Final Project – CSCI E-84 A Practical Approach to Data Science – Group 6

Final Project: 2020 Election Predictions

Group 6

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Abstract

This report describes the work performed by Group 6 in order to prediction the 2020 presidential elections outcome in five states: Massachusetts, Maine, Nebraska, New Mexico and North Carolina. Voter groups and categories are presented, along with the major issues that have an influence on the presidential elections. We describe our prediction methods and results, as well as the data sources that were used. Voting patterns and polls accuracy are also discussed and we conclude by assessing how many Electoral College votes each party are expected to gather from our five states in the 2020 presidential election.

Keywords: Presidential election, Massachusetts, Maine, Nebraska, New Mexico, North Carolina, election prediction, voter statistics, election history, voting patterns.

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Final Project: 2020 Election Predictions

Introduction

This report describes Group 6's final project about the 2020 election predictions for the Harvard University Extension School class CSCI E-84: A Practical Approach to Data Science.

Pattern Analyses

The methods used to predict the 2020 election results were tailored according to the specificities of each individual state and the available data.

Five major categories and voter outcome

Maine

Five Major Categories:

1. Economy, 2. Education, 3. Environment, 4. Health care, 5. Gun control

The ranking is arranged from Pew Research Center issues for Maine

(http://www.people-press.org/2016/07/07/4-top-voting-issues-in-2016-election/)

Factors affecting Maine Economy

According to [Portland Press Herald](#) and Maine's revenue datasets provided on Maine.gov, website (https://data.maine.gov/browse?category=Finances&utf8=%E2%9C%93), Professional, scientific and technical services.

1. Agriculture

2. Forestry

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3. Fishing

4.Hunting

5.Taxes

6.Management of companies and enterprises

7.The finance and insurance sector

Maine Economic indicators

According to a [study on Maine economy done the University of Maine](#) in February 2016

1. Real Gross Domestic Product: Increased 1.0% in the second quarter of 2015

2. Personal Income: Grew 3.5% in the first three quarters of 2015

3. Wage and Salary Income: Grew over 3.3% in the first three quarters of 2015

4. Employment: Maine has recovered about 23,000 jobs since 2008

5. Unemployment: Unemployment rate is now about 4%; down from over 8%.
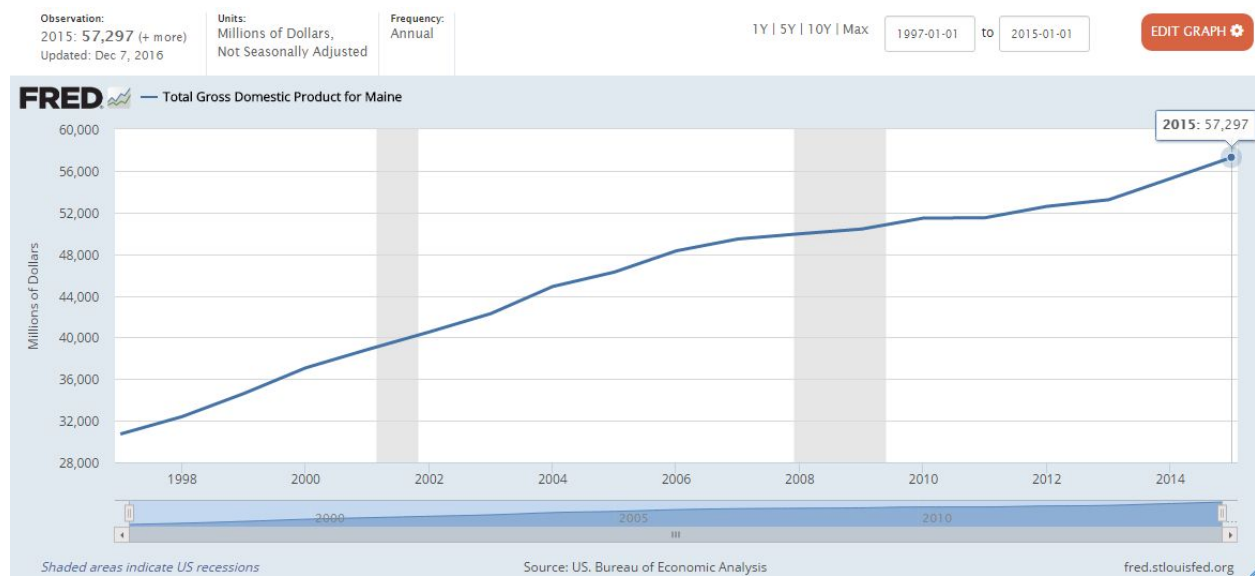
Maine GDP

