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Voting Patterns have little to no effect on Preventative Care in Iowa and Wisconsin

ABSTRACT

Throughout the last half of the twentieth century, life expectancy rates have stagnated or declined in counties with an increasingly prominent republican population (Bor 2017). Additionally, predominantly republican counties have seen a decrease in the amount of primary care as well as an increase in cost for that primary care. To further understand how the voting trends can impact the health of the community. This study was conducted to understand if preventable diseases can be predicted by voting trends.

To conduct this research, the election, heart disease, diabetes, and poverty data for Iowa and Wisconsin was compiled and projected. After this, a Moran's I test was conducted to see if the variables were significantly clustered or non-clustered. Then, an OLS test and a GWR test was used to see if the election data could be used as a predictive factor and how well it performed compared to poverty as a predicted value. The results of the OLS and GWR test were compared to see which model was a better fit for this project. The results from these tests found that every variable except diabetes was significantly clustered. Furthermore, poverty performed extremely well as a predictive factor for heart disease and less well, but still better than voting trends, for diabetes. The findings indicate that democrat percentage had minimal impact on predicting these health conditions, suggesting that lifestyle factors contributing to heart

disease and diabetes are not exclusive to a particular political party. Poverty, however, emerged as a more effective predictor, aligning with the notion that healthier behaviors are easier to maintain outside of poverty.

INTRODUCTION

Throughout the last 40 years, counties within the U.S with higher proportion of republican voters had stagnated or lower life expectancies than those with democratic voting tendencies (Bor 2017). Furthermore, these same communities often vote for administrations against programs that could potentially increase their life expectancy and overall health (Bor 2017). Additionally, counties that had an increase in voting for the republican candidate from 2012 and 2016 also saw a decrease in primary care and an increase in health care costs within that time frame (Wasfy 2017). Since voting trends have a clear relationship between life expectancy and healthcare access, it was an interest of this project to further explore this topic and see if voting trends could be used as an explanatory variable for a community's health. Additionally, because primary care access was being reduced through this phenomenon, it was an interest of this project to see if specifically preventative diseases, like heart disease and diabetes, could be predicted by voting trends within that respective area. On top of that, it was an interest of this project to see if the precedence of medicaid expansions influenced these results. Furthermore, it was an interest of this project to see which regression analysis model was better fit for this topic. These interests led the project to its four main objectives. First, can voting trends be a predicting factor in preventative diseases like heart disease and diabetes? Second, how does using voting trends as a predictive factor compare to a more transition variable like poverty? Third, does the presence of medicaid expansion

change if voting trends are a predicting factor for preventive diseases like heart disease and diabetes? Lastly, which model is better fit at answering this question: OLS or GWR?

METHODS

To start this research project, the data had to be compiled and cleaned. For both the heart disease rate and the diabetes rate, the datasets were found on the CDC website. For the poverty rates within Iowa, the data was found using the Iowa State Data Center, and for the poverty rates within Wisconsin, the data was found using the Wisconsin Department of Health. Furthermore, for the Election data, was found using a total votes per candidate count for the 2020 US Presidential Election. All of these datasets were at the county level. Additionally, for the election data needed to be normalized. To calculate this the total votes were added for each candidate to make a total of all votes casted, then the republican total was subtracted, and the democrat total was divided by total of all votes for a democrat percentage. After the data was gathered and normalized, scatter plots were generated to compare the heart disease and diabetes rates to both the democrat percentage and the poverty rates. Next, Moran's I tests were conducted on heart disease rates, diabetes rates, poverty rates, and democrat percentage. After that, a OLS test was conducted for the heart disease and diabetes rates with democrat percentage and the poverty rates as the explanatory variables. Furthermore, GWR test was conducted on the heart disease and diabetes rates with democrat percentage and the poverty rates as the explanatory variables and mapped the coefficients of each explanatory variable for each disease. Additionally, the GWR and OLS results were compared to see which model was a better fit.

