FINAL PROJECT

TEAM 4

ABSTRACT

The team analyzed election data from past elections (2000-2016) to predict the 2020 presidential election results for Georgia, South Dakota, Kansas and Illinois.

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Harvard Extension School: A Practical Approach to Data Science

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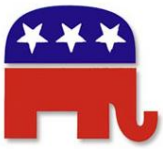
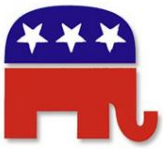
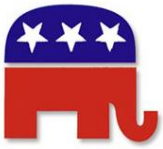
I. Summary

Based on analyzing the groups of data (Race, Gender and Age), along with other important factors that affect the outcome of a race, including turnout, GDP, income, etc., we determine that Democrats and Republicans will win the following states.

States	Party That Will Win 2020	Our Predictions
Georgia		We predict that Republicans will take the state of Georgia in 2020 by a 3-4% margin over Democrats.
South Dakota		We predict that Republicans will take the state of South Dakota in 2020 by 20-30% margin over Democrats.
Kansas		We predict that Republicans will take the state of Kansas in 2020
Illinois		We predict that Democrats will take the state of Illinois in 2020

Each presidential election is unique, the voters are not monolithic and the voter issues of each state varies from one election cycle to another. The actual candidates presented in 2020 for the presidential race, the state of US economy, race relations along with voter turnout will have significant impact during the 2020 race. 3 out of 4 states that we analyzed have been a "Solid Republican" state, where they have won majority of both Presidential and Interim congressional and senate races. We expect that this trend will continue except in the case of Georgia. As the voter demographics changes in Georgia, with minorities becoming a larger share of the registered voters each year, the voting trend will shift towards Democrats and Independents. This change however is unlikely to impact the results of the next presidential election in 2020, but moving into 2024 the margin of victory for Republicans will shrink in Georgia. We expect that Democrats will comfortably hold Illinois, while Republicans will hold Kansas and South Dakota in their respective columns.

II. Georgia

A. Georgia 2020 Predictions

Age	Gender	Race
Millennials and those between 30 and 44 will continue to participate at a lower rate in 2020 than those that are 45 and older. In 2012, 60% of the voters between the ages of 18-29 voted for a Democrat, while only 37% voted for a Republican. In 2016, however, 57% of millennials voted for a Democrat, and 37% still voted for a Republican, indicating a shift from Democrats to Third Parties. If the trend continues, more young voters will abandon Democrats and move towards Independent parties in 2020, with no significant gain for the Republicans. And, as those in the age group between 14 and 17 year old become eligible to vote in 2020, it is likely that Republicans will also lose some share of this group.	There is an upward momentum of both genders voting for a Republican. In 2012, 55% of the women voted for Democrats, while only 44% voted for a Republican. In 2016, Democrats garnered 54% (-1%) and Republicans received 45% (+1%) of women's votes. In 2012, 45% of the men voted for a Democrat and 52% voted for a Republican. In 2016, 41% (-4%) voted Democrat and 53% (+1%) of the male voters voted for Republicans. In 2020, I anticipate that a larger % of the Women's and Men's vote will go for Republicans in the state of Georgia, though might be offset by increased turnout among minorities.	My analysis shows that the overall % of white voters when compared to the Georgia's voting population changed from 75.08% in 2000, to 61.39% in 2012. At the expected annual population growth of 7.8% for Hispanics, 2.5% for Blacks and .6% for Whites, I predict that White votes will be < 57.96% of the total votes cast in 2020. Given that there was a healthy margin of 5.6% in favor of Republicans between Republican and Democrat votes cast, during 2016, I anticipate that in 2020 Republicans will still take Georgia.
If the question is who will win the 2020 presidential election, the answer will depend on three key factors; Age, Gender & Race. The change in demographics, the age of the voter population and the influence of women over the next two election cycles, will have a significant impact on the 2020 presidential race. The candidate that understands and taps into the needs of these three groups, and the voter turnout in 2020 will influence who enters the White House as President. With the data analyzed to date, I predict that in 2020, Republicans will win Georgia by 3-4% margin.		

B. Categories & Groups

1. Age

a) Groups

The key groups with Age are 18-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64 and 65+.

As voters age, they turnout at a higher rate at polling booths in Georgia, and they lean Republican, rather than Democrat.

Figure GA.1: In the figure below, we can identify that the voters between the ages of 18-29 are continuously decreasing % of the overall voting population from 2004 to 2012.

Source: My RStudio work on Age

In the state of Georgia, from 2004 to 2012, I noted that there was a voter participation jump of 4% among 45-49, 4% among 50-54, 6% among 55-59, 29% among 60-64 and 26% among 65+ year old. In the same period, there was a voter participation reduction of -5% among 18-24, -22% among 25-29 and -17% among 30-34, -19% among 35-39 and -13% among 40-44-year-old.

In 2012, 60% of the voters between the ages of 18-29 voted for a Democrat, while only 37% voted for a Republican, and the rest voted for an Independent party. In 2016, however, 57% (-3%) voted for a Democrat, and 37% still voted for Trump (a Republican), indicating a shift towards Third Parties such as Green Party, Libertarian Party, etc. and away from the Democratic Party. If the trend continues, more Millennials will shift towards Independent parties, and when combined with the Millennials' lower voter participation rates, it would imply that Republicans will at least hold ground with this group in Georgia. As the current population ages, the new group of millennials, may or may not buck this trend.

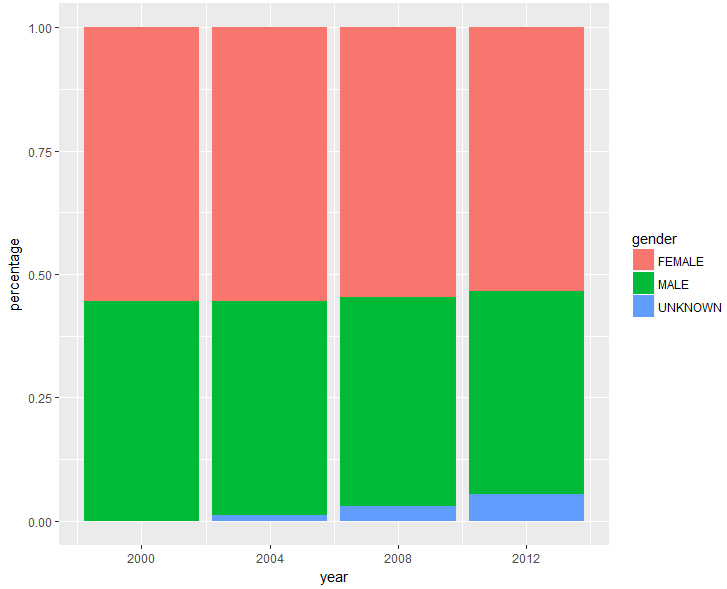
2. Gender

a) Groups

The key groups within Gender are Female, Male and Unknown.

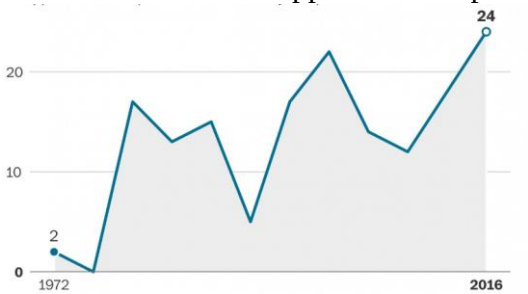
In 2012, 55% of the Women voted for Democrats, while only 44% voted for a Republican. However, in 2016, Democrats garnered 54% of this group's votes and 45% of the female voters voted for a Republican. In 2016, 53% of the male voters voted for a Republican and 41% voted for a Democrat. There is an upward momentum of both Male & Female voters voting for a Republican (especially among non-college educated). But, the college educated still prefer a Democratic candidate.

Figure GA.2: From this figure below, in Georgia, we can identify that the overall proportion of Female voters to Male voters who cast their ballots, is declining (albeit slowly).



Source: My RCode analysis.

Men increased their support for a Republican candidate by 8 points since 2012.



Source: Washington Post (2016).

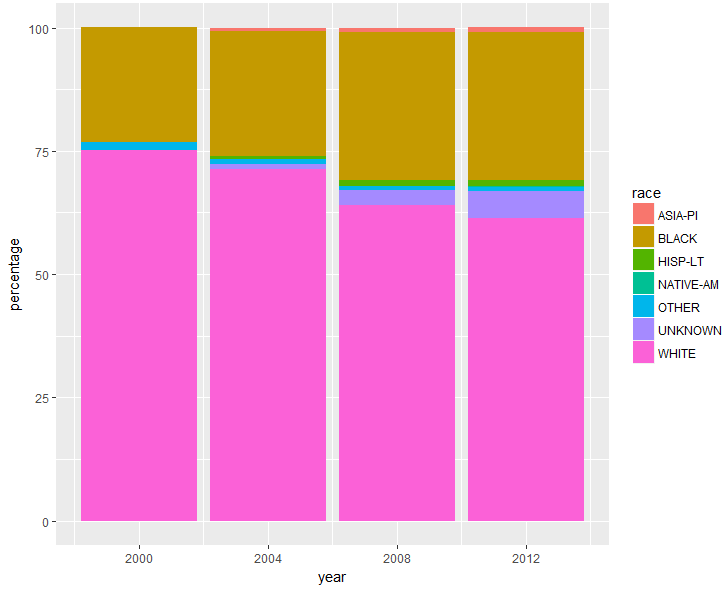
3. Race

a) Groups

The key groups within Race in Georgia are Black, Hispanic-Latino, White, Asian-Pacific Islander, Native-American, Other and Unknown

The demographics of Georgia will continue to change from predominantly White population to Hispanics and Blacks, with Hispanic population doubling every 8.97 years.

Figure GA.3: As seen in most of the Southeast states, the Hispanic-Latino and African American population will continue to grow in the State of Georgia, and White population will continue to decline.



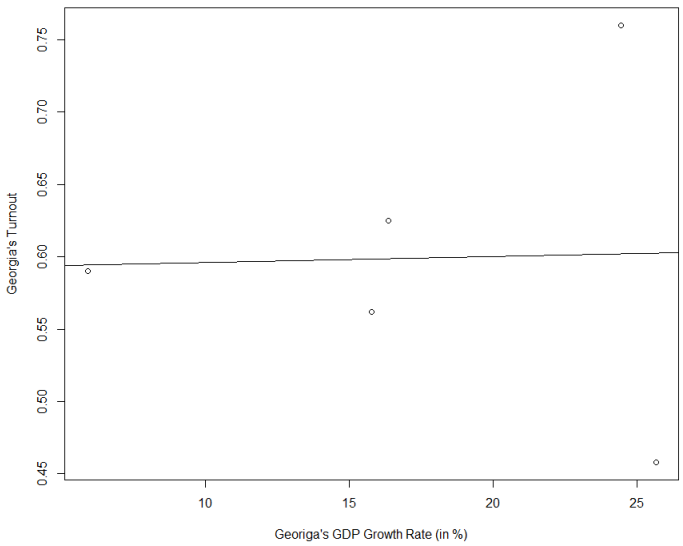
Source: My RStudio work on Race

The expected growth of Hispanic-Latino population is 7.8%, African Americans is 2.5% and Whites is .6%. This change in population will affect the number of registered voters by 2020 and 2024, favoring democrats. There was a 5.6% margin between the votes cast for Republicans versus Democrats in 2016. As per Wabe90.0 and Georgia SOS (2016), the voter turnout in Georgia during 2016 General Election was 76. The White voter turnout is at 75.65%, Black voter turnout is 71.53%, and Hispanics-Latino voter turnout is only at 56.13%.

Moving into 2018 and 2020, the significant growth in minority population will affect outcome of the races in larger metropolitan areas. However, lower turnout rates among the minority population and the fact that rural areas are predominantly White, implies that Republicans should expect to win Georgia's general presidential election in 2020, but not in 2024.

4. GDP/Turnout

Figure GA.4: The figure below indicates that there is a weak correlation between the Georgia's GDP & Georgia's turnout.



Source: My RStudio code - Correlation between GDP and Voter Turnout

Though Georgia has a strong GDP growth in double digits between 2000 and 2008 and then again in 2016, we know that the recession in 2008-2011 affected all states' growth negatively. The correlation coefficient for these two numeric values (GDP & Voter Turnout) is a mere .03029178, implying a very week, but positive correlation. Given that there is very weak correlation between GDP and voter turnout, I do not see a strong relationship between Georgia's economy and the presidential race, though this will not be true in other swing states like Ohio.

GEORGIA'S GDP Data

Year	Millions_Of_Dollars	GDP_Growth	Turnout
2000	304,942	25.66%	45.80%
2004	353,025	15.77%	56.20%
2008	410,778	16.36%	62.50%
2012	434,978	5.89%	59.00%
2016	541,300	24.44%	76.00%

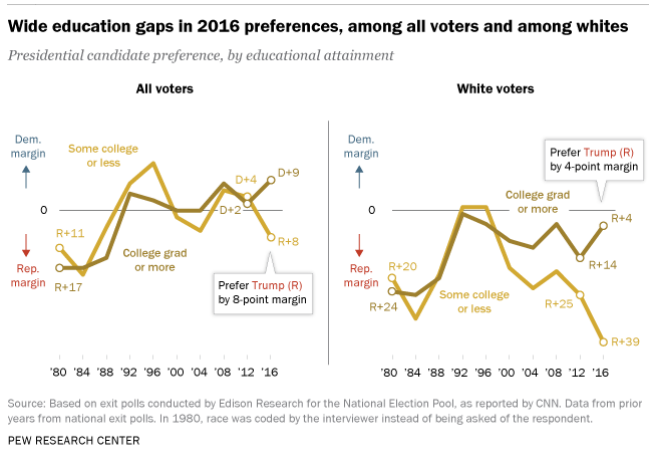
Source Data: Collected from various sources (see References)

5. College Graduates

a) Groups

The key groups College Graduates are White-College Educated, Non-White College Educated

Figure GA.5: The figure below indicates that there is a difference between how college educated and some-college/or less voted for a GOP vs. Democratic candidate.



Source: Pew Research (2016)

Overall, during the 2016 elections, voters across the country who were college educated preferred a Democrat (by 9%), and those without a college degree preferred a Republican (by 8%). Specifically, 67% of non-college whites voted for Trump, while only 28% voted for Clinton.

In, 2012, college educated preferred Democrats by only 2% margin, and those without a college degree also preferred a Democrat by 3% margin. Among non-college educated whites, 61% preferred a Republican, and 36% preferred a Democrat.