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Historical Real Per-Capita GDP (2009 Chained Dollars) and Population data for Maine

Date	US Per-Capita GDP	Maine Per-Capita GDP	Maine Population
2015	$49,844	$37,958	1,329,492
2014	$49,091	$37,807	1,330,089
2013	$48,396	$37,447	1,328,702
2012	$48,156	$37,748	1,328,592
2011	$47,586	$37,798	1,327,930
2010	$47,287	$38,256	1,327,361
2009	$46,680	$37,773	1,329,590
2008	$48,401	$38,453	1,330,509
2007	$49,126	$38,822	1,327,040
2006	$48,909	$39,197	1,323,619
2005	$48,090	$38,796	1,318,787

Source: http://www.deptofnumbers.com/gdp/maine/

In Graph the total GDP for Maine

Source: https://fred.stlouisfed.org/series/MENGSP
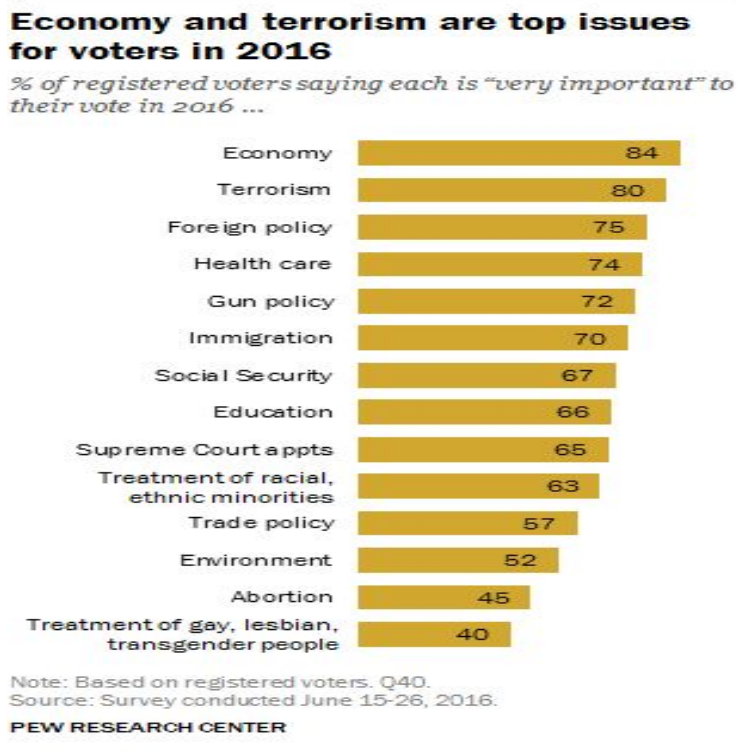
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As the economy and employment rate in Maine is good, it leans to be democrat. However, the

gun control is correlated to the economy as Maine population rely on hunting, this may affect the

voting. In 2016, Clinton won 3 electoral votes out of 4.

(More graphs and details about Maine's GDP, unemployment rate, and income are in the
appendix).