RESULTS

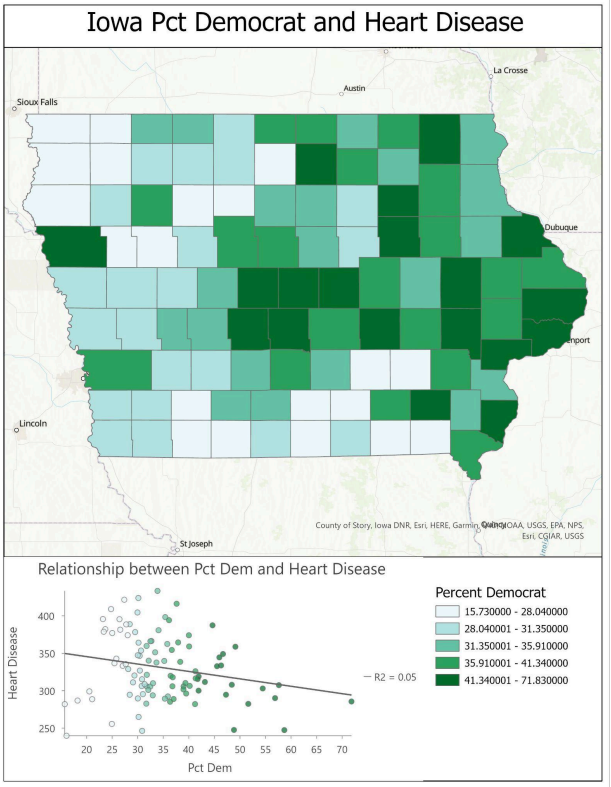
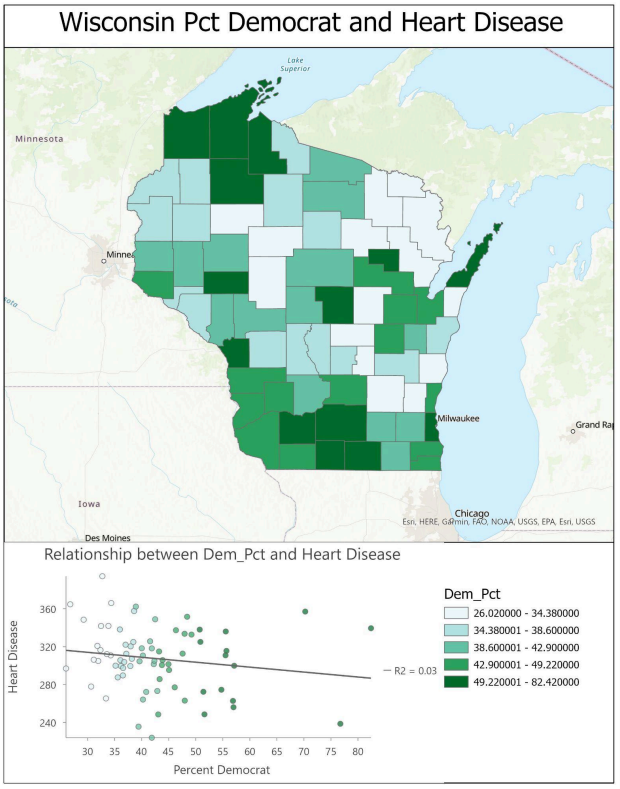


Figure 1.



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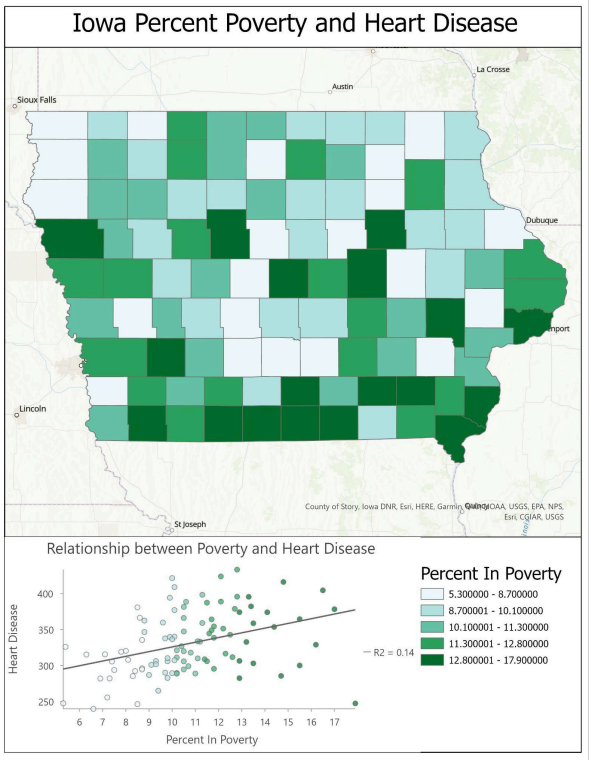

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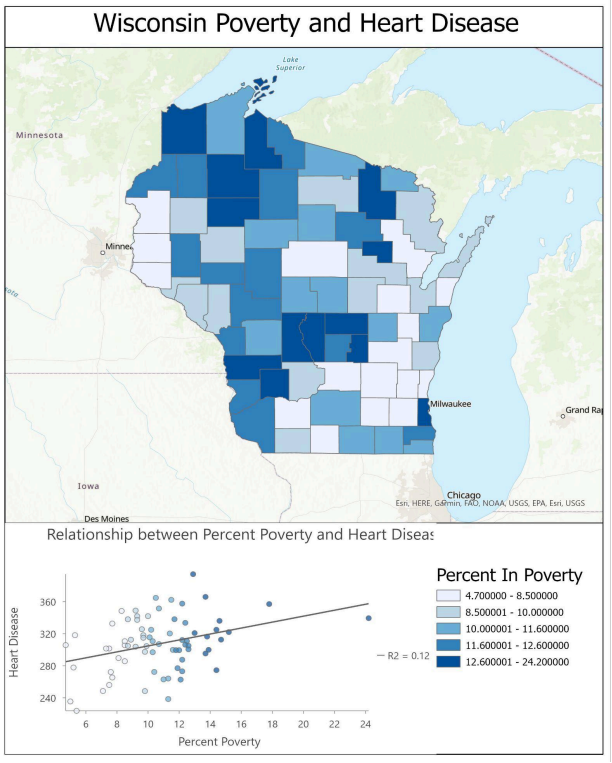