In 2008, college educated preferred Democrats by 10%, and those without a college degree preferred Republicans by 6%. Among non-college educated whites, 58% preferred a Republican, and 40% preferred a Democrat.

In 2020, I predict that a larger percentage of college-educated will vote for a Democrat, while a larger percentage of non-college educated white will continue to favor a Republican.

C. Best Fit Model – Monte Carlo Simulation

Based on the analysis of available county level results data between 2000 and 2016, and my understanding of data models, I believe that the best fit model would be Monte Carlo. I averaged the ballots cast for Democrats, Republicans and Independents over six election cycles to run the Monte Carlo model. Democrats are the largest group of registered voters yet their turnout is lower when compared to registered Republicans. For 2020, when combined with high voter turnout among white voters who favor Republicans, I predict that Republicans will win the Presidential Elections in Georgia.

Figure GA.6.1: Data from 159 Counties.

Data from Georgia (1992-2016) with 159 Counties

The FREQ Procedure

Frequency | Table of Row by Col

Row	Col 1	Col 2	Col 3	Total
1	2529	3758	124	6411
2	1079	1365	48	2492
3	1357	2122	66	3545
4	843	737	24	1604
5	7542	6620	240	14402
6	1838	3404	117	5359
7	7232	11021	445	18698
8	11622	17274	652	29548
9	2641	2640	79	5360
10	2076	3246	118	5440
11	32317	25199	803	58319
12	1757	2542	75	4374
13	1924	3305	121	5350
14	2653	2721	79	5453
15	4078	5998	156	10232
16	8975	10247	321	19543
17	4590	3810	101	8501
18	3292	4134	142	7568
19	1166	852	28	2046
20	6283	7574	209	14066
21	1352	1715	53	3120
22	14704	19256	714	34674
23	8095	12501	411	21007
24	1418	1834	57	3309
25	50328	41988	1326	93642
26	754	679	29	1462
27	3127	4056	188	7371
28	26933	45595	1686	74214
29	20910	14821	1189	36920
30	769	546	15	1330
31	54889	25844	1108	81841
32	1028	1191	46	2265
33	129303	138562	6100	273965
34	5302	6461	176	11939
35	4865	6637	196	11698
36	18414	27765	649	46828
37	2175	2700	72	4947
38	17163	24990	790	42943
39	1945	2359	83	4387
40	3060	3330	92	6482
41	2222	3336	160	5718
42	2656	5158	180	7994
43	4359	4554	118	9031
44	176958	93064	4736	274758
45	2978	3850	131	6959
46	2039	1760	53	3852
47	20346	13447	348	34141
48	22381	20554	794	43729
49	2334	2082	62	4478
50	348	631	22	1001
51	6168	9532	229	15929
52	3394	3724	132	7250
53	3346	3810	109	7265
54	1513	1816	47	3376
55	3510	5527	219	9256
56	21448	28190	993	50631
57	12872	16878	593	30343
58	19949	36627	1137	57713
59	2651	4177	154	6982
60	199598	134870	5510	339978
61	3476	5696	203	9375
62	407	777	26	1210
63	12457	15194	392	28043
64	5741	8845	318	14904
65	3620	4335	129	8084
66	3120	3533	79	6732
67	116065	122471	5445	243981
68	4447	7769	246	12462
69	18592	29967	979	49538
70	2505	1158	28	3691

71	3613	5686	213	9512
72	4876	7070	161	12107
73	3720	4813	176	8709
74	1480	2165	88	3733
75	33024	32278	964	66266
76	21358	24725	819	46902
77	1437	1828	55	3320
78	6136	10959	338	17433
79	2083	2734	80	4897
80	1884	2781	100	4765
81	3592	2852	73	6517
82	1519	1546	44	3109
83	1453	1840	50	3343
84	4625	5596	152	10373
85	2841	3488	123	6452
86	1139	1281	44	2464
87	7840	8971	243	17054
88	3962	6506	132	10600
89	7839	5244	183	13266
90	1680	2019	54	3753
91	1390	1561	60	3011
92	15705	16220	452	32377
93	3271	5355	230	8856
94	2753	1811	50	4614
95	3665	5740	212	9617
96	1341	1380	41	2762
97	3786	4157	114	8057
98	2614	2527	77	5218
99	4132	3887	126	8145
100	1029	1367	46	2442
101	3663	3376	87	7126
102	4210	5535	159	9904
103	1327	1775	56	3158
104	3169	4131	124	7424
105	3920	5793	258	9971
106	35692	26838	692	63222
107	16163	14548	482	31193
108	5489	8448	312	14249
109	2284	3009	133	5426
110	16846	24084	705	41635
111	4948	4182	122	9252
112	3709	6492	228	10429
113	2059	3632	75	5766
114	2329	4129	123	6581
115	5030	6801	262	12093
116	1554	1907	58	3519
117	3376	4290	118	7784
118	539	446	20	1005
119	2457	3830	162	6449
120	1600	1277	33	2910
121	40684	28105	871	69660
122	16752	14317	638	31707
123	611	856	21	1488
124	2792	2736	71	5599
125	1582	1705	58	3345
126	9591	10848	346	20785
127	3610	5374	207	9191
128	1197	830	27	2054
129	5719	5060	139	10918
130	1838	1209	39	3086
131	552	366	11	929
132	2596	3470	109	6175
133	1583	1598	41	3222
134	1913	1924	67	3904
135	2096	1687	45	3828
136	7309	8157	201	15667
137	5305	6826	151	12282
138	3575	4742	137	8454
139	1968	3130	123	5221
140	1177	1298	37	2512
141	10110	11574	340	22024
142	1480	1513	51	3044
143	2178	1807	66	4051
145	4397	5376	146	9919
146	8144	12063	471	20678
147	10543	17076	502	28121
148	4773	6053	143	10969
149	1342	1033	28	2403
150	4190	3551	104	7845
151	3695	5364	155	9214
152	533	477	14	1024
153	873	1023	31	1927
154	3215	5497	194	8906
155	10234	14479	486	25199
156	1179	1503	47	2729
157	2192	2204	63	4459
158	2164	2021	66	4251
159	3044	4098	112	7254
Total	1620061	1614023	58773	3292857

Figure GA.6.2: Key Statistics.

Statistics for Table of Row by Col

Statistic	DF	Value	Prob
Chi-Square	316	108093	<.0001
Likelihood Ratio Chi-Square	316	109245	<.0001
Mantel-Haenszel Chi-Square	1	1853	<.0001
Phi Coefficient		0.18118	
Contingency Coefficient		0.17828	
Cramer's V		0.12811	

Figure GA.6.3: Pearson Chi-Square Test.

Pearson Chi-Square Test	
Chi-Square	108093
DF	316
Asymptotic Pr > ChiSq	<.0001
Exact Pr >= ChiSq	.

Sample Size = 3292857

Figure GA.6.4: MC Procedure for the Exact Test.

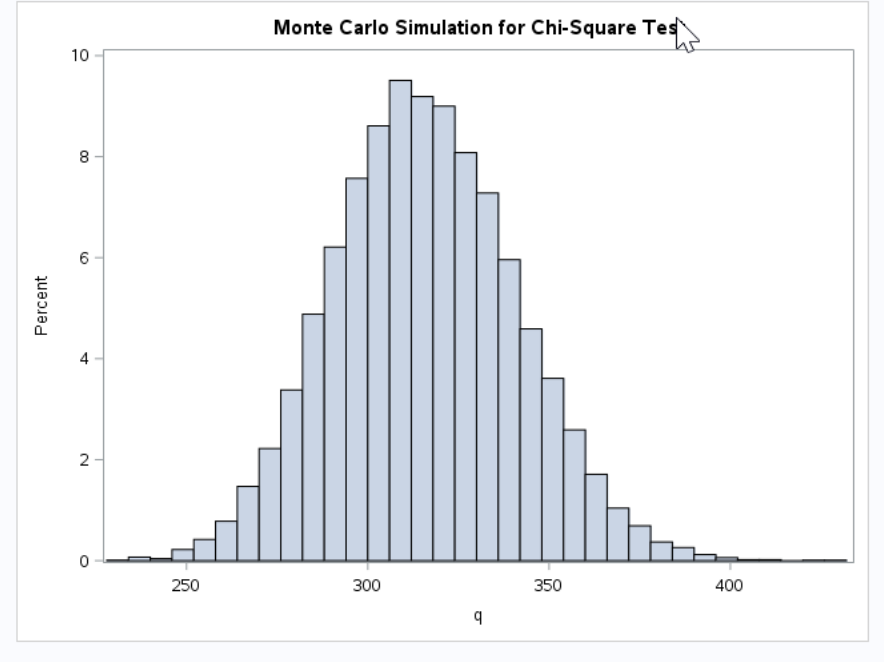
Data from Georgia (1992-2016) with 159 Counties

The FREQ Procedure
Statistics for Table of Row by Col

Pearson Chi-Square Test	
Chi-Square	108093
DF	316
Asymptotic Pr > ChiSq	<.0001

Monte Carlo Estimate for the Exact Test	
Pr >= ChiSq	<.0001
99% Lower Conf Limit	<.0001
99% Upper Conf Limit	0.0005
Number of Samples	10000
Initial Seed	222345293

Figure GA.6.5: MC Simulation for Chi-Square Test.



Source: My SAS Model

The results above reflect that I have a normal distribution of voters across the three parties: Republican, Democrat and Independent in 2020, favoring Republicans

D. Predictable Outcomes from Past Results

There are 6 major predictable outcomes using past elections' data from Georgia that we can apply to future elections:

- ✓ Majority of non-college educated whites vote for a Republican
  - Over 2/3 of non-college educated whites vote for a Republican

- ✓ Majority of blacks (college educated and non-college educated) vote for a Democrat
  - Over 70% of non-Hispanic blacks will vote for a Democrat

- ✓ Fewer % of voters below the age of 45 cast their vote when compared to those older than 45
  - During the last 5 presidential elections, fewer % of voters (varies by age) below the age of 45 turnout to vote, regardless of their party affiliation

- ✓ The economy of Georgia has little to no impact on the voter turnout
  - Voter turnout was high in Georgia during the 2016 election (76%) and the economy (GDP) had double digit growth of 24.44%. Regardless of these facts, historical evidence shows that there is no significant correlation between GDP and voter turnout.

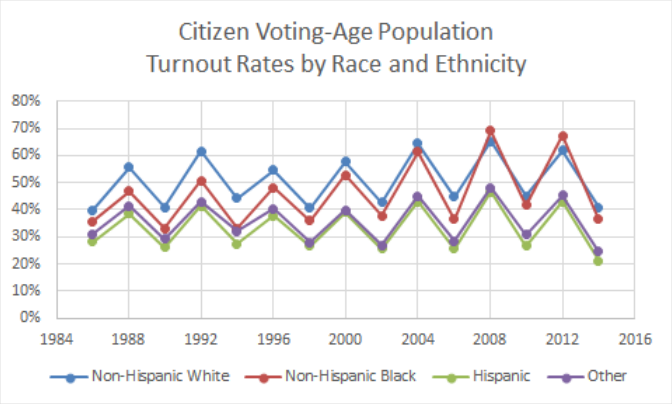
- ✓ Hispanic & Latino voter turnout is <50%
  - Historical evidence shows that Hispanic and Latino voter turnout remains anemic at best in Georgia. Less than 45% of registered Hispanic and Latino voters, cast their ballot in 2012, and there continues to be a downward trend.

- ✓ Majority of college educated voters vote for a Democrat.
  - College educated voters continue to shift towards Democrats, and the trend remains will remain entering 2020 elections.

E. Turnout

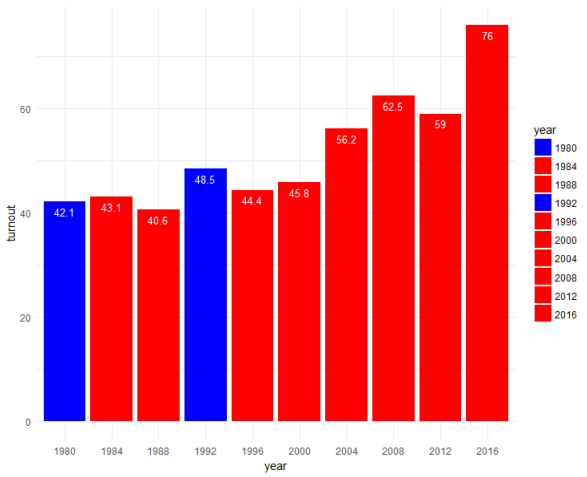
Voter turnout will be a major contributor to who wins the White House in 2020. In Georgia, the White Male, White Female and Black Female voter turnout is traditionally high, when compared to Black Male voters. In 2012, 77.31% of the Black Females, 75.34% of White Males and 75.95% of White Females turned out to vote. As of 2016, there are 934,981 Black Female, 1,404,562 White Male and 1,635,775 White Female registered voters in Georgia, comprising 75% of the total registered voters. Only 65.75% of Black Men voted during 2012 in Georgia, though they form almost 12% of the registered voters. This lower participation rate among Black Males, continues to challenge Georgia's presidential races, giving the election to Republicans, even though there are more registered Democrats in Georgia.

Figure GA.7: The figure below indicates that since 1986, across US that the Non-Hispanic Black voter turnout has been steadily increasing, while that of Hispanic participation is significantly lower than all others and decreasing.



Source: Elect Project (2016)

Figure GA.8: The figure below indicates that Republicans have won the last 6 Presidential contests in Georgia, regardless of the overall turnout rate.



Source: My RStudio code for voter turnout

Contrary to popular belief, there is a no strong correlation between voter turnout and Republicans winning in GA. Since 1996, the state of GA has voted for a Republican candidate, regardless of the voter turnout.

F. Top 5 Georgia Voter Concerns

Immigration

A

As per PewHispanic.org, the State of Georgia has one of the highest illegal immigration population in the country at 400k. This mixed with a high net increase of Hispanics and Latino population moving into Georgia since 2000, has produced hysteria in a state that boasts "Too busy to hate" as Atlanta's slogan.

Georgia will benefit from influx of immigrants through legal channels to carry the state well into the 21st century with jobs for both skilled and unskilled labor. Hotel, transportation, and farming industries will benefit from influx of legal immigration, given their high demand for unskilled labor. Inversely, Technology, Healthcare and Telecom will benefit from skilled labor.

Trade

B

The concern among Georgia's electorate remains that we have a significant trade deficit with economies such as China, Japan, Germany, Mexico and other countries. Voters would like this trade deficit reduced.