Massachusetts

Five Major Categories: 1. Economy, 2. Terrorism, 3. Foreign Policy, 5. Health Care and

5. Gun Policy.

GDP/Economy is at the top of the mind. (Sources: pew research and people-press)

Economy and terrorism are top issues for voters in 2016

% of registered voters saying each is "very important" to their vote in 2016 …

Issue	%
Economy	84
Terrorism	80
Foreign policy	75
Health care	74
Gun policy	72
Immigration	70
Social Security	67
Education	66
Supreme Court appts	65
Treatment of racial, ethnic minorities	63
Trade policy	57
Environment	52
Abortion	45
Treatment of gay, lesbian, transgender people	40

Note: Based on registered voters. Q40.
Source: Survey conducted June 15-26, 2016.
PEW RESEARCH CENTER

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The state is predominantly Democratic. As the economy is doing quite well, it did not have any major impact on the outcome. Clinton won by 26.5% in 2016.

More graphs and details about Massachusetts GDP, unemployment rate, and income are in the appendix

Nebraska

Economy:

Agriculture and Industry in Nebraska

Nebraska economy is a set of human and social activities and institutions related to the production, distribution, exchange and consumption of agriculture and industry goods and services. The balance between Nebraska various economic sectors differs largely between various regions and other states in the US.

Nebraska Agriculture and Industry

Nebraska's real gross state product in 2012 was estimated to be $83,393 which was $104,047 and 56% lower than the national state average, $187,440. Nebraska has the 37th highest GSP out of the 50 states.

Nebraska's economy is dominated by **agriculture**. The chief farm products are **cattle**, **corn**, **hogs**, **soybeans**, and **wheat**. Nebraska is **second** in the US in its cattle production. The largest

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industry in the state, food processing, is also related to its agricultural roots. More varieties of grass grow in Nebraska than in any other state, and this resource is valuable for livestock forage. The cities of Dakota City and Lexington are among the largest meat-packing centers in the US

However, since World War II, manufacturing has increased in the state, and electrical machinery, metals, and transportation equipment are important industries. Oil was discovered in Cheyenne in 1949, and this also contributes to the state's economy.

Nebraska Agriculture

Cattle, corn, hogs, soybeans, wheat, sorghum.

Nebraska

Food processing, machinery, electric equipment, printing and publishing.

The Bureau of Economic Analysis estimates of Nebraska's gross state product in 2004 was $68 billion. Per capita personal income in 2004 was $31,339, 25th in the nation.

Nebraska has a large agriculture sector, and is a national leader in the production of beef, pork, corn (maize), and soybeans. Other important economic sectors include freight transport (by rail and truck), manufacturing, telecommunications, information technology, and insurance.

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New Mexico

Five Major Categories: 1. Jobs and the economy 32%, 2. Health Care 17%, 3. Terrorism 13%, 4. Education 12%, 5. The environment 9%. (Source: Washington Post)
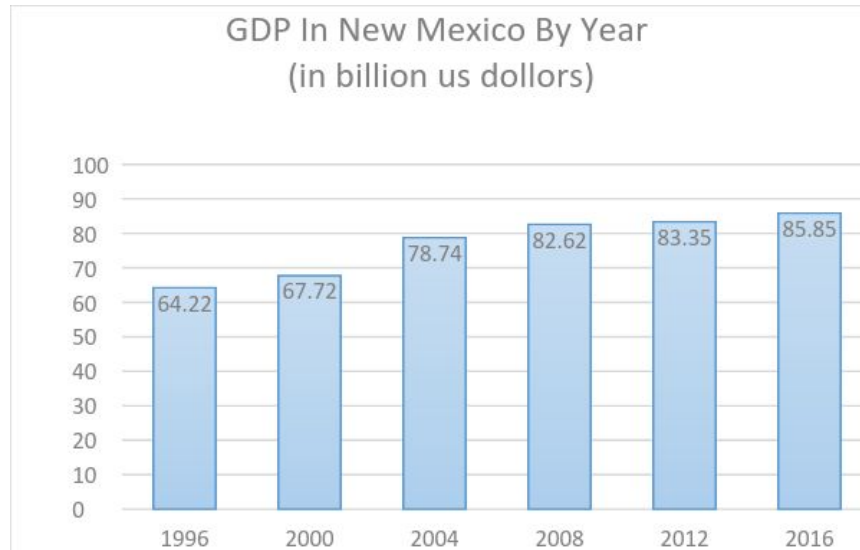
GDP and economy:

GDP has been increasing over the past five elections. Pearson correlation coefficient between GDP growth rate and Voter turnout is 0.47. There is some relationship between GDP and Voter Turnout: when GDP significantly improved before the election, the voter turnout is high.