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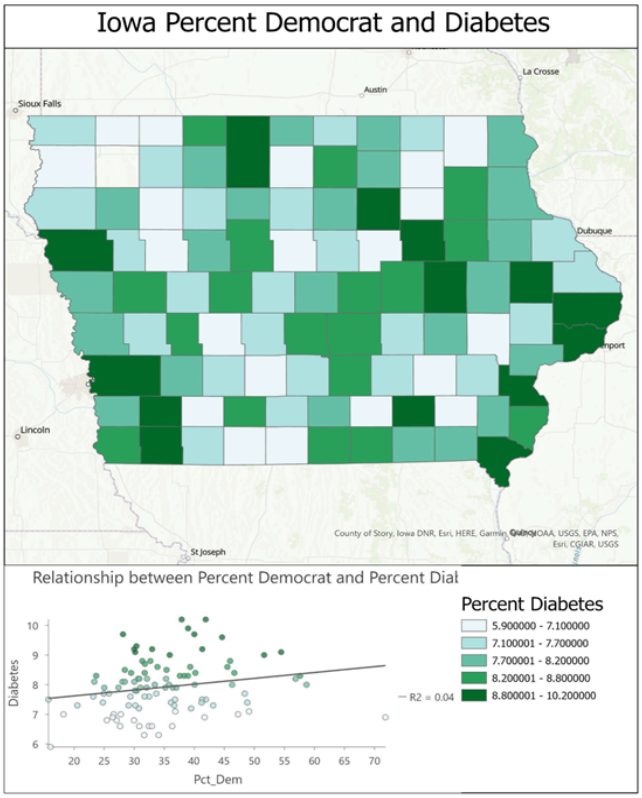

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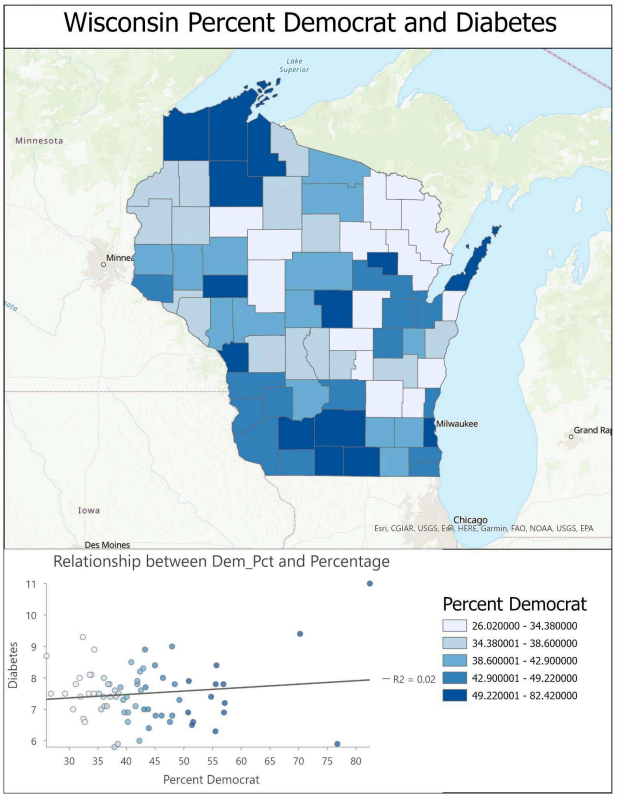

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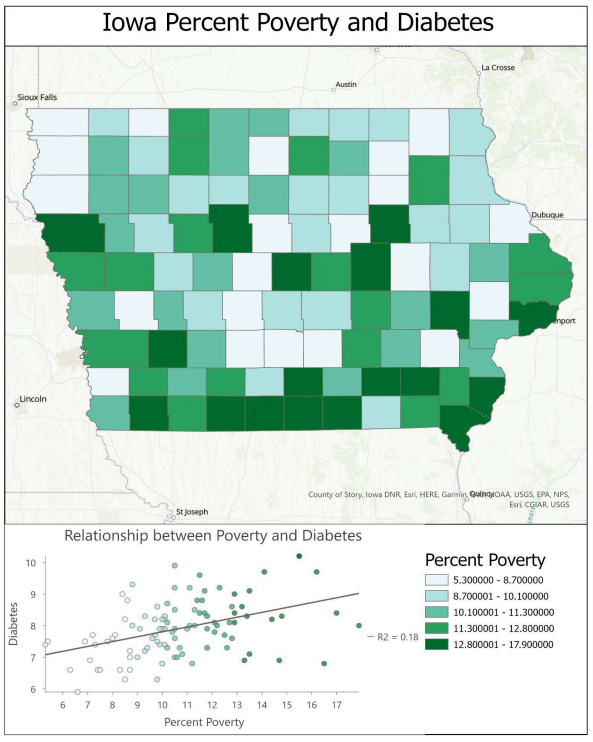