Guns

C

As per usliberals.about.com, Georgia has 40.3% gun ownership, ranking 25th in the nation. Georgians like their guns (including liberals) and their 2nd Amendment rights to carry a weapon. So, a clear majority of the voters prefer that these rights not be impinged upon.

Race

D

As per Bluestein (2016), by 2025 the state will become a majority-minority state, and by 2036, people of color will outnumber Whites. No predominant population in the history has likened change of this scale, and hence the pushback from White voters in Georgia to remain in the Republican camp.

However, with a significant change to the Black population due to reverse southern migration, I predict that by 2025, Georgia will be a near blue state.

Economy

E

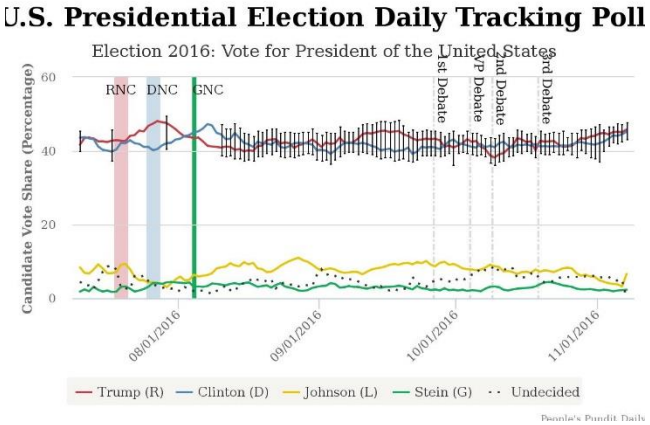
As per infoplease (2016), Georgia has a vibrant economy with Trade and Services, and recently its manufacturing and agriculture industries have shown growth. Georgia also has the CDC, and a Naval base in Kings Bay. These sectors produce a variety of jobs for the state.

A majority of the Georgians believe that the economy needs to improve and support a $15 minimum wage.

G. 2016 Election Polls

The following three pollsters called 2016 correctly:

- ✓ IBD/TIPP Presidential Election Tracking Poll (called it 43% in favor or Trump, when compared to 41% for Clinton)
- ✓ USC Dornsife/LA Times Presidential Election Poll



Source: Peoples Pundit Daily (2016)

- ✓ People's Pundit Daily (PPD), had some of the best polling results. They predicted that Trump would win by 48.5$ vs. Hillary at 47.8$. The actual results are 48.8% for Trump and 47.6% for Clinton.

III. South Dakota

A. South Dakota 2020 Predictions

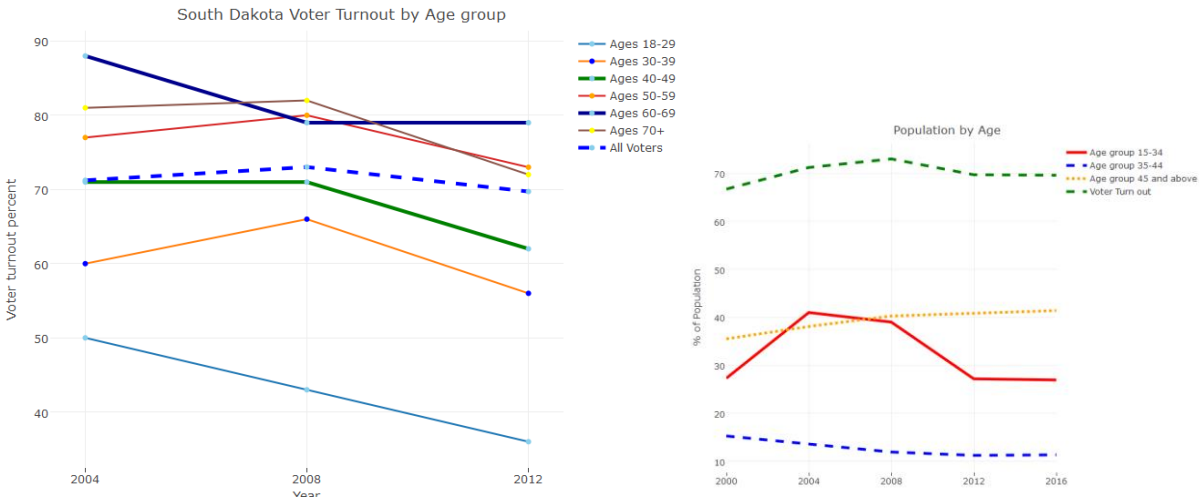
Age	Gender	Race
From the trend seen in the previous elections, we can see that the millennials between 18-29 and the next age group 30-39 will continue to have lower turnout in 2020 elections as well. As per exit polls of 2012, 60% of voters of age 18-29 voted for democrats while as the age increases vote share of republicans increases. This is in line with the national trend as well. The older people are they tend to be more conservative and vote for republicans.	Women tend to have a higher turnout than men in South Dakota but the turnout rates have fallen sharply over the years compared to men. Also, as per the exit polls women seem to favor Democrats more compared to men. In 2012 exit polls 53% women favored democrats compared to 47% men. In 2016 exit polls, only 41% women favored Democrats which was a big drop (i.e. 12%). However South Dakota continues to remain loyal to republicans. We expect the same trend to continue in 2020 as well.	South Dakota has a 86% population which is white and 8% American Indian and rest are African Americans and Asian Americans. As per 2012 exit polls, 59% White favored Republicans compared to just 7% African-Americans and 27% Latinos. This is once again very similar to the national level as well. Even 93% African-Americans support Democrats, this population is just 1.2% of all South Dakota which makes this very negligible. The population of White Americans is reducing every year by less than one percentage. So we expect the same trend to continue in 2020 as well.
The change in demographics, the age of the voter population and the influence of women over the next two election cycles, will have a significant impact on the 2020 presidential race. The candidate that understands and taps into the needs of these three groups, and the voter turnout in 2020 will influence who enters the White House as President. With the data analyzed to date, I predict that in 2020, Republicans will win South Dakota by 20-30% margin.		

B. Categories & Groups

1. Age

As voters age, they turnout at a higher rate at polling booths in South Dakota, and they lean Republican, rather than Democrat.

Figure SD.1: In the figure below, we can identify that the voters between the ages of 18-29 are continuously decreasing % of the overall voting population from 2004 to 2012.



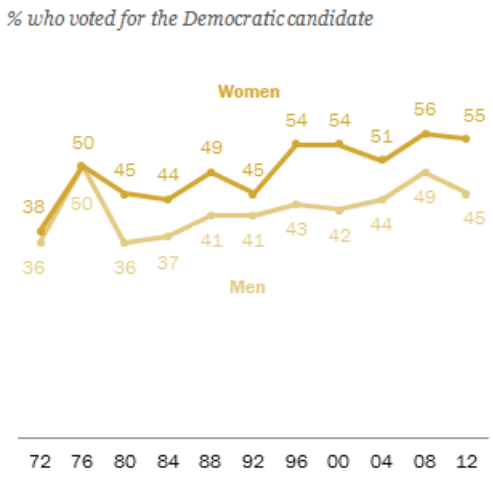
Source: My RStudio work on Age and Census Bureau

In the state of South Dakota, the voter turnout for millennials i.e. age group 18-29 is significantly lesser compared to any other age group. The worrisome trend is that over the years 2004-2012, 15% less voters turned out at the booths. Also, the population of South Dakota is growing older. In the last 15 years, population of 45 years and above have increased by 7-8% whereas the millennials have retained the same percentage. This plays a major factor in 2020 elections as the population of older people will keep increasing who in turn will favor republicans and also will have a higher turn out. In 2016, there was 5.6% votes cast to third party candidates. This could be because there were more people who were not satisfied with either of the candidates and if this trend continues we may see more votes for Third party candidates in 2020.

2. Gender

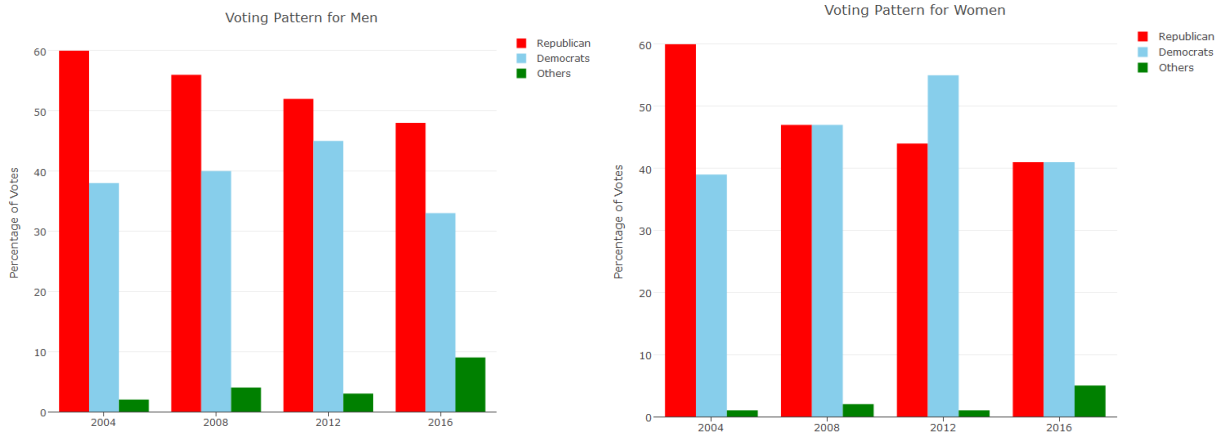
Based on exit poll data, in 2012 52% men voted for Republicans and in 2016 48% men voted for republicans. 44% women voted for Republicans in 2012 and in 2016 41% voted for republicans. Even though for men it shows a downward trend, women held steady and still continued to vote for republicans. But the steady trend for women cannot be seen for democrats as in 2012 53% women voted for democrats but in 2016 only 41% women planned to vote for democrats which is a significant drop(12%). At a national level, This shows to an extent the conservative attitude of the state.

At a national level, women preferred democrats and every election year the trend only seems to be more positive. This is in contrast to South Dakota where women are switching to republicans.



Source: Pew Research center (2016)

Based on the graphs below, we can see an interesting trend in South Dakota where the vote share of Republicans and Democrats are on a constant decline and the inclination towards third party is increasing slowly for men. This may still not make much of a difference in 2020, as the increase is only very small but an interesting trend to note.

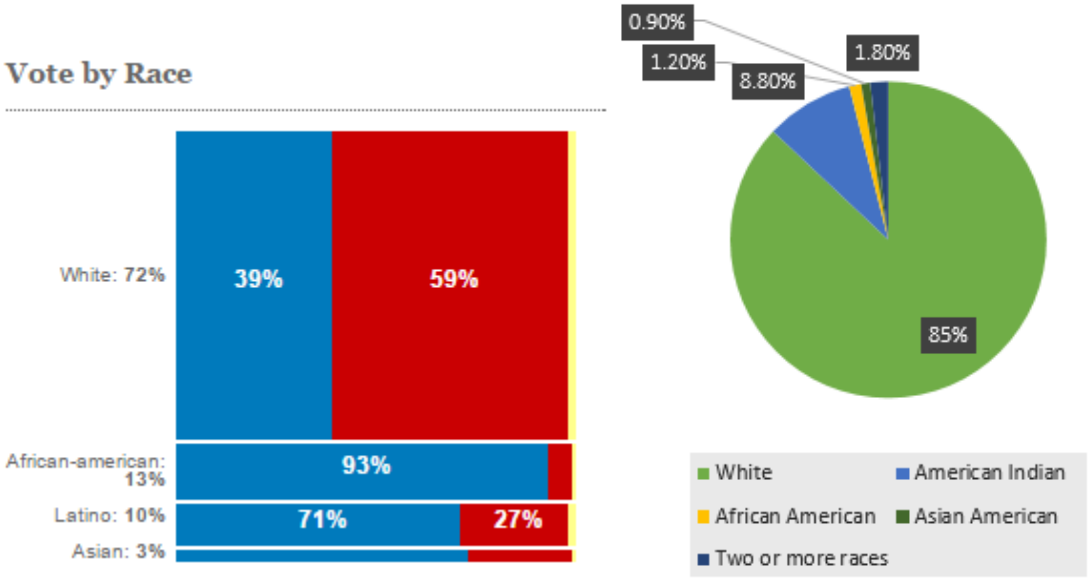


Source: My RStudio work on Gender and Exit polls for Year 2004-2012

3. Race

Whites will continue to dominate as the major race for South Dakota for some more election years. This is in spite of the increase in population for Hispanic, Black and Asians.

As per 2012 exit polls, we could see that the majority of White voters prefer republicans which is in line with the national assumptions.



Source: (Left) CNN Exit Polls 2012. (Right)Wikipedia and Census Bureau

In 2011, 25.4% of children less than one year old were minorities. This means when these children cross 18 years old and still continue to be in South Dakota, then they could completely alter the demographics of South Dakota. For 2020, this may not be a major issue though.

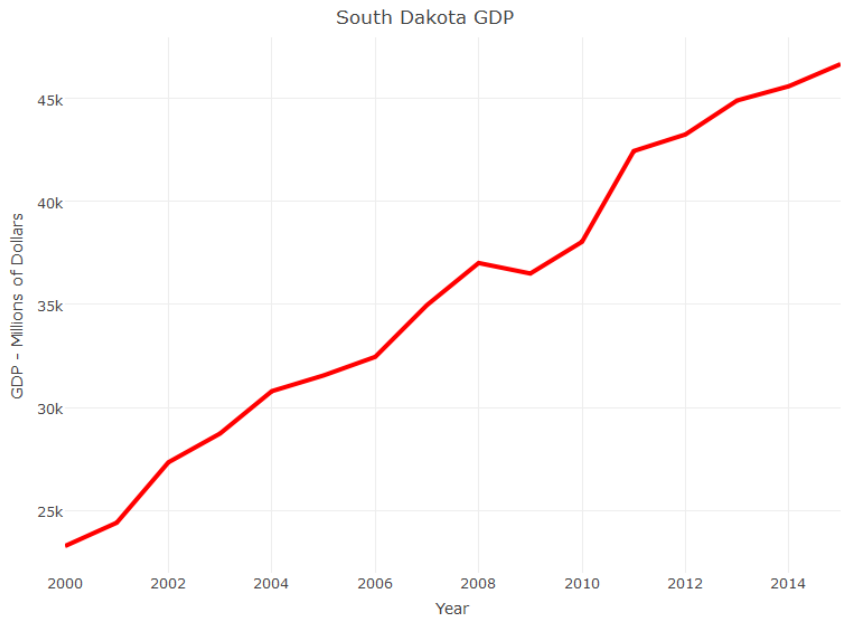
The number of black residents doubled from 4685 to 10207 between the years 2000-2010. This is a 113%increase. Part of the increase may be due to the influx of African immigrants and refugees.