North Carolina

According to our research, the major voting issues in North Carolina relate to the split between rural and urban areas, racial tensions, and economic considerations.

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Rural and Urban Development

North Carolina's population has increased 88% between 1970 and 2010. Even though metropolitan areas have seen large population increases, North Carolina has not lost its rural tone and is still the nation's top producer of poultry and eggs, and has significant hog and tobacco production, as well as Christmas trees ("North Carolina state profile", 2016).

Racial Tensions

There have been reports of race being an issue in the state's moves to tighten its voting procedures ("North Carolina state profile", 2016). It appears that the adopted laws resulted in an important decrease in votes from black voters. Hurricane Matthew, which flooded 32 counties, also affected turnout, however turnout was higher in counties under a state of emergency than in counties with new voter suppression rules ("African American early voting is way down in North Carolina", 2016). The percentage of African American early voters went down by 8.5% compared to 2012 and Caucasian voters went up by 22.5% at the same time compared to 2012, and voter suppression was expected to impact the outcome of the 2016 presidential election (Michealson, 2016).

Economic Considerations and GDP

North Carolina has felt the impact of the 1994 North American Free Trade Agreement more than potentially any other state in the nation (Smith, 2014). Unemployment peaked at 11.3% in February 2010, and was 5.4% in December 2014 ("North Carolina state profile", 2016). A Republican candidate who proposes the renegotiation or even the end of Free Trade agreements would be expected to resonate well with the population of this state, as opponents of

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the agreement believed it led to the destruction of hundreds of thousands of U.S. jobs as well as

plummeting wages (Smith, 2014). Over the 5 years ending in 2015 the North Carolina economy

grew in real terms by 6.95% (North Carolina GDP, 2016). Although the GDP of North Carolina

has grown in the last years, the value of that metric to describe a state's economic health has

been debated (Schofield, 2016).

Issues by Political Affiliation

We do not have the relative importance of voter issues by age or racial groups, but we

have this information by political party. North Carolina has a balanced electorate (40% of voters

are registered Democrats, 30% Republicans, and 30% unaffiliated).

According to the analysis of a Elon University poll (Guilllory, 2016), the most important

issue in North Carolina in 2016 was Education with 29%, followed by Jobs/Employment/Wages

and Economy with 19% and 8% respectively, for a combined total of 27% which is less than

Education. The Elon poll results showed Democratic voters (32 percent) were more likely to cite

education as the most important issue than Republicans (22 percent). Of independents, 32

percent put education at the top. By contrast, Republican voters (32 percent) named economic

issues as the most important, more than Democrats (22 percent) and independents (27 percent).

However, The Suffolk University poll provided different results: "The voters polled said

that the number one issue facing the next president is jobs/economy (24 percent) followed

closely by terrorism and national security (21 percent), choosing Supreme Court nominees (11

percent), illegal immigration (7 percent), and education and health care (tied at 6 percent).

Among those most concerned about jobs and the economy, Trump led Clinton 46 percent to 36

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percent, and among those who cited terrorism/national security as the most important issue, he led 58 percent to 33 percent. Clinton topped Trump 67 percent to 17 percent among voters most concerned about education, and those concerned about health care preferred Clinton 68 percent to 21 percent." ("Suffolk University Poll […]", 2016)

Three major groups and voter outcome

Maine

The three major groups are: Age, Gender, and Race.