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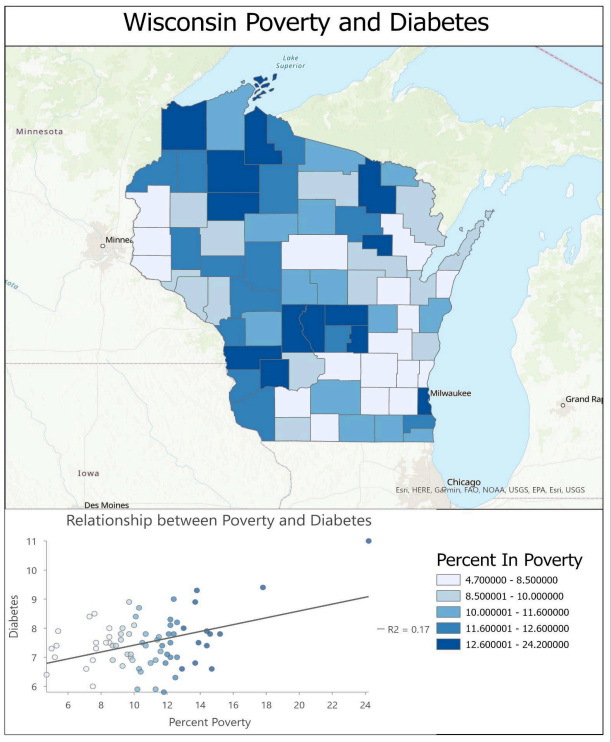

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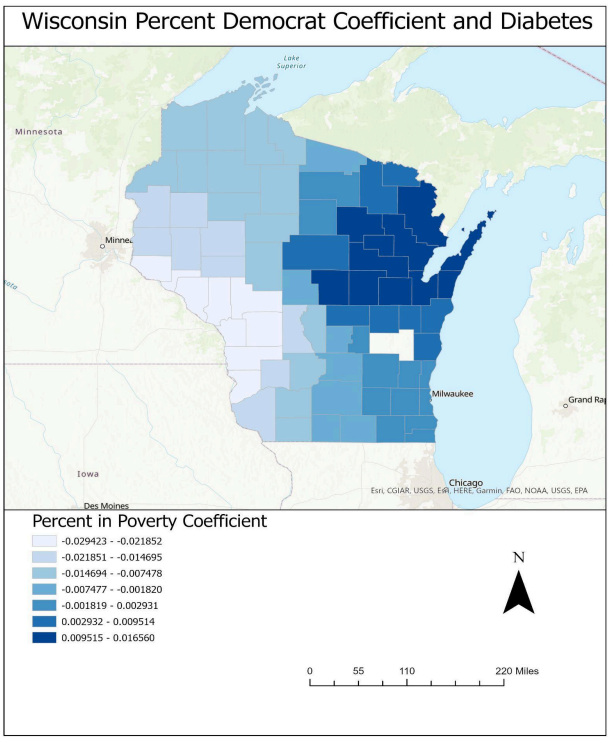

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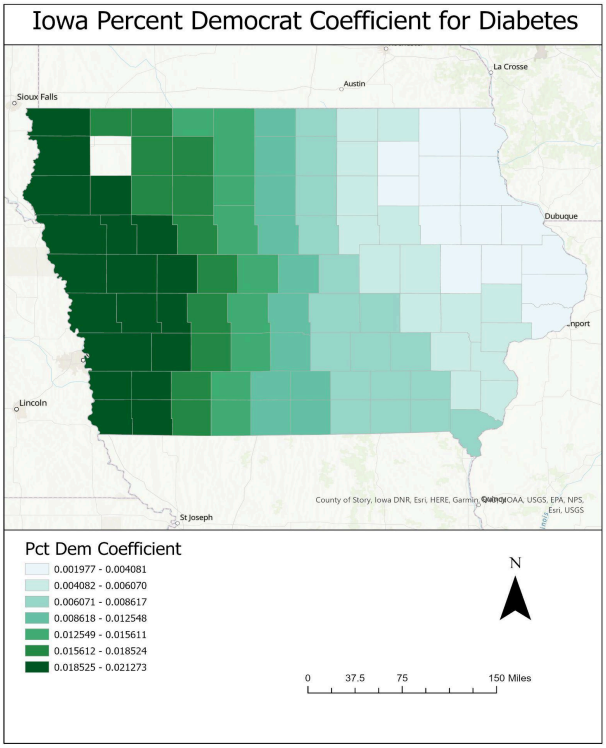