According to the 2010 Census, the number of Hispanic people living in the state doubled to more than 22,000 in the past 10 years, but they still comprise not quite 3 percent of its population.

Based on the above analysis of population change in South Dakota, we could note that the population will be diverse in South Dakota like other states in some decades. Since Hispanics and Blacks constitute less than 5% of population currently, it will take many years for having a significant impact in the elections.

4. GDP/Turnout

South Dakota has one of the most impressive GDP growth in the overall United States.



Source: My RStudio work on GDP and FRED Economic Data

South Dakota is comparatively smaller state and has a lower GDP compared to other states. But still the GDP growth of South Dakota over the years is very impressive. South Dakota GDP raised from $25000 million to $45000 million in the last 15 years.

Even during the recession, South Dakota GDP did not decline but held steady.

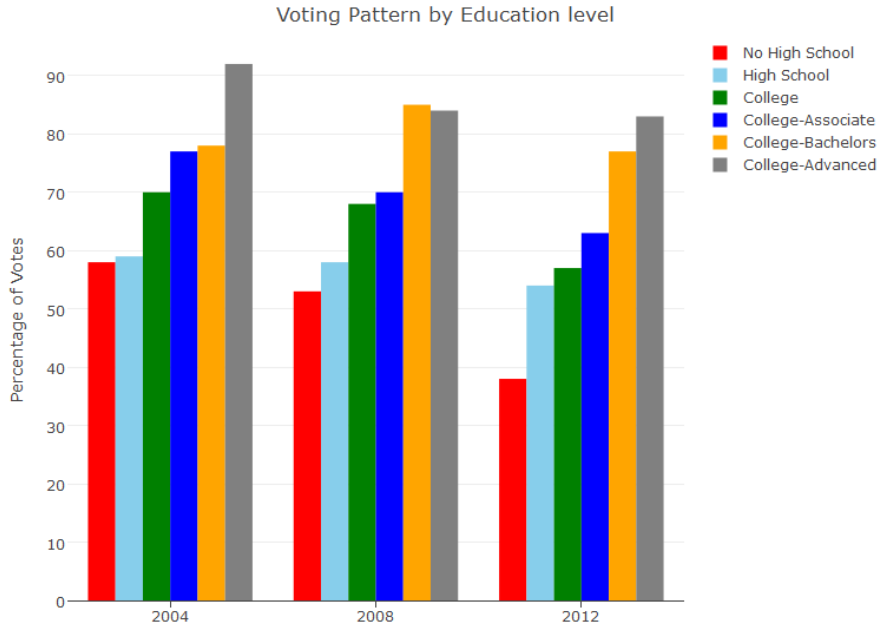
South Dakota's economy grew a robust 9.2 percent in the third quarter of 2015, by far the largest gain in US. The state benefited from its heavy dependence on farming and outdoor activities, with agriculture, forestry, fishing, and hunting contributing 6.9 percentage points in gross domestic product during the period. South Dakota also posted strong growth in construction, finance and insurance, health care, and real estate.

Agriculture, South Dakota's largest industry, has helped the state's economy by not only producing a diverse range of crops and livestock but processing more of them locally before they are shipped, said Lucas Lentsch, the state's secretary of agriculture.

Since South Dakota relies on traditional industries like Agriculture, forestry and fishing, which are generally not affected because of globalization / immigration, we expect South Dakota to continue to improve on GDP in the future years as well. Once again these are conservative industries and has higher chances of leaning towards republicans.

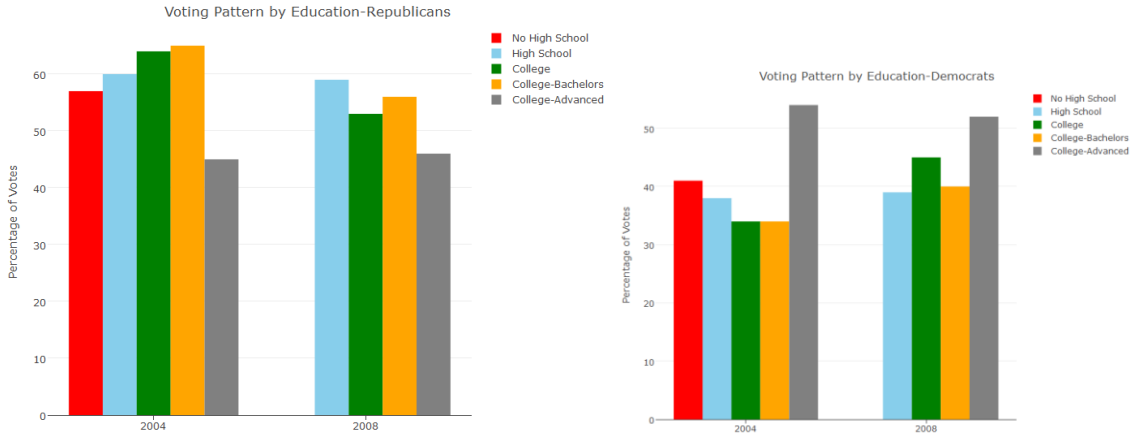
5. College Graduates

More educated voters turn up to the voting booth during elections for South Dakota. The higher the education, more the voter turnout is. Based on poll data, we could see the following trend for the last few election years.



Source: My RStudio work on Education and Voting Hot Report, Census Bureau

Based on the exit polls below, we see that highly educated people tend to vote democrats while high school or some college educated stick with republicans.



Source: My RStudio work on Education and CNN Exit Polls (2004-2008)

Since more educated voters tend to turn up at the poll booths, and they prefer democrats will change the demographics in the future as more people will start going to college.

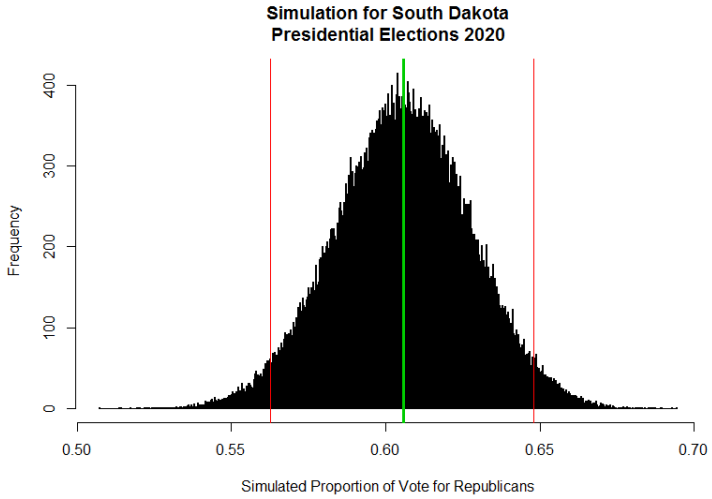
C. Best Fit Model – Monte Carlo Simulation

Based on the analysis done by Race, Education, Gender, GDP and Age on historical data, we could see that there is a strong shift to republicans in 2020. Population of Blacks and Hispanics are doubling at a faster rate, but to have an effect on the elections, we may need to wait for some more elections.

So, we predict that Republicans will win 2020 Presidential elections also. We use Monte Carlo simulation method to see what the proportion of votes will be obtained by Republicans in 2020 in every South Dakota county. All the required development was done using R Studio.

We averaged the ballots cast for Democrats, Republicans and Independents over five election cycles (2000-2016) to run the Monte Carlo model. We simulated the ballots cast 100000 times and got the results below.

Based on our prediction, we are 95% confident that, Republicans will get a vote share of anywhere between 56.24% and 64.80% votes in 2020 Elections.



Source: My RStudio work on Simulation for 2020 and Wikipedia / Politico Historical Election Results

We also predicted the Confidence Interval and the median values of the Republican Vote share at county level based on the Monte-Carlo simulation method as well.

In the table below, we have predicted the Vote Share of republicans by County for 2020.

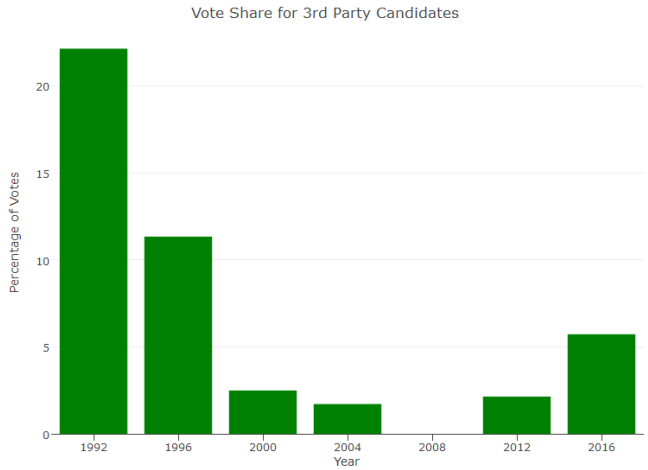
	Simulation_Median	Confidence_Interval_Low	Confidence_Interval_High
Aurora	60.37783	56.256103	64.43420
Beadle	58.25679	54.103050	62.31295
Bennett	55.35301	51.145263	59.48716
Bon Homme	61.25687	57.101953	65.26254
Brookings	52.77495	48.610294	56.94144
Brown	53.71920	49.532605	57.85466
Brule	61.44169	57.326146	65.43565
Buffalo	29.44830	25.734912	33.35311
Butte	73.31129	69.495369	76.88337
Campbell	77.44105	73.796556	80.78785
Charles Mix	59.34970	55.193720	63.39012
Clark	60.97197	56.841125	64.99155
Clay	42.04168	37.938427	46.21287
Codington	59.68837	55.564488	63.75275
Corson	44.80485	40.687201	49.00172
Custer	68.15766	64.180632	71.96407
Davison	60.40459	56.285797	64.46098
Day	49.23199	45.064005	53.40560
Deuel	56.84709	52.669577	60.95688
Dewey	38.31902	34.304252	42.44059
Douglas	78.50820	74.940157	81.82375
Edmunds	65.28170	61.239460	69.16897
Fall river	65.06774	61.003253	69.00917
Faulk	68.84322	64.904716	72.62696
Grant	58.32305	54.151112	62.39347
Gregory	68.52428	64.550501	72.36360
Haakon	84.45342	81.276198	87.33407
Hamlin	65.52693	61.483910	69.43165
Hand	68.78869	64.833984	72.58516
Hanson	66.27539	62.241499	70.14439
Harding	86.32992	83.270091	89.03875
Hughes	65.41444	61.366059	69.31304
Hutchinson	69.82123	65.920001	73.55482
Hyde	72.38775	68.535219	76.05040
Jackson	61.73115	57.613210	65.73028

	Simulation_Median	Confidence_Interval_Low	Confidence_Interval_High
Jerauld	56.98996	52.856631	61.10813
Jones	78.27800	74.720008	81.59589
Kingsbury	58.56041	54.372905	62.65891
Lake	54.36413	50.166359	58.46644
Lawerence	62.69270	58.599733	66.65540
Lincoln	61.57598	57.431423	65.56865
Lyman	59.89368	55.726595	63.91472
Marshall	50.81957	46.651295	55.04144
McCook	65.36426	61.288677	69.24929
McPherson	69.66464	65.695127	73.43938
Meade	70.86644	66.989134	74.55116
Mellette	57.83241	53.652163	61.93099
Miner	56.52402	52.328852	60.64719
Minnehaha	53.37928	49.217000	57.51608
Moody	51.66387	47.472576	55.82005
Pennington	64.04246	59.988516	67.97715
Perkins	75.29904	71.588700	78.78530
Potter	72.94153	69.107308	76.55868
Roberts	48.38637	44.215943	52.55946
Sanbron	61.79246	57.665205	65.79973
Shannon	10.02862	7.694421	12.72964
Spink	57.66530	53.504279	61.74915
Stanely	69.36214	65.412196	73.10545
Sully	74.67219	70.927278	78.19942
Todd	24.13408	20.646779	27.82497
Tripp	70.66413	66.795351	74.37031
Turner	64.24301	60.164118	68.17843
Union	59.68038	55.556769	63.73169
Walworth	69.51376	65.563233	73.26537
Yankton	55.58952	51.416397	59.68426
Ziebach	43.67797	39.557643	47.85914

Source: My RStudio work on 2020 Presidential Election Prediction using Monte-Carlo approach

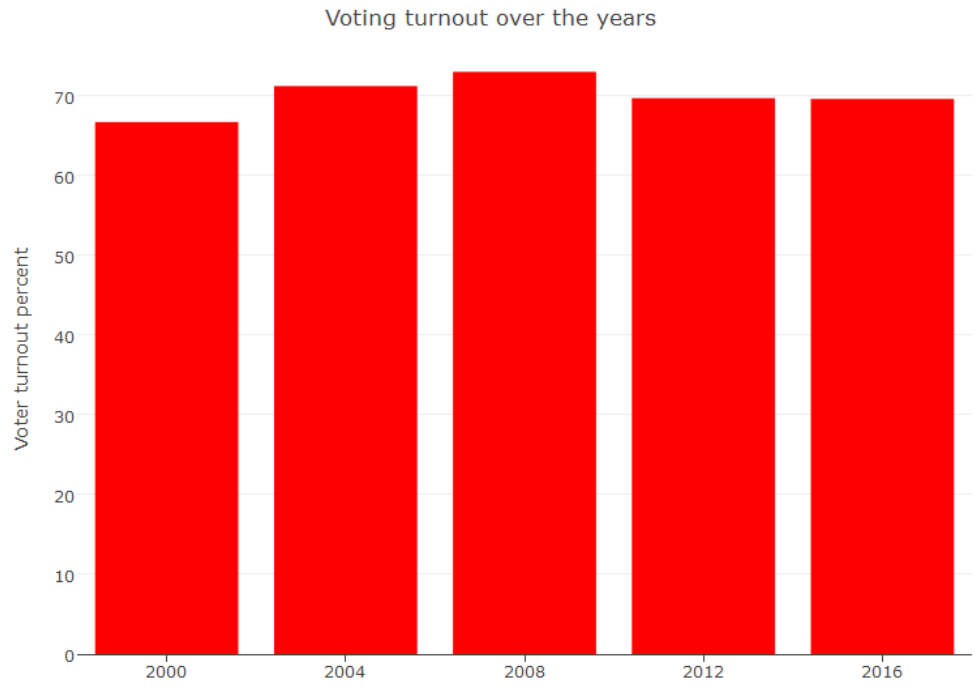
D. Predictable Outcomes from Past Results

- ✓ The older the age, more people turn up at the polling booth.
- ✓ Younger people show less interest in polls and the percentage of votes for younger population is reducing every election year.
- ✓ Highly educated people tend to vote democrats
- ✓ Irrespective of the election and the Recession the economy of South Dakota is on a rising trend for the last two decades.
- ✓ Republicans are losing votes in every election year from 2000. Democrats are not gaining the same number of votes, but people tend to vote for independent candidates
- ✓ 86% of population is White in South Dakota and blue collar jobs. They predominantly vote republicans
- ✓ Population of African-Americans and Hispanics are doubling very fast. In the far future, this will change the trend in South Dakota and it may lean more democrat. Currently the population share is very less (i.e. less than 5%) for African-American and Hispanics, so doubling will take more time to show some effect on the elections.
- ✓ In the 1990s, a considerable percentage of South Dakota Voters chose Independent Candidates but in the elections in the past decade, Vote share of Independent candidates reduced drastically. But in the last two elections, Vote share of Independent candidates increased again. This explains, that even though republicans are losing the share, democrats were not gaining the votes.



