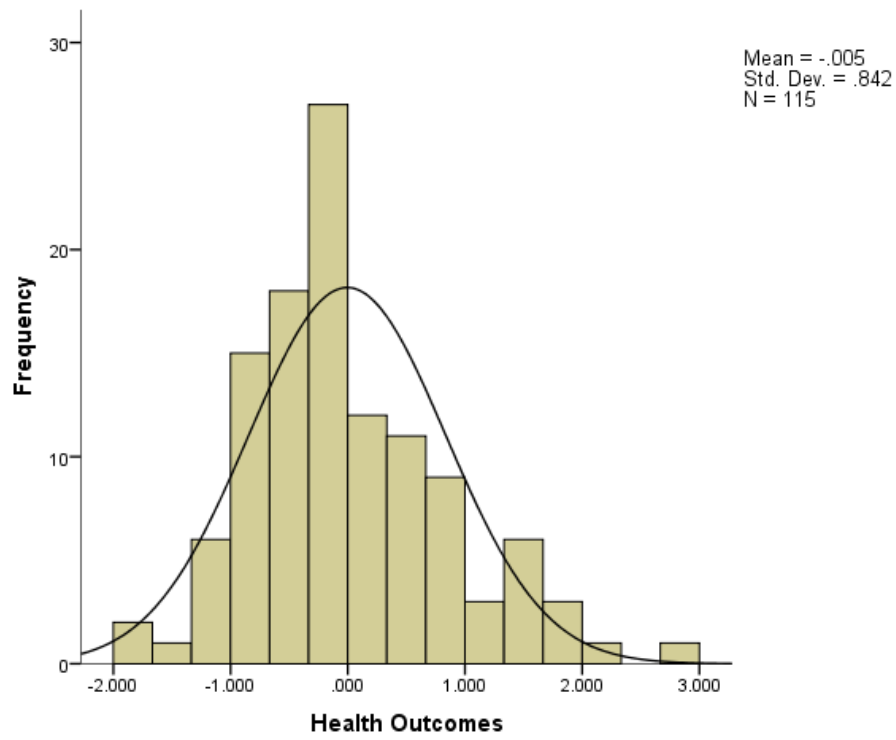


Figure 2. Histogram for Health Outcomes

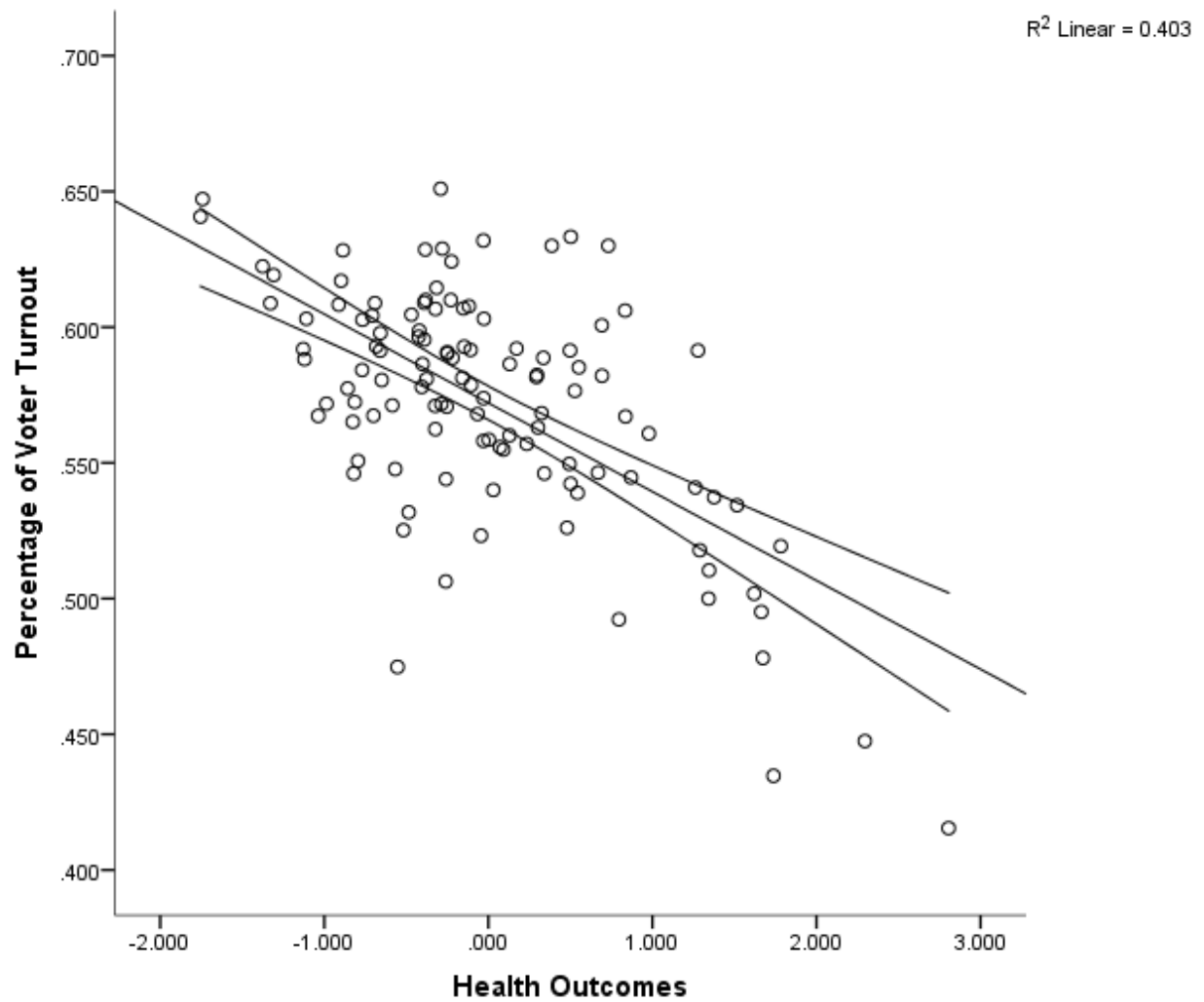


Figure 3. Scatter Plot for Percentage of Voter Turnout by Health Outcomes variable