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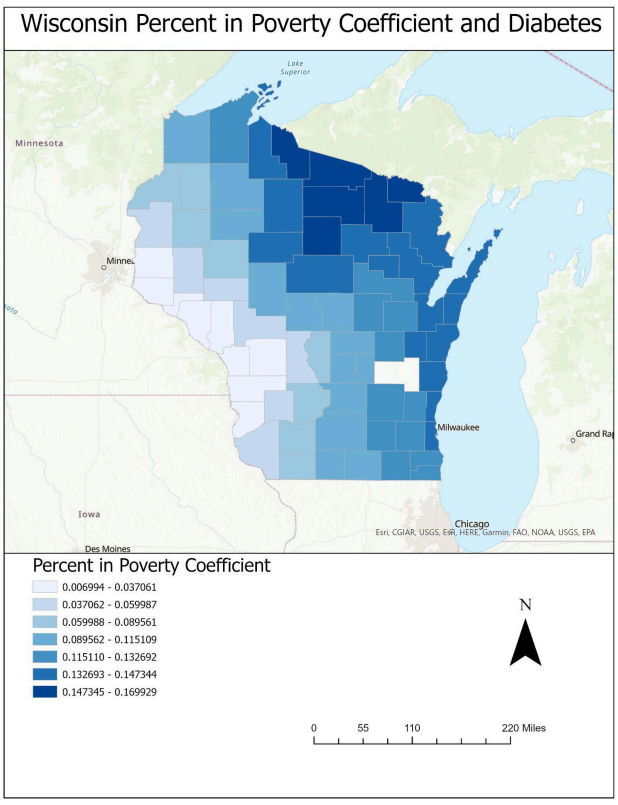

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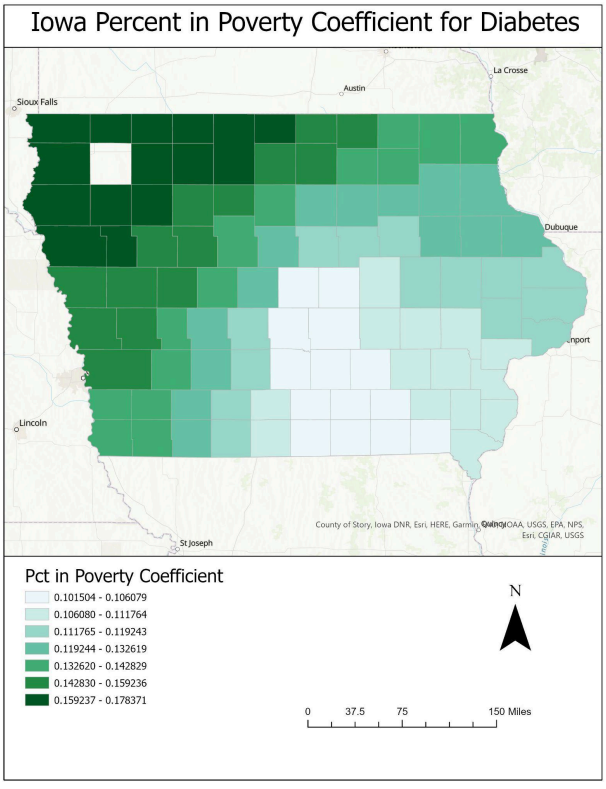

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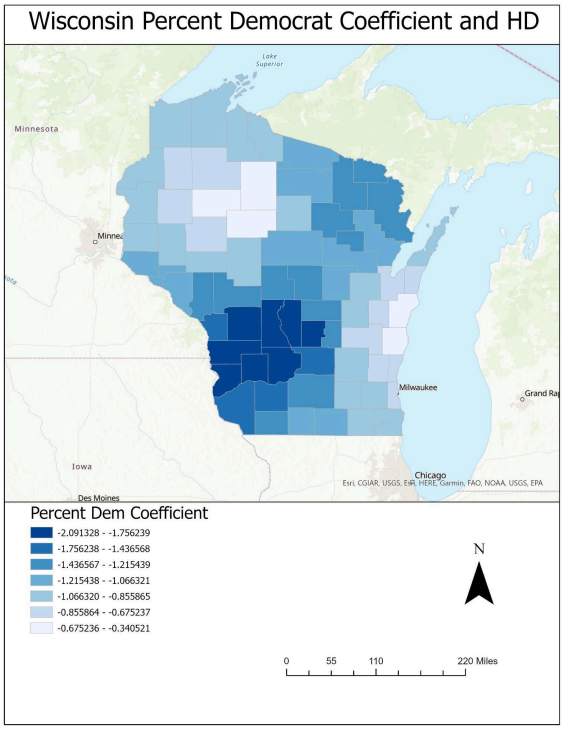

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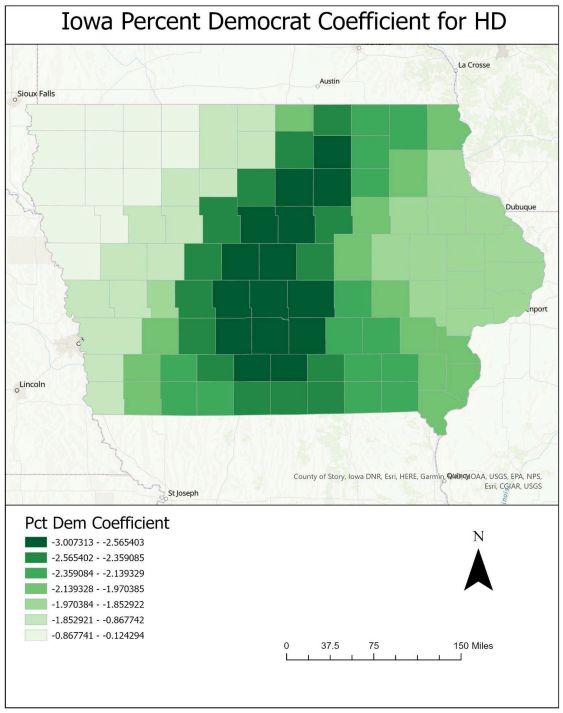