Source: My RStudio work on Election Results and USElectionAtlas.org

E. Turnout

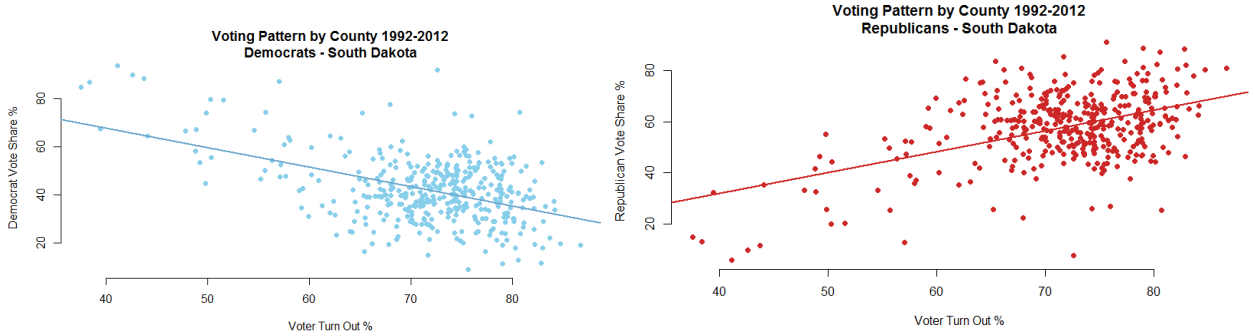


Source: My RStudio work on Voter Turnout and Census Bureau

Correlation:
I did not find any correlation between Voter Turnout and selection of a candidate. Irrespective of the voter turnout, republicans continue to win South Dakota from 1970s.

Rather, we found correlation between the margins of the win by Republicans based on the Voter turnout. When more voters go to the polls, Republicans win with more margin. And vice-versa is applicable for Democrats.

This can be shown in the graph below, which shows county level data for South Dakota.



Source: My RStudio work on Voter Turnout and Census Bureau

F. Top 4 South Dakota Voter Concerns

Education Spending

A

Continuing a decades-long trend, South Dakota spends less on each student in K-12 education than any state in the region. In fact, only six states spent less per student in 2009 than South Dakota, according to the U.S. Census Bureau.

The Census Bureau study, which was released earlier, shows the state spent $8,507 per student in 2009, ranking it 44th in the nation. The national average, meanwhile, rose to $10,499. Over the years other states increased spending while South Dakota continues to spend less.

Abortion

B

South Dakota is a high conservative state.
It recently became the latest state to pass a pain-capable abortion ban where abortion is prohibited after 20 weeks. The legislation penalizes doctors who perform or attempt to perform such abortions in non-emergency situations. Violators would be subject to penalties of up to a year in jail, a $2,000 fine, or both.

Guns

C

Gun ownership in South Dakota is very high(59.9% at 2000) but death due to injury by fire arms is very low, this could make them still support for guns, so the state may not favor any party/candidate against guns. We could assume that they give high importance to 2nd amendment as well.

Dakota Access Pipeline

D

The pipeline has united a number of different interest groups with a variety of objections, but Native Americans have been at the center of the opposition. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has reported more than 3,300 incidents of leaks and ruptures at oil and gas pipelines since 2010.

G. 2016 Election Polls

All the exit polls predicted that Trump would win South Dakota as it is a traditionally republican state. But none of the polls predicted the correct percentage of votes Clinton and Trump will get.

Some of the polls came very close to the results though.

Actual Results

President

CANDIDATE	PARTY	VOTES	PCT.
 ✔ Donald J. Trump	Republican	227,701	**61.5%**
 Hillary Clinton	Democrat	117,442	**31.7**
 Gary Johnson	Libertarian	20,845	**5.6**
Darrell Castle	Constitution	4,059	**1.1**

Source: CNN Actual Poll Results 2016

The polls that came very close to these results are:

Poll	Clinton	Trump
Survey Monkey	32%	53%
CCES / YouGov	31%	50%
Ipsos	33%	50%

Source: FiveThirtyEight.com

Political analysts gave reasons for why the exit polls were not accurate. Some of the reasons are:

- ✓ Women did not turn out in huge numbers to support Clinton
- ✓ In spite of the political climate, Hispanics and blacks did not turn in large numbers to vote for Clinton as analysts expected
- ✓ Field reporting was missing in this election. So the general feel of the people were not checked. Local newspapers are shut down (effect of smartphones!!!), local TV stations are focused on crime and ratings only

IV. Illinois

A. Illinois 2020 Predictions

Age	Gender	Race
Historically people older than 45 have been registering for vote more than others with at least 75% of the total citizens registered and they are voter turnout is around 70%. younger voter (18 to 24) are registering lot less compared to others they are at less than 50% in registering the votes and less than 40% in voter turnout. Other populations (25 to 44) are registering around 60% and about 50% of the citizens in these age groups are voted. Over the years these trends have slightly changed as the people getting aged they are falling in different age groups and they have been continuously registering and voting compared to the new generations.	There are more females than males in the state with at least 2.5% difference. Likewise, women tend to register for voting more (average 70%) than male (68%), but out the registered men, voter turnout is more than women by 5% margin. There was a slight decline in voting patterns in years 2008 and 2012 compared to previous years. There was a decline over registered and voting in all genders in 2008 compared to 2004 and decline in voting in 2012 compared to 2008.	White population dominates the state with around 75 percentage of the total population and about little over 15 percentage are black population. Historically voter turnout of the black population is at over 70% which is higher than any other race in the state. White population voter turnout is just above 60% over the years. Hispanics voter turnout is close to 37%, whereas Asians voter turnout of used to be very low and at around 35%, but since 2008 they have been voting at least 50%.
Based on the historical election results and other data in the 2020 presidential election projection for the state of Illinois is a Democratic party will win the elections with 95% confidence interval, these are the four major categories will impact the election results: Age, Gender, Race and how the Metropolitan voters will vote.		

B. Categories & Groups

1. Age

In the state of Illinois there are more middle aged peoples 25 to 64 and there are high numbers of those have been registering for the vote and have voted historically compared to people in other age groups. Overall there has been around 70% voter turnout in Illinois and democrats have been winning since 1992. Like I mention earlier in this paper more people in metropolitan areas have been voting for democrats irrespective of age group which is making significant difference in overall state outcome.

Figure IL.1: Below graph has the information taking the people over 18 years; total population, citizens, registered voters, and people voted in percentages over the past five elections (2000,2004,2008,2012,2016).

Created using RStudio and data has been gathered from various sources such as census, Illinois election board etc.

2. Gender

There are more women than men in the state. Men tend to vote more than women, but there are more women are registering for votes. There was a slight decline in voting in 2008 and 2012 compared to previous years. Please see the below tables with the percentage of voter changes over years.

Figure IL.2: Historical voter registration and voter turnout changes.

Year	Gender	Registered Voters (18+)	% Change from previous elections	Total Voted (18+)	% Change from previous elections
2016	Male	3,118,912	**3.49**	2,623,923	**4.07**
2012	Male	3,010,000	**3.65**	2,517,000	**-0.16**
2008	Male	2,900,000	**-5.14**	2,521,000	**-4.72**
2004	Male	3,049,000	**10.59**	2,640,000	**12.50**
2000	Male	2,726,000	**0.00**	2,310,000	**0.00**

Year	Gender	Registered Voters (18+)	% Change from previous elections	Total Voted (18+)	% Change from previous elections
2016	Female	3,470,105	**1.59**	2,948,022	**1.26**
2012	Female	3,415,000	**4.77**	2,911,000	**-0.10**
2008	Female	3,252,000	**-4.18**	2,914,000	**-4.05**
2004	Female	3,388,000	**5.99**	3,032,000	**10.29**
2000	Female	3,185,000	**0.00**	2,720,000	**0.00**

3. Race

The population historically increased around 5% for every election cycle, Whites comprised around 75% of the overall population and majority of them voted. Blacks comprise around 15% of the population and Hispanics around 11%.

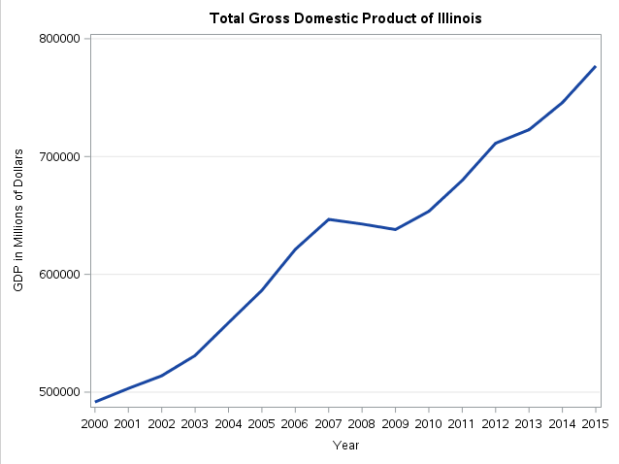
Figure IL.3: Overall whites dominate the state of Illinois.

Created using RStudio and data have been gathered from various sources such as census, Illinois election board etc.

4. GDP/Turnout

In 2015 Illinois GDP grew by 1.8 percent compared to prior year. Illinois is one of the top 5 states in the United States, except 2008-2009.It was $776,900 million in 2015; GDP change overall US was 2.5%.

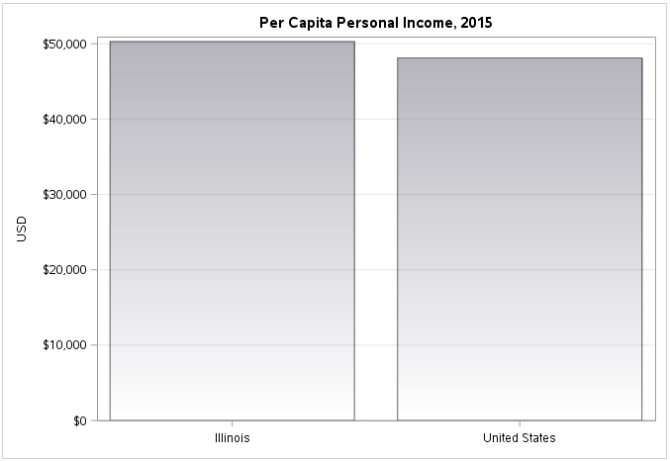
Figure IL.4: GDP of the state of Illinois



Created using SAS and data have been collected from various resources (see References)

Per capita income per person is $50,295 where the United States national average was $48,112, which puts the state of Illinois in the 15th position in the nation in terms of per capita personal income.

Figure IL.5: Comparison of per capita income of Illinois and the United States in 2015



Created using SAS and data have been collected from various resources (see References)

Figure IL.6: Comparison of Compound annual growth rate of Illinois and the USA

2005-2015 CAGR

	Illinois	U.S.
Net earnings	2.6 %	3.2 %
Dividends, interest, and rent	3.7 %	4.3 %
Personal current transfer receipts	4.9 %	5.9 %

CAGR: compound annual growth rate

Image captured form the report
https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=17000&areatype=STATE&geotype=3

Figure IL.7: Comparison of top 5 industries as a percent of total GDP in 2015

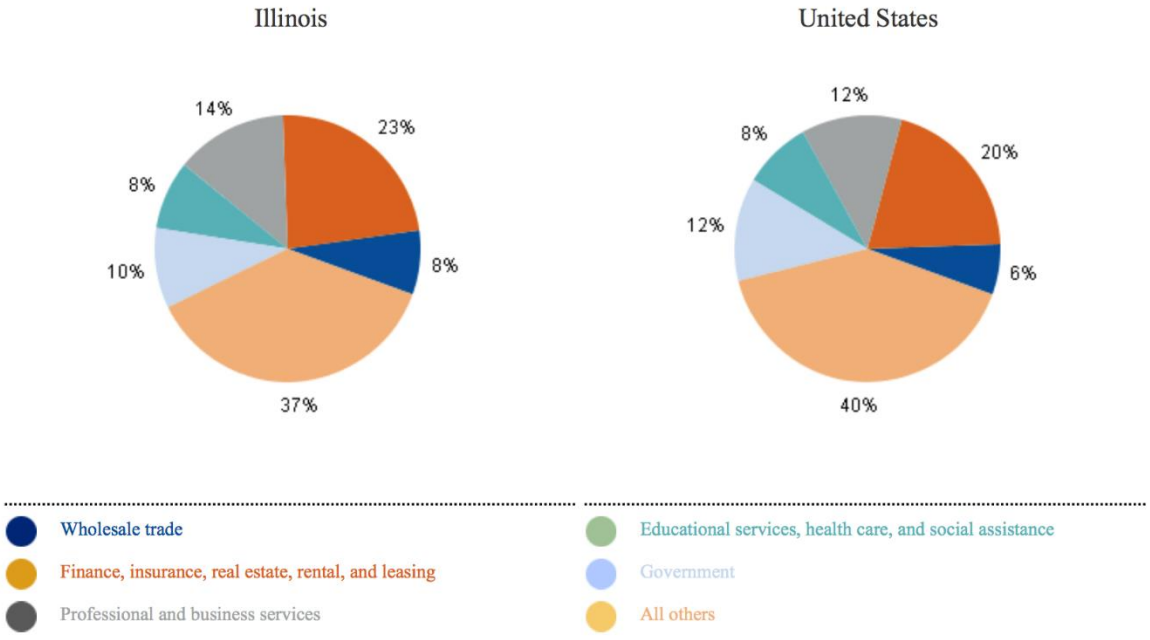


Image captured form the report
https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=17000&areatype=STATE&geotype=3