- In Maine, the registered female population is higher than the male on in Maine. However, the percentage differences for both genders is less than ±2%.

- About race in Maine, more than 96% of the population is white over the years; hence, I grouped the black, Asian, Hispanic in non-white registered voters.

- In 2016, there is a remarkable decrease in the 65+ registered voters; on the other hand, there is an increase in 18-24 age and 25-44 groups.

    Reference

    http://www.census.gov/topics/public-sector/voting/data/tables.html

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	2004			2008			2012			2016		
	D	R	O	D	R	O	D	R	O	D	R	O
Voter Turn Out	396,842	330,201	8,069	421,923	295,273	10,636	401,306	292,276	9,352	357,735	335,593	38,105
%	53.57%	44.58%	1.09%	57.71%	40.38%	1.45%	56.27%	40.98%	1.31%	47.80%	44.90%	5.10%
18 to 24	48%	50%	1%	71%	26%	3%	65%	30%		50%	42%	5%
25 to 29	48%	50%	1%	62%	36%	2%	60%	35%		46%	44%	8%
30 to 39	48%	50%	1%	60%	38%	2%	59%	36%		40%	50%	7%
40 to 49	59%	39%	1%	54%	44%	2%	51%	44%		48%	46%	6%
50 to 64	59%	39%	1%	61%	36%	3%	58%	40%		47%	48%	4%
65+	54%	45%	1%	45%	53%	2%	55%	43%		56%	39%	3%
Male	48%	49%	1%	52%	46%	2%	50%	46%		41%	52%	6%
Female	57%	42%	1%	64%	34%	2%	64%	34%		55%	39%	5%
White	53%	45%	11%	58%	40%	2%	57%	40%		47%	46%	5%
Non-White										56%	33%	10%
Total	824000			801000			787000			1056410		

Massachusetts

The three major groups are: Immigrants, Income, and Gender.

● Immigrant groups are more like to vote Democrat.

● Individual's likelihood of being a Democrat decreases as the income increases.

● Democratic party has significant advantage with women. 37% of women associate with Democratic party vs. 24% for Republicans. (Sources: pewresearch and people-press)

Nebraska

Voting Percentage by Age Bracket							
Year	18-24	25-44	45-65	>65	Total	Actual Total	% Difference
2006							
Total Registered	138,572	377,335	397,644	171,801	1,085,352	1,138,422	-4.66%
Total Voted	28,325	156,213	262,200	129,845	576,583	610,499	-5.56%
Total % Voted	20%	41%	66%	76%	53%	54%	-0.94%
2008							
Total Registered	134,942	370,934	410,914	175,963	1,092,753	1,157,345	-5.58%
Total Voted	66,096	233,845	325,831	144,894	770,666	811,923	-5.08%

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Total % Voted	49%	63%	79%	82%	71%	70%	0.53%
2010							
Total Registered	116,107	377,995	430,097	209,809	1,134,008	1,142,057	-0.70%
Total Voted	16,607	107,846	232,958	137,034	494,445	497,248	-0.56%
Total % Voted	14%	29%	54%	65%	44%	44%	0.14%
2012							
Total Registered	118,644	382,144	435,063	217,880	1,153,731	1,163,871	-0.87%
Total Voted	56,943	225,544	339,040	176,119	797,646	804,245	-0.82%
Total % Voted	48%	59%	78%	81%	69%	69%	0.05%
2014							
Total Registered	107,415	386,912	430,541	234,011	1,158,879	1,158,840	0.00%
Total Voted	19,328	121,017	246,812	161,838	548,995	552,115	-0.57%
Total % Voted	18%	31%	57%	69%	47%	48%	-0.57%
2016							
Total Registered	116,649	394,210	418,255	237,122	1,166,236	1,211,101	-3.70%
Total Voted	62,838	244,673	324,378	191,450	823,339	860,573	-4.33%
Total % Voted	54%	62%	78%	81%	71%	71%	-0.65%

New Mexico

The three major groups are: Hispanics, Women, and Income.