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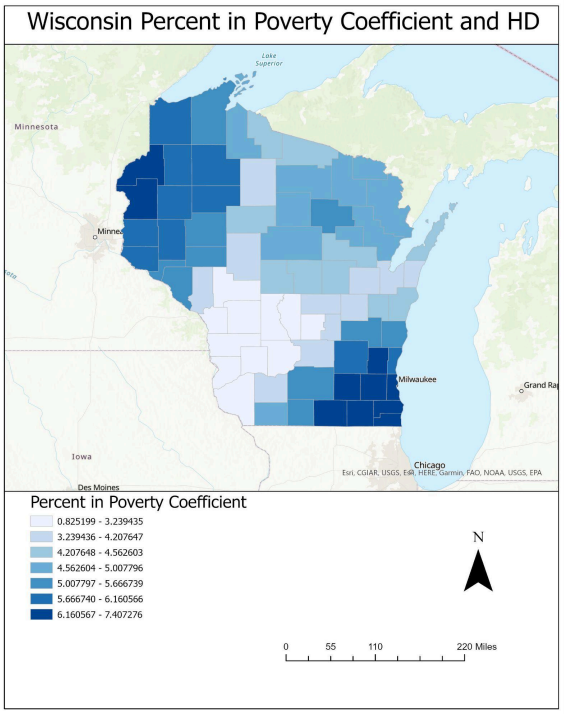

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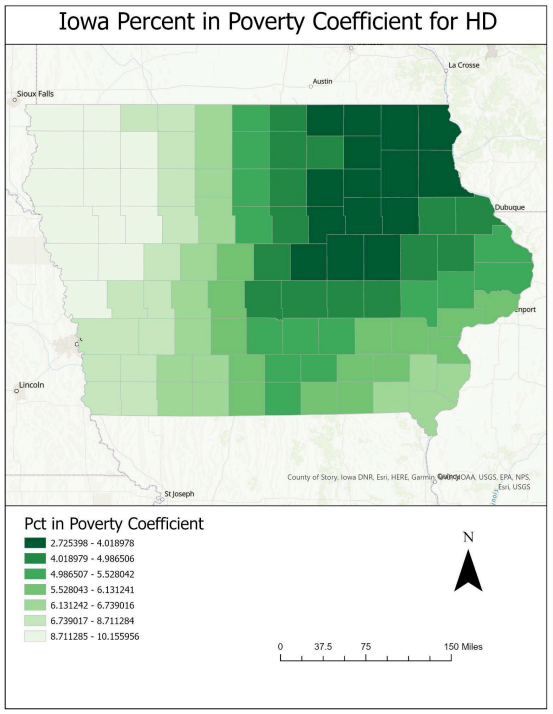

Figure 16.

Iowa

HD

Global Moran's I Summary	
Moran's Index	0.439516
Expected Index	-0.010204
Variance	0.007107
z-score	5.334660
p-value	0.000000

Diabetes

Global Moran's I Summary	
Moran's Index	0.071493
Expected Index	-0.010309
Variance	0.007251
z-score	0.960650
p-value	0.336728

Poverty

Global Moran's I Summary	
Moran's Index	0.169429
Expected Index	-0.010204
Variance	0.007044
z-score	2.140380
p-value	0.032324

Pct Dem

Global Moran's I Summary	
Moran's Index	0.415006
Expected Index	-0.010204
Variance	0.006933
z-score	5.106852
p-value	0.000000

Wisconsin

HD

Global Moran's I Summary	
Moran's Index	0.267744
Expected Index	-0.014085
Variance	0.009246
z-score	2.931023
p-value	0.003378

Diabetes

Global Moran's I Summary	
Moran's Index	0.126792
Expected Index	-0.014286
Variance	0.009206
z-score	1.470353
p-value	0.141466

Poverty

Global Moran's I Summary	
Moran's Index	0.188909
Expected Index	-0.014085
Variance	0.008719
z-score	2.173920
p-value	0.029711

Pct Dem

Global Moran's I Summary	
Moran's Index	0.154326
Expected Index	-0.014085
Variance	0.008827
z-score	1.792533
p-value	0.073048

Figure 17.