5. College Graduates

Highly educated people had higher turnout in the elections compared to people who did not complete high school

Figure IL.8: Voting pattern based on education in Illinois

	Voted	Registered, No Vote	Not Registered	No Response
Did not complete high school	28%	16%	27%	29%
Completed high school	54%	11%	19%	15%
Some college, no degree	59%	16%	14%	11%
Associate's degree	63%	11%	9%	16%
Bachelor's degree	74%	9%	7%	10%
Advanced degree	83%	5%	4%	8%

Image captured form the report
https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=17000&areatype=STATE&geotype=3

C. Best Fit Model – Monte Carlo Simulation

There are several models that we can use to predict but out of which I believe Monte Carlo is best the fit. I have used the county level data for the state of Illinois there are 102 counties, please see the results below:

Figure IL.9: Monte Carlo simulation results votes that got by county row1# Republican, 2# Democratic, 3# Libertarian 4#Green

Table of Row by Col					
	Col				
Row	1	2	3	4	Total
1	22790	7676	1168	249	31883
2	1496	1262	48	14	2820
3	4888	2068	447	67	7470
4	12282	8986	1068	330	22666
5	1796	476	77	10	2359
6	9281	6029	842	197	16349
7	1721	739	72	26	2558
8	4434	2447	395	98	7374
9	3216	1621	172	51	5060
10	33368	50137	4547	1797	89849
11	10543	3992	662	149	15346
12	5622	1877	277	49	7825
13	5021	1020	209	48	6298
14	12412	3945	813	125	17295
15	13003	7309	1025	287	21624
16	453287	1611946	58678	32484	2156395
17	6277	1992	324	68	8661
18	4206	1031	238	47	5522
19	19091	20466	2482	751	42790
20	5077	1910	431	61	7479
21	5698	1949	362	90	8099
22	166415	228622	20357	6367	421761
23	5645	1793	328	49	7815
24	2778	434	91	12	3315
25	13635	3083	644	100	17462
26	7372	1819	283	57	9531
27	4480	1414	323	87	6304
28	13116	4727	541	183	18567
29	8492	6133	780	239	15644
30	1942	657	73	20	2692
31	4145	1205	164	39	5553
32	13454	8065	1140	323	22982
33	3206	802	114	24	4146
34	6430	2139	348	64	8981
35	1653	420	46	18	2137
36	2155	1155	158	19	3487
37	13985	8871	1243	200	24299
38	9750	2504	554	150	12958
39	10843	11634	1081	649	24207
40	3975	924	181	26	5106
41	11695	4425	573	158	16851
42	7748	2679	410	94	10931
43	6121	4462	500	116	11199
44	4649	1142	182	57	6030
45	82734	103665	9292	2896	198587
46	25129	18971	1992	587	46679
47	24961	24884	2675	742	53262
48	10737	10083	1109	278	22207
49	109767	171095	13312	3821	297995
50	26689	19543	2298	649	49179
51	4521	1290	194	41	6046
52	8612	5528	896	226	15262
53	10208	4023	777	125	15133
54	8181	3313	537	130	12161
55	26866	18343	1851	459	47519
56	14322	6689	934	247	22192
57	70490	50587	5472	1838	128387
58	11859	4369	548	164	16940
59	3785	1789	266	78	5918
60	4058	2014	321	54	6447
61	4846	1558	194	42	6640
62	6795	5288	635	210	12928
63	71612	60803	7180	2155	141750

64	37237	36196	4855	1208	79496
65	4231	1817	311	74	6433
66	4807	3071	475	82	8435
67	12629	5535	742	200	19106
68	8630	3504	599	128	12861
69	9076	4696	670	189	14631
70	4455	1481	238	44	6218
71	14352	8050	1159	275	23836
72	35633	38060	3725	1085	78503
73	6855	2462	347	113	9777
74	5634	2645	558	83	8920
75	5754	1413	257	40	7464
76	1678	375	62	18	2133
77	1675	962	55	20	2712
78	1767	1147	136	35	3085
79	10023	3439	490	135	14087
80	5739	1584	235	81	7639
81	26998	32298	3015	733	63044
82	8276	2572	358	77	11283
83	49944	40907	4512	1443	96806
84	2524	1075	154	41	3794
85	1966	535	68	22	2591
86	8229	2288	372	55	10944
87	53857	60756	4181	1473	120267
88	1778	751	149	33	2711
89	11083	7768	936	250	20037
90	38707	20685	3358	830	63580
91	5790	2402	219	126	8537
92	19087	10039	1097	296	30519
93	4047	1151	175	42	5415
94	4275	2987	359	92	7713
95	5571	1448	289	75	7383
96	6967	1048	191	55	8261
97	5640	1412	205	34	7291
98	12615	11035	1285	326	25261
99	132720	151927	11822	3885	300354
100	21570	8581	997	396	31544
101	55624	55713	5064	1703	118104
102	13207	5092	942	214	19455
Total	2146015	3090729	209596	76802	5523142

Statistics for Table of Row by Col

Statistic	DF	Value	Prob
Chi-Square	303	719012	<.0001
Likelihood Ratio Chi-Square	303	738973	<.0001
Mantel-Haenszel Chi-Square	1	134595	<.0001
Phi Coefficient		0.36081	
Contingency Coefficient		0.33939	
Cramer's V		0.20831	

Pearson Chi-Square Test	
Chi-Square	719012
DF	303
Asymptotic Pr > ChiSq	<.0001
Exact Pr >= ChiSq	.

Sample Size = 5523142

Monte Carlo Simulation for Chi-Square Test

q0
719011.76

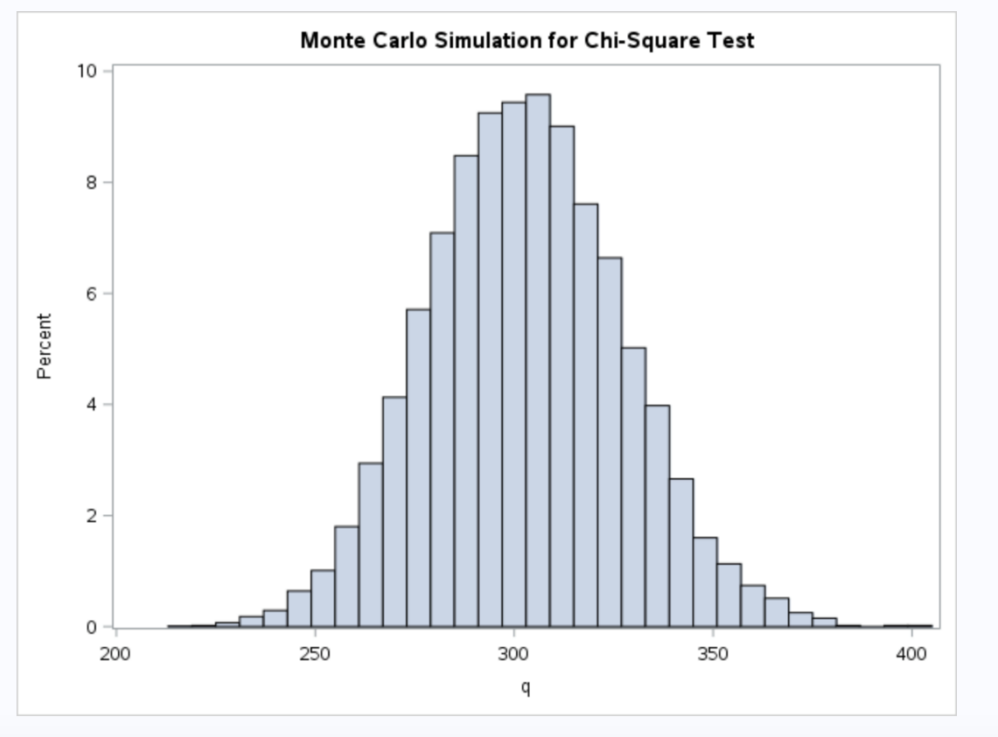
pValue
0

Binomial 99% CI		
Est	LowerCL	UpperCL
0	0	0

The FREQ Procedure
Statistics for Table of Row by Col

Pearson Chi-Square Test	
Chi-Square	719012
DF	303
Asymptotic Pr > ChiSq	<.0001

Monte Carlo Estimate for the Exact Test	
Pr >= ChiSq	<.0001
99% Lower Conf Limit	<.0001
99% Upper Conf Limit	0.0005
Number of Samples	10000
Initial Seed	5716687



Based on the Monte Carlo simulation results I have a normal distribution of voters and favoring democratic party in 2020 presidential elections.

D. Predictable Outcomes from Past Results

The 5 major predictable outcomes from the historical elections in Illinois:

- ✓ Majority of the people in Metropolitans will be voting Democrats.
- ✓ Democrats more likely win.
- ✓ People with some college education are more likely to vote than people who are just high school educated
- ✓ People in the age group 24 to 65 have a higher turnout in the election
- ✓ GDP and Voter turnout has no impact on voting pattern of the presidential elections.

E. Turnout

Irrespective of voter turnout in Illinois Democrats will win the State in 2020. One major factor to consider is how the people in metropolitan will vote.

Figure IL.10: Illinois voter turnout.

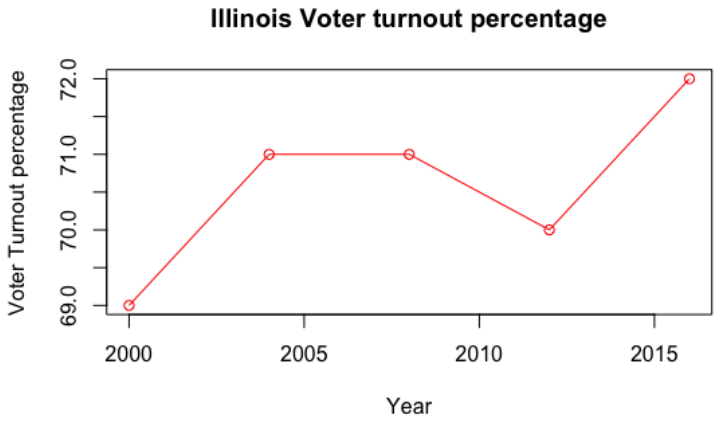
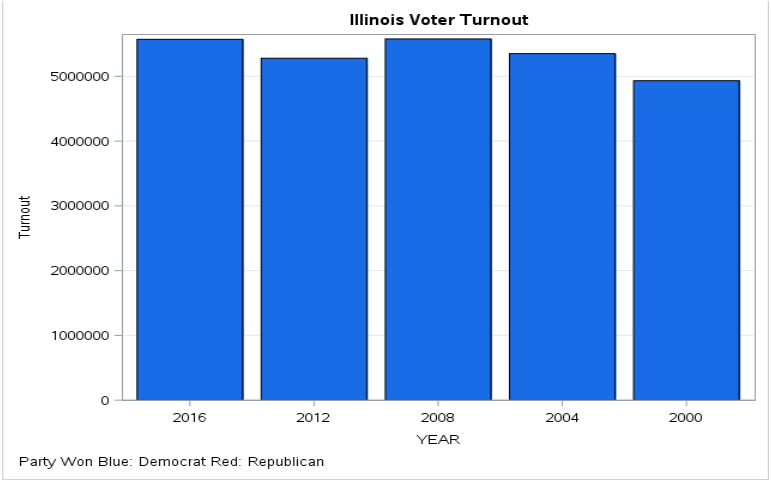


Figure IL.11: Illinois voter turnouts in numbers.



Democrats have been winning in the state of Illinois since 1992 mainly due to the voters in the metropolitans.

Source: Crated using SAS data gathered from various resources

F. Top 5 Illinois Voter Concerns

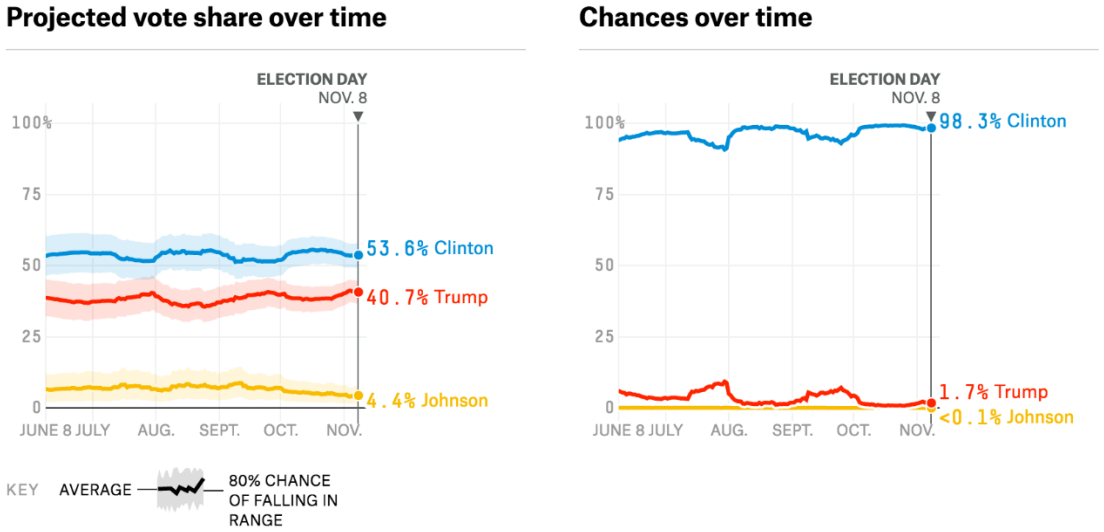
Jobs A	The unemployment rate is the higher in the list with the current rate at 6% which is 0.6% higher than the national average. Historically the state unemployment rate is always higher than the national average unemployment rates.
Police B	After few fatal shootings by police, people of Illinois have several issues trusting police department. The state department has been taking several measures to gain the trust of the public.
Marijuana C	In the year 2016, Illinois legalized the use of marijuana along with several other states in the country. With the new amendment of rules, people can carry less than 10 grams legally. Some other amendments are driving impaired, the new law makes the standard 5 Nano-grams of THC, marijuana's in driver's blood.
Transportation Lockbox D	Transportation is one of the issues in the state. The new proposed amendment to the state's constitution would set aside money for transportation projects. Supporters say change is needed because money that's supposed to be earmarked for building roads has gone to other expenses over the years. Not sure what this means
Budget E	Per the projections by NPR Illinois, the state may have gone for about eighteen months without a full spending plan. There is a huge logjam in decision making and government officials are debating on how the money needs to be spent. There is $13 billion shortage for the present year. An expected deficit of about $14 billion every year for the following five years. Unfunded liabilities for retiree benefits and social insurance of $174 billion. A $10 billion heap of unpaid bills for administrations as of now rendered by sellers, social specialist co-ops and other. To remediate state board is planning to increase the income tax and expanding the tax base.