- Hispanics: The percentage of Hispanics among all population (41%) was already high in New Mexico; moreover, it has still been increasing over the past elections. According to CNN exit polls, Hispanics have a strong favor for Democratic party, so the group is dominating group in New Mexico to vote for Democratic.

- Women: There are 8% more female than male in New Mexico on average. In general, women tend to vote for Democratic party (average of 54% in five elections) more than that of Republican (44%). So Female is another major group that votes for Democratic.

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- Income: In 2015, the median household income in New Mexico is $44,963 according to the US census, meaning more than half of the population in the state have household income under $50,000. From 2000 to 2016, 54% of the people who earn less than $50,000 voted for Democratic, while only 41% of those voted for Republican. So people whose income less than $50,000 forms another dominating group.

  (Data source: US census, CNN)

North Carolina

For the North Carolina state, voter data was available from the North Carolina State Board of Elections ("Voters statistics", 2016) for presidential elections from 2004 to 2016 and provided statistics for the following groups:

- Political allegiance: Democrats, Republicans, Libertarians and Unaffiliated
- Race: White, Black, American Indian, Hispanic, and Other
- Gender: Male or Female

Data regarding age groups was not available. The number of individuals belonging to those groups has fluctuated over time. The "Other" racial category has seen a larger increase than the other racial groups.

White voters make up almost 70% of the registered voters, while we have about 22% black registered voters. Hispanic voters are a very small group and represent only 2.4% of registered voters in NC.

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Past elections and predictable outcomes

Maine

Maine is "Lean Democrat" because Democrat won 7 out of 15 times from 1960 till 2016. Predicting that it will mostly vote Democrat in 2020 with a small difference. Starting from 1992, Democrat won straight in Maine.

Year	D	%	R	%
2016	357,735	47.80%	335,593	44.90%
2012	401,306	56.27%	292,276	40.98%
2008	421,923	57.71%	295,273	40.38%
2004	396,842	53.57%	330,201	44.58%
2000	319,951	49.10%	286,616	44.00%
1996	312,788	51.60%	186,378	30.80%
1992	263,420	38.80%	206,820	30.40%
1988	243,569	43.90%	307,131	55.30%
1984	214,515	38.80%	336,500	60.80%
1980	220,974	42.30%	238,522	45.60%
1976	232,279	48.07%	236,320	48.91%
1972	160,584	38.50%	256,458	61.50%
1968	217,312	55.30%	169,254	43.10%
1964	62,264	68.84%	118,701	31.16%
1960	181,159	42.95%	240,608	57.05%

The Democrat mean is 42.95%, while the Republican mean is 40.38%. The median of the Democrat is 42.3%, while that of the Republican is 31.16%. Hence the difference between the Demarcate mean and Republicans mean is not that much!

(The code in R and the console output is in the appendix).

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Massachusetts

Predicted winner: Democrat in 2016 based on historical data from 1960 to 2012.

Democrat Clinton Predicted to win by 24.09%+ based on historical data

Actual Winner: Democrat Clinton

Actual results: 60.5% for Clinton vs. 33.8% for Trump i.e. 26.7% difference

Hillary Clinton has won Massachusetts's 11 electoral votes. Clinton has 881,699 more

votes than Donald J. Trump, with 100 percent reporting. Hillary Clinton is up by 26.7% points

with all precincts reporting. (Sources: Ballotpedia and Wikipedia)

S	Year	Republican	Democratic
S	2012	37.51% 1,188,314	60.65% 1,921,290
	2008	36.20% 1,105,908	61.80% 1,894,067
	2004	36.83% 1,070,109	61.92% 1,803,801
	2000	32.51% 878,502	59.93% 1,616,487
	1996	28.11% 718,107	61.52% 1,571,763
	1992	29.04% 805,049	47.51% 1,318,662
	1988	45.42% 1,194,635	53.23% 1,401,416
	1984	51.22% 1,310,936	48.43% 1,239,606
	1980	41.90% 1,057,631	41.75% 1,053,802
	1976	40.44% 1,030,276	56.11% 1,429,475
	1972	45.23% 1,112,078	54.20% 1,332,540
	1968	32.89% 766,844	63.01% 1,469,218
	1964	23.44% 549,727	76.19% 1,786,422
	1960	39.55% 976,750	60.22% 1,487,174