Iowa Diabetes

Summary of OLS Results - Model Variables

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	5.910226	0.439453	13.449046	0.000000*	0.588771	10.038247	0.000000*	--------
IOWAELECTION	0.012755	0.008896	1.433737	0.154937	0.010994	1.160159	0.248890	1.033550
POVERTYREPOR	0.145326	0.033469	4.342154	0.000038*	0.038355	3.789000	0.000271*	1.033550

Wisconsin Diabetes

Summary of OLS Results - Model Variables

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	6.324747	0.458767	13.786408	0.000000*	0.713442	8.865114	0.000000*	--------
WISCELECTION	-0.003086	0.010190	-0.302855	0.762929	0.013172	-0.234292	0.815464	1.179752
POVERTYREPOR	0.121926	0.034514	3.532677	0.000748*	0.043345	2.812939	0.006411*	1.179752

Iowa Heart Disease

Summary of OLS Results - Model Variables

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	297.527013	21.011911	14.159922	0.000000*	28.790778	10.334108	0.000000*	--------
IOWAELECTION	-1.346277	0.423726	-3.177238	0.002006*	0.439437	-3.063640	0.002842*	1.034046
POVERTYREPOR	7.464513	1.611759	4.631283	0.000013*	1.769011	4.219598	0.000059*	1.034046

Wisconsin Heart Disease

Summary of OLS Results - Model Variables

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	299.747740	16.714227	17.933688	0.000000*	14.914364	20.097922	0.000000*	--------
WISCELECTION	-1.129717	0.373786	-3.022361	0.003520*	0.381104	-2.964329	0.004163*	1.184254
POVERTYREPOR	5.217649	1.262684	4.132189	0.000102*	1.280992	4.073131	0.000125*	1.184254

Figure 18.

	Iowa		Wisconsin	
	Heart Disease	Diabetes	Heart Disease	Diabetes
GWR AIC	999.36	241.54	694.95	173.93
OLS AIC	1011.25	241.70	700.55	179.30

Table 1.

When looking at democrat percentage and heart disease in Iowa, there are a few clusters of high democrat percentage in central and eastern Iowa and clusters of low in NW and southern Iowa (Figure 1). Additionally, the scatter plot shows a negative trendline with a value of 0.05 (Figure 1). Furthermore, when looking at democrat percentage and heart disease in Wisconsin, democrat percentage has high clusters in northern and southern Wisconsin and low clusters in the NE part of the state (Figure 2). Additionally, the scatter plot shows a negative trendline of 0.03 (Figure 2).

On top of that, when you look at percent poverty and heart disease in Iowa, there are a few high clusters of poverty in southern and SE Iowa as well as low clusters of poverty in the central and NW parts of the state (Figure 3). In addition, the trendline of the scatter plot has a positive value of 0.14 (Figure 3). Moreover, when you look at poverty rates and heart disease in Wisconsin, there are clusters of high poverty in the northern and central regions and low clusters along the eastern side of the state (Figure 4). The scatter plot trendline has a positive value of 0.12 (Figure 4).

When you look at democrat percentage and diabetes rates in Iowa, the democrat percentage spatial trends are the same (Figure 1 and Figure 5). However, the scatter plot trendline has a positive value 0.04 (Figure 5). When you look at democrat percentage and diabetes rates in Wisconsin, the democrat percentage spatial trends are the same as

well (Figure 2 and Figure 6). However, the scatter plot has a positive value of 0.02 (Figure 6).

When you look at percentages in poverty and diabetes rates in Iowa, the spatial trends of poverty rates are the same (Figure 3 and Figure 7). However, when you look at the scatter plot, the trend line has a positive value of 0.14 (Figure 7). Additionally, when you look at poverty rates and diabetes in Wisconsin, the spatial trend of poverty is the same (Figure 4 and Figure 8). However, the scatter plot trendline has a positive value of 0.12 (Figure 8).

On the other hand, when looking at the coefficients for democrat percentage and diabetes for Wisconsin, the highest cluster is in the NE part of the state with a value of -0.021 to -0.029, and the lowest part is in the western part of the state with a value of 0.009 to 0.017 (Figure 9). Additionally, when looking at the coefficients for democrat percentage and diabetes in Iowa, the lowest values of 0.002 - 0.004 occur in the eastern parts of the state as well as one county in the NW (Figure 10). The highest values of 0.019 to 0.021 occur in the western parts of the state (Figure 10).

On top of that, when looking at the coefficients for percent poverty and diabetes for Wisconsin, the lowest values of 0.007 to 0.037 occur in the north and the highest values of 0.15 to 0.17 occur in the west (Figure 11). In addition to that, when looking at the coefficients for percent poverty and diabetes for Iowa, the lowest values of 0.102 to 0.106 occur in the south central area and the highest values of 0.15 to 0.17 occur in the NE (Figure 12).

Furthermore, when looking at the coefficients for democrat percentage and heart disease in Wisconsin, the lowest values of -2.09 to -1.76 occur in the central to east area, and the highest values of -0.68 to -0.34 occur in the east and the NW (Figure 13).

Additionally, when looking at the coefficients for democrat percentage and heart disease, the center of the state had the lowest with values of -2.5 to -3 and the outer edges of the state had the lowest values of -0.1 to -0.8 (Figure 14).