G. 2016 Election Polls

Almost all the polls projected that Democrats will win the state of Illinois:

Here are the some of the polls that predicted accurately:

- ✓ Fivethirtyeight.com consolidated all the polls and which was surveyed by various companies and projected close results of 2016 for Illinois.



Source: https://projects.fivethirtyeight.com/2016-election-forecast/illinois/

- ✓ Huffington post conducted a poll named Victory research in between October 16-18th 2016and predicted that Clinton will receives about 51.2%, trump will receive around 36.1%.
- ✓ Thomson Reuters IPSOS survey which was conducted October 31st to November 6th predicted that Clinton will get around 51% votes and trump will receive 39% votes.

V. Kansas

A. Introduction

Age	Gender	Race
The trends from past elections clearly indicate that the older generation will continue to make up the highest percentage of voters in future elections. This is in line with national average.	Census data shows an almost even split between gender population breakdown with females slightly edging males. Women, however, vote at a higher percentage than that of men and this trend will continue in future election.	White population has been declining over the last 2 decades and will continue to see a decline in the future; however, white population will continue to vote at a higher percentage in the next few elections but will start to balance out with black voter percentage.
Based on my research, I find that Kansas is struggling because of tax reform of 2012 and has hindered the growth of the state. Young millennials are not taking much interest in elections because the economy doesn't provide the necessary support they need in order to thrive and are looking to move to more urbanized cities/states. Using previous election data and taking the voter issues into consideration, I predict that in the year 2020, Republicans will win Kansas by 13-15% margin.		

B. Categories & Groups

1. Age

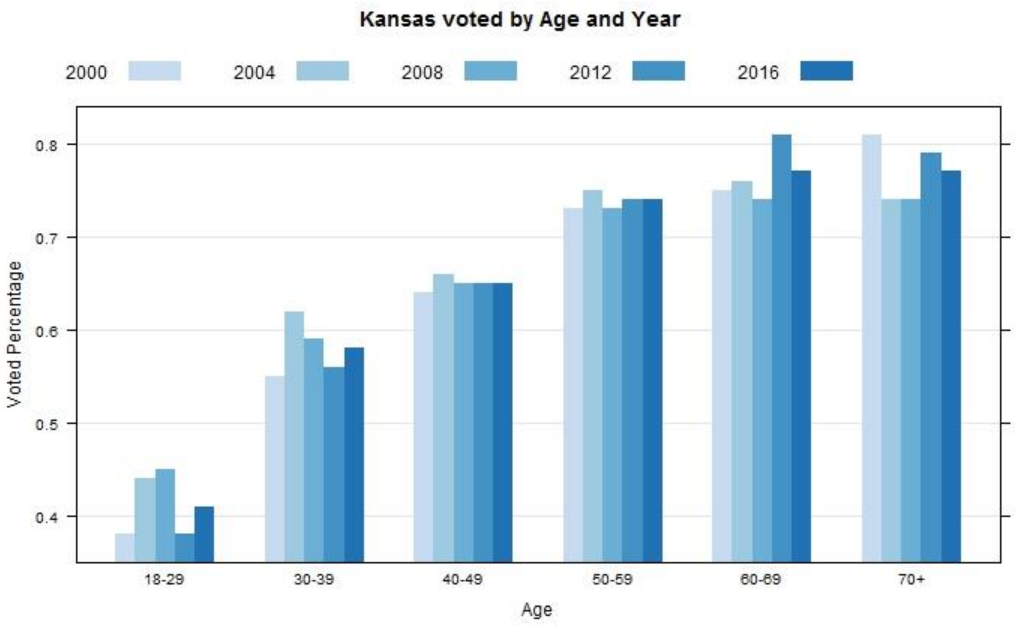


Figure KS.1: Kansas voter breakdown by Age and Year

In the year 2000, only 38% of voters between the ages of 18-29 voted compared to older age groups (50-59, 60-69, 70+) in which more than 70% of the voters voted. The trend seems to be consistent across next four election periods. Even though in next four elections periods (2004 thru 2016), the percentage of voters in each younger age group (ages <59) increased slightly, the percentage of voters in these age group still stayed below 70%. However the percentage of voters in older age group (50+) has consistently stayed over 70%.

The graphs clearly depict that young voters especially millennials are less likely to vote. There are many factors that can attribute to their reluctance in voting. One of the major factor could be lack of understanding politics and distrust in election process and results. Other reasons could be that campaign trails don't cover the issues that interest them and millennials don't believe that candidates hold on to their promises after they win the election.

2. Gender

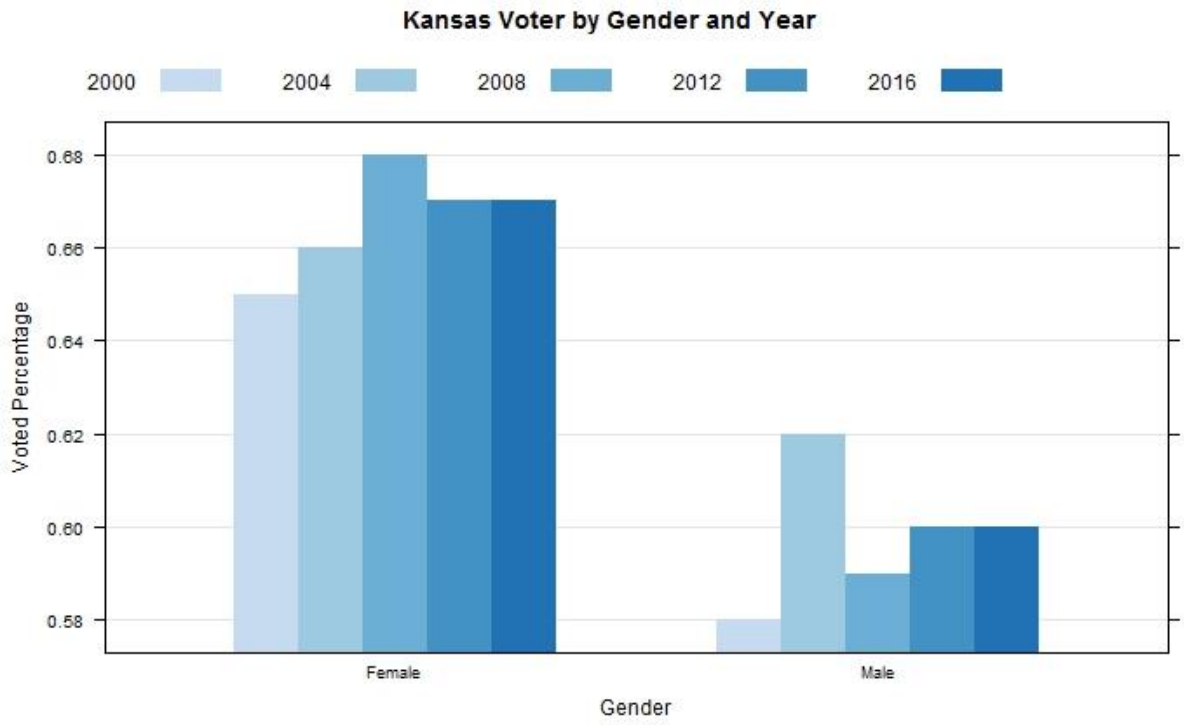


Figure KS.2: Kansas voters by Gender and Year

In the year 2000, of the total registered voters 65% of Kansas voters were female and 58% of voters were male. In next four election periods, female voters increased by fewer percentage, the highest being 68% in 2008. However, percent of male voters consistently stayed below that of female voters and stayed between 60 to 62%. The graph clearly depicts that female population in Kansas is more likely to vote vs male population. There are many factors that could attribute to the gender difference in voting. One of major factor could be that female voters tend to be care givers and receiver of government services. More social issues such as abortion, working right, equality of pay are impacting women than men. Other factors could be women want to get their voices heard and exercise their right to vote. Feminist groups encourage women to vote to improve their social status.

3. Race

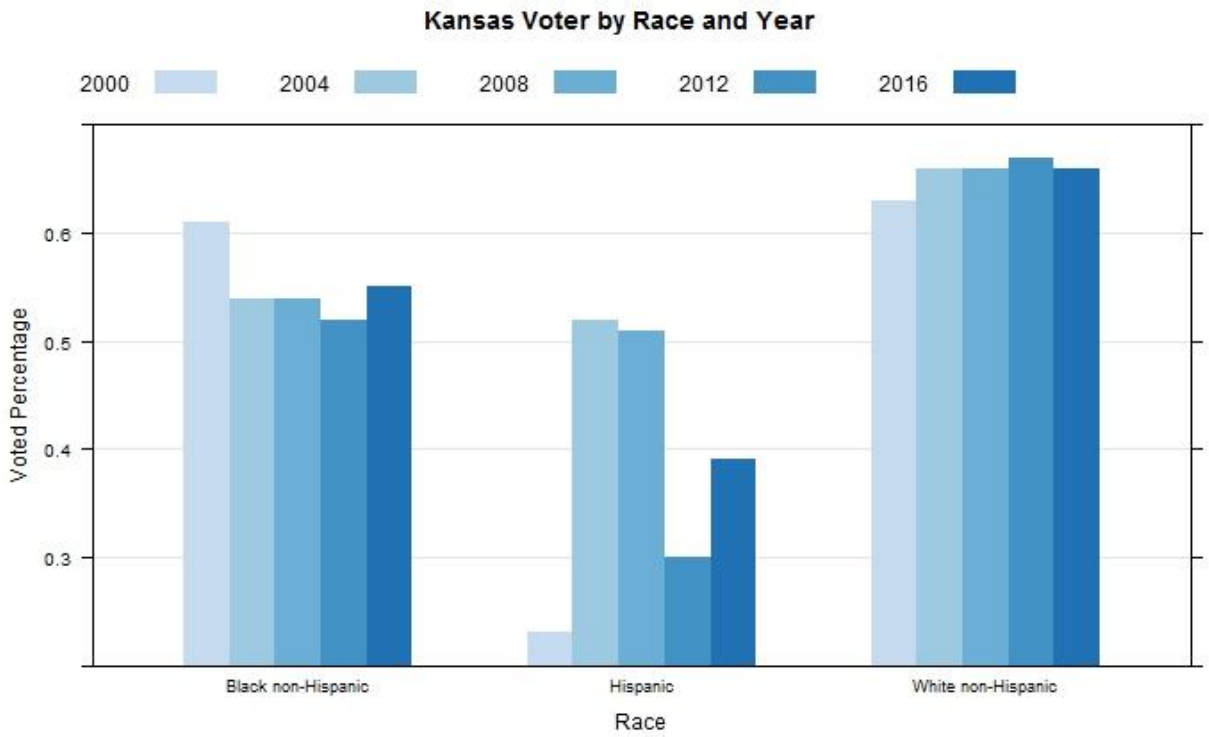


Figure KS.3: Kansas voter breakdown by Race and Year

In the year 2000, of the total registered voters, over 62% of voters identified themselves as "Black non-Hispanics" and 65% of voters identified as "White non-Hispanic". However, the voted percentage gap widens over the next four election periods. Percentage of black non-Hispanic voters continue to hover between 53 to 56%; whereas, percentage of White non-Hispanic race increased and held consistently at 65%. White non-Hispanic group makes the biggest percent of voters in all five election periods. The voter turnout ratio for Hispanic was not significant in year 2000; however, it bumped up by approximately 28% in year 2004 and 2008. The Hispanic voters' turnout was significantly lower in 2012 but increased by 9% in 2016.

The graph clearly illustrates that white non-Hispanic are most likely to vote in Kansas compared to Hispanic and Black non-Hispanic groups.

4. GDP

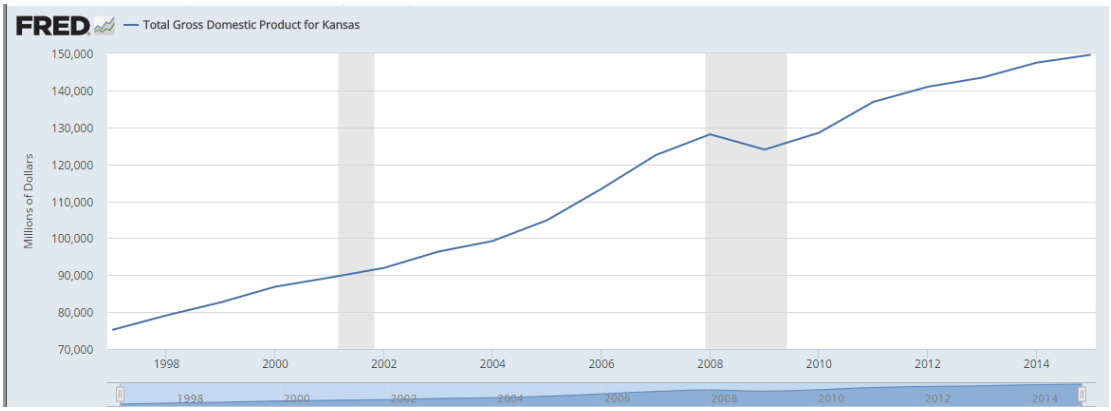


Figure KS.4 – Source: https://fred.stlouisfed.org/series/KSNGSP

Year	GDP	GDP Growth Percent
2000	86,869	15%
2004	99,242	11%
2008	128,108	22%
2012	140,964	13%
2016	149,641	6%

Figure KS.5 – Source: GDP from https://fred.stlouisfed.org

Kansas' GDP grew by 47% from 2000 to 2008; however, since then, it has only grown by 17%. Since the tax-reform of 2012, the state has faced and continues to face many challenges with economy, jobs, budgets for various public sectors and few other issues. Kansas relies heavily on agriculture, aerospace industry and oil production, which is the 8th largest oil producer in the country. However, oil production has seen a decline over the past decade and with Boeing moving manufacturing out of the state have resulted in slower GDP growth and economy.