Presidential elections results

Nebraska

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The state is strongly Republican in presidential elections – it last voted Democratic in 1964. However, it is one of only two states (Maine being the other) to not use the all-or-nothing approach to awarding electoral votes. The winner of the popular vote gets two electoral votes, while one is assigned to the winner of each of the state's three congressional districts. This approach was established beginning with the 1992 election. In 2008, while John McCain easily won the state by 15%, Barack Obama won the 2nd Congressional District (Omaha area) by a little over 3,000 votes (1.2%) to win that District's electoral vote. That split did not recur in 2012 as Mitt Romney won the state over Obama by 22%, with a 7% margin in the 2nd Congressional District. Nebraska's primarily rural population has not grown as quickly as other parts of the country, leading to declining electoral influence – from a peak of eight electoral votes before the Great Depression to its current total of five.

Nebraska voting history

	Democratic	284,494	33.7%
2016	**Republican**	495,961	58.7%
	Independent	0	0.0%
	Other	63,772	7.6%
	Democratic	302,081	38.0%
2012	**Republican**	475,064	59.8%
	Other	17,234	2.2%

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|			
	Democratic	333,319	41.6%
2008	**Republican**	452,979	56.5%
	Other	14,983	1.9%
	Democratic	254,328	32.7%
2004	Republican	512,814	65.9%
	Other	11,044	1.4%
	Democratic	231,780	33.3%
	Republican	433,862	62.2%
2000			
	Independent	24,540	3.5%
	Other	6,837	1.0%
	Democratic	236,761	35.0%
	Republican	363,467	53.7%
1996			
	Independent	71,278	10.5%
	Other	5,909	0.9%

New Mexico

During 4 out of 5 elections, New Mexico voted for Democratic party. 2004 is the only year when the state voted for Republican; however, year 2004 is an outlier: the voter turnout in 2004 is much higher than in other years, which is because the voter turnout of age 25-44 group

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significantly higher than other years (64% in 2004 compared to average of 50.93% in other

years). However, no such pattern was shown in other elections. So New Mexico can be

considered as a solid Democratic party over the past five elections.

RECENT ELECTIONS

Year	Democratic	Republican
2016	48.3%	40.0%
2012	53.0%	42.8%
2008	56.9%	41.8%
2004	49.0%	49.8%
2000	47.9%	47.8%
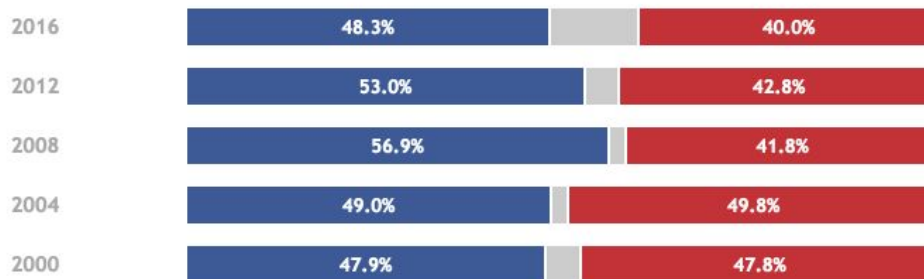
(Source: 270towin.com)

North Carolina

Based on the history of the state, the Republican Party may have a slightly higher chance

of winning this state again as they have won 10 out of 12 presidential elections since 1972

("North Carolina", 2016). However, the Democratic Party may still have a fair chance to swing

this state in the future, as they did in 1976 and 2008.

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Demographics and voting patterns

Maine