On the other hand, when looking at the coefficients for percent poverty and heart disease in Wisconsin, the lowest values of 0.83 to 3.24 occur in the SE central area, and the highest values of 6.2 to 7.4 occur in the SE and the NW (Figure 15). In addition, when looking at the coefficients for percent poverty and heart disease of Iowa, the lowest values of 2.7 to 4 occur in the NE, and the highest values of 8.7 to 10.2 occur in the NW and west central (Figure 16).

On top of this, the results for the Moran's I test, heart disease, percent in poverty, and democrat percentage are all spatially clustered for both Iowa and Wisconsin (Figure 17). However, diabetes is not spatially clustered for both Iowa and Wisconsin (Figure 17).

Furthermore, the results from the OLS model show that, for diabetes in Iowa, the coefficient for percent in poverty was 0.14 compared to 0.01 for democrat percentage (Figure 18). The results for diabetes in Wisconsin show a similar trend with the coefficient for percent in poverty being 0.12 compared to -0.003 for democrat percentage (Figure 18). Additionally, for heart disease in Iowa the coefficient for poverty was 7.46 compared to -1.34 for democrat percentage (Figure 18). Wisconsin showed a similar trend with percent poverty being 5.21 compared to -1.13 for democrat percentage (Figure 18).

Lastly, when comparing the AIC of the GWR and OLS models for Iowa and Wisconsin respectively, the GWR model outperformed the OLS model for Iowa heart disease, Iowa diabetes, Wisconsin heart disease, and Wisconsin Diabetes (Table 1).

DISCUSSION

Going back to the project's first objective, it seems that voting trends had varying degrees of success, depending on the test, as a predictive factor for heart disease and diabetes in Iowa or Wisconsin. For the scatter plots trend lines and OLS coefficients, democrat percentage had extremely small values on whether it was positive or negative (Figure 1, Figure 2, Figure 5, Figure 6, Figure 18). However, the GWR model coefficients were also small but, in comparison, were much greater than the OLS coefficients (Figure 9, Figure 10, Figure 13, Figure 14). This is potentially due to the fact that the lifestyle behaviors that lead to heart disease and diabetes are not exclusive to just republican voters, but found throughout all party demographics. Therefore, we do not see a clear relationship between democrat percentage and heart disease and diabetes.

On the other hand, when looking back at the project's second objective, it is clear that poverty does a much better job at predicting heart disease across Iowa and Wisconsin. The trendline within the scatter plots, as well as the coefficients of the OLS and GWR models, performed better than democrat percentage (Figure 3, Figure 4, Figure 15, Figure 16, Figure 18). This is because both heart disease and diabetes can be avoided or improved with a healthier diet and increased physical activity, which are both easier to accomplish not in poverty (Gaskin 2014 and Lee 2007).

Despite these trends, if you look at diabetes, poverty still performs better as an explanatory variable, with OLS and GWR, when compared to democrat percentage (Figure 9, Figure 10, Figure 11, Figure 12, Figure 18). However, the separation between democrat percentage and poverty is much smaller than heart disease. This is potentially because diabetes is influenced by non controllable factors such as genetics and ethnicity,

whereas heart disease, while influenced by genetic factors, is exceedingly influenced by diet and exercise.

Furthermore, when looking at the project's third objective, although the distinction of medicaid expansion is important and can have real effects on people's health outcomes, there was no significant difference between Iowa and Wisconsin within the scope of this project (Figure 1 - 16, Figure 18). This is potentially due to the fact that Iowa and Wisconsin are too similar, and these underlying similarities overpower any differences between the states and therefore express the same outputs and general trends.

When looking at the project's fourth objective, it is clear that the GWR model outperforms the OLS model (Table 1). This is probably because the GWR model allows for spatial variation in the relationships between variables. Additionally, the GWR model is able to change its parameters locally where OLS is not.

To obtain a comprehensive spatial analysis of the project, Moran's I tests were also conducted on each of the variables; heart disease for Iowa and Wisconsin, democrat percentage for Iowa and Wisconsin, and percent in poverty for Iowa and Wisconsin were all significant and were clustered (Figure 17). On the other hand, diabetes for Iowa and Wisconsin was not significant and can be explained by random distribution (Figure 17). A potential reason we see this is because the clustered variables can be influenced by environmental and social factors. If only one grocery store is available and it is unhealthy, the diet of the community is worse; if everyone around votes republican, you probably feel more pressure to do the same; if there is not a lot of economic activity in the area, everyone is probably lower income.

Finally, there are several limitations that are important to consider regarding this project. First, presidential election data is not necessarily indicative of the local political trends and policies. Although, the assumption can be made that if a county votes republican for the president, they also will for their local elections. However, this discounts the possibility that people vote for multiple parties and also discounts the possibility that the party that controls the local government could be different from the presidential majority. A future step for this project would be to look at the percentage of state legislatures controlled by a specific party and compare that to different diseases. This could potentially show more clear trends on how controlling parties and how their policies affect a community's health.

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