C. Best Fit Model – Monte Carlo Simulation

Figure KS.6: Kansas' 105 counties (Col 1 – Democrats, Col 2 – Republicans, Col 3 – Others)

Data from Agresti, Wackerly, and Boyett

The FREQ Procedure

Frequency	Table of Row by Col			
	Col			
Row	1	2	3	Total
1	2271	5247	3393	10911
2	121	1327	11953	13401
3	13267	765	3388	17420
4	4740	2537	93	7370
5	645	2530	1424	4599
6	70	3202	9707	12979
7	3121	86	2469	5676
8	13105	15729	864	29698
9	1448	3712	2156	7316
10	52	8594	97956	106602
11	117567	4914	434	122915
12	2516	4401	75	6992
13	428	43370	44670	88468
14	2241	3929	6547	12717
15	1497	37	343	1877
16	2114	2258	77	4449
17	271	1546	1903	3720
18	63	1004	3913	4980
19	1783	57	1325	3165
20	3619	948	16	4583
21	1206	3669	2122	6997
22	37	209	4435	4681
23	7376	324	5512	13212
24	10379	3602	94	14075
25	8253	9209	1906	19368
26	51	389	2519	2959
27	2671	131	2581	5383
28	6672	1087	20	7759
29	1180	3400	2767	7347
30	85	30953	20621	51659
31	3191	17	410	3618
32	2591	4101	136	6828
33	396	1745	1241	3382
34	54	4207	48304	52565
35	18316	1158	890	20364
36	2255	100	0	2355
37	3007	7579	200	10786
38	0	2924	6724	9648
39	197	0	4303	4500
40	7666	312	0	7978
41	3364	4912	161	8437
42	0	274	1294	1568
43	45	0	353	398
44	1192	45	0	1237
45	654	2268	41	2963
46	0	462	1874	2336
47	39	0	153	192
48	657	18	0	675
49	851	2207	80	3138
50	0	249	931	1180
51	22	0	807	829
52	2237	84	0	2321
53	6052	9912	473	16437
54	0	275	1432	1707

55	23	0	233	256
56	986	21	0	1007
57	2314	3939	174	6427
58	0	3576	5566	9142
59	275	0	366	641
60	1501	57	0	1558
61	116088	167747	5691	289526
62	0	327	1265	1592
63	20	0	1006	1026
64	2932	113	0	3045
65	256	1239	32	1527
66	0	4008	5493	9501
67	227	0	224	451
68	902	23	0	925
69	12708	17467	703	30878
70	0	419	1409	1828
71	65	0	1628	1693
72	3311	125	0	3436
73	252	1304	43	1599
74	0	6009	7776	13785
75	406	0	1735	2141
76	4682	172	0	4854
77	1924	3550	134	5608
78	0	4068	9962	14030
79	393	0	384	777
80	1770	35	0	1805
81	5557	9762	321	15640
82	0	764	2723	3487
83	92	0	4745	4837
84	10089	337	0	10426
85	963	2018	94	3075
86	0	284	1320	1604
87	23	0	1479	1502
88	4299	141	0	4440
89	2695	4890	196	7781
90	0	356	1468	1824
91	41	0	551	592
92	2126	65	0	2191
93	2763	4989	235	7987
94	0	466	1677	2143
95	62	0	697	759
96	2500	102	0	2602
97	935	2185	76	3196
98	0	581	2395	2976
99	68	0	2561	2629
100	7012	470	0	7482
101	1341	3248	113	4702
102	0	296	1465	1761
103	46	0	10119	10165
104	18132	782	0	18914
105	652	2405	88	3145
Total	472066	450335	381237	1303638

Statistics for Table of Row by Col

Statistic	DF	Value	Prob
Chi-Square	208	1200618	<.0001
Likelihood Ratio Chi-Square	208	1360975	<.0001
Mantel-Haenszel Chi-Square	1	29730	<.0001
Phi Coefficient		0.95967	
Contingency Coefficient		0.69241	
Cramer's V		0.67859	

Pearson Chi-Square Test	
Chi-Square	1200618
DF	208
Asymptotic Pr > ChiSq	<.0001
Exact Pr >= ChiSq	.

Sample Size = 1303638

Data from Agresti, Wackerly, and Boyett

The FREQ Procedure
Statistics for Table of Row by Col

Pearson Chi-Square Test	
Chi-Square	1200618
DF	208
Asymptotic Pr > ChiSq	<.0001

Statistics for Table of Row by Col

Pearson Chi-Square Test	
Chi-Square	1200618
DF	208
Asymptotic Pr > ChiSq	<.0001

Monte Carlo Estimate for the Exact Test	
Pr >= ChiSq	<.0001
99% Lower Conf Limit	<.0001
99% Upper Conf Limit	0.0005
Number of Samples	10000
Initial Seed	100833654

Monte Carlo Simulation for Chi-Square Test

q0
61470.39

pValue
0

Binomial 99% CI		
Est	LowerCL	UpperCL
0	0	0

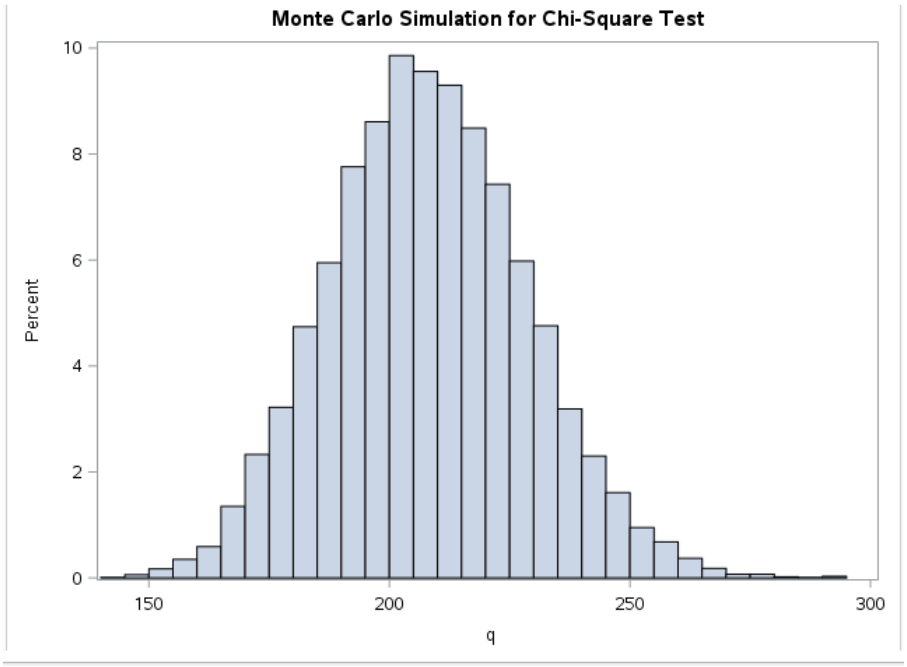


Figure KS.7: Monte Carlo Simulation using SAS

Based on the data collected from various authentic sources for previous election (2000-2016) and taking into consideration Kansas' growth rated of 1.6% over the next four years, I believe Monte Carlo is the best fit model as it allows to run multiple random samples to predict whether the next election will follow the previous elections trend.

As shown in the Figure KS.7, Monte Carlo simulation repeated 10,000 times shows a normal distribution between with Republicans, Democrats and Others parties. It concludes that Kansas will remain a red state in 2020 election.

D. Predictable Outcomes from Past Results

Below is a list of predictable outcomes for future election based on the results from past elections in Kansas.

- White non-Hispanic will continue to make up for over 65% of the voters
- Black non-Hispanic and Hispanic voter percent may increase in 2020 by few percent but will continue to lag behind White non-Hispanic voter percentage
- Sluggish economy may force millennials to move to other states for growth opportunities, causing further decline in millennial voter turnout ratio
- With feminist movement growing and women interest in politics heightens, female voters are more likely to vote compared to their male counter parts.
- The state's population will grow at a slower rate compared to other states
- The 2012 tax reform will continue to hurt the state's GDP growth
- Kansas's population is predominately white but over the last 2 decades, it has seen a decline in white population while other race groups population have seen a slight increase (see Figure 9)

Kansas ethnic breakdown of population

Racial composition [hide]	1990[34]	2000[35]	2010[36]
White	90.1%	86.1%	83.8%
Black	5.8%	5.8%	5.9%
Asian	1.3%	1.7%	2.4%
Native	0.9%	0.9%	1.0%
Native Hawaiian and other Pacific Islander	-	-	0.1%
Other race	2.0%	3.4%	3.9%
Two or more races	-	2.1%	3.0%

Figure KS.8 – Source: https://en.wikipedia.org/wiki/Kansas#Race_and_ethnicity

E. Turnout

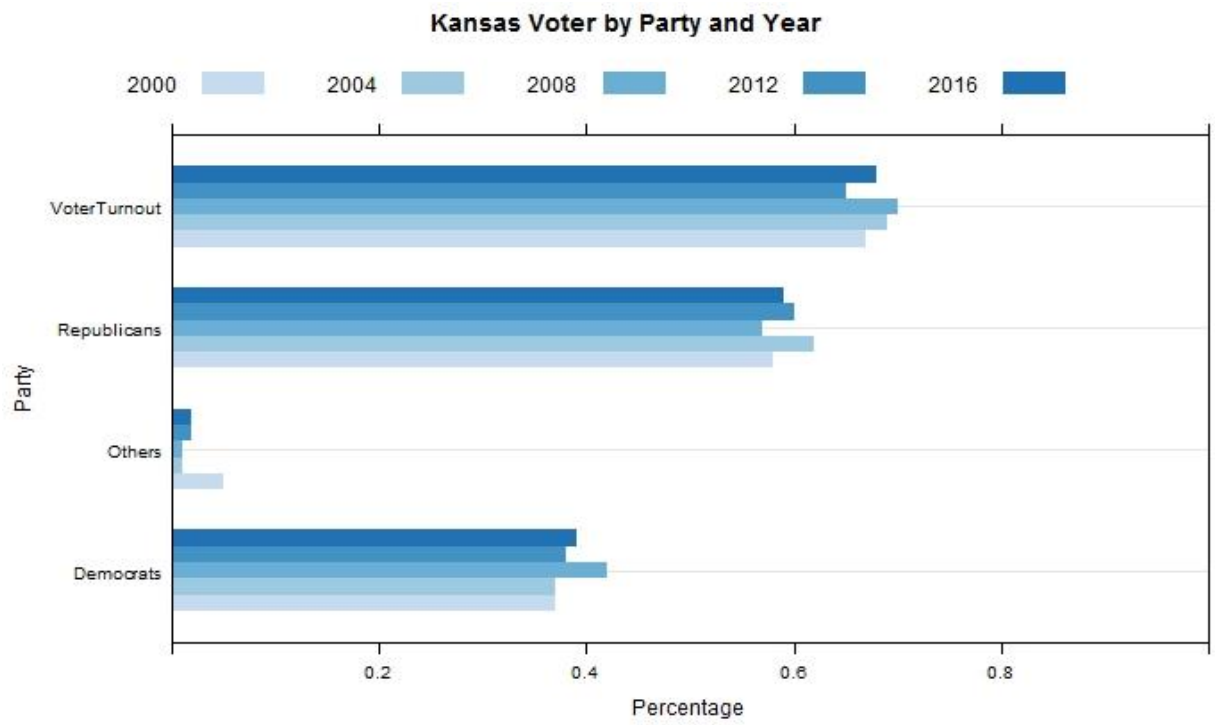


Figure 6 – Kansas voter breakdown by Party and Year

Historically, Kansas has been a red state and the graph in Figure 6 shows that Republican Party won last five elections (2000 - 2016). The graph also shows the voter turnout over the same period with highest (70%) in 2008 and lowest (65%) in 2012. There is no correlation between voter turnout and favoring a particular party.

F. Top 5 Kansas Voter Concerns

Economy A	Kansas economy has not grown as fast as the economies of the other states. Part of this is because the state relies too much on 20th century model such as heavy manufacturing, agriculture, and retail sales. Kansas Governor Sam Brownback eliminated state tax to help boost the economy by putting more money in the pocket of the residents in hopes that they would reinvest in the economy; however, that hasn't panned out as planned.
Education B	Because of the tax-reform, the quality of education is Kansas is taking a direct hit. Governor Sam Brownback is cutting school budgets and allocating those funds to other sectors of the economy. This is resulting in a shorter school year, school closures, less efficient quality of education and teaching methods. This action by the state governor is greatly impacting quality of teachers and students.
Jobs C	Kansas has been one of the worst states when it comes to jobs creation. Over the last year, Kansas ranked 4th worst state out of the 50 states and also lost 8300 jobs on over the one year span. Because of the tax-reform, it has not been able to adequately fund sectors as needed.
Health D	Kansas health has been declining over the last few decades. According to America's Health Rankings, Kansas ranked in as the 27th healthiest state compared to 1990, where it was ranked as 12th healthiest state. Major cause of this is public health funding has declined, resulting in increased cancer deaths, occupational fatalities, and lowest rates of immunized children.
Transportation E	Kansas is not taking on new transportation/construction projects because of budget issues. It has funds to work on repairs and maintenance but cannot take on projects to create new highways.

G. 2016 Election Polls

Historically, Kansas has been a Republican state and most polls accurately predicted Republican winning the state. Below are a few polls that nailed the predictions:

- Cooperative Congressional Election Study (CCES) favored Trump by approximately 16% (Trump's 47.5% vs Clinton's 31.6%) using sample size of 776 people.

- Reuters predicted Trump to win Kansas by 21%.

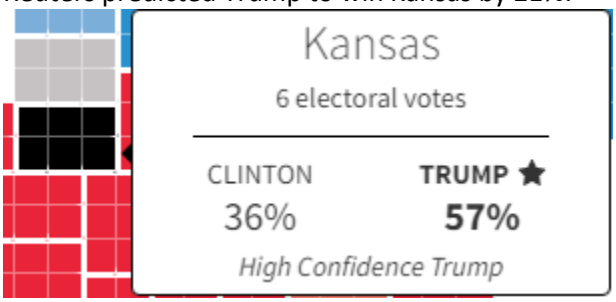


Figure 9 – Source: http://www.reuters.com/statesofthenation/

Of the 7,769 surveyed by Remington Research Group, 44% were in favor of Trump vs. 37% for Clinton.

VI. Video Presentation

A. Link to Video Presentation

https://www.youtube.com/watch?v=0phNOkXQFKQ

VII. Code Libraries

A. Link to Georgia GitHub

https://github.com/hotlcsw1/CSCI-84-Finals

B. Link to South Dakota Github

https://github.com/satkuma/CSCI-84/tree/master/project

C. Link to Kansas Github

https://github.com/zshan458/Project

D. Link to Illinois Github

https://github.com/rkc9/CSCI-84-Project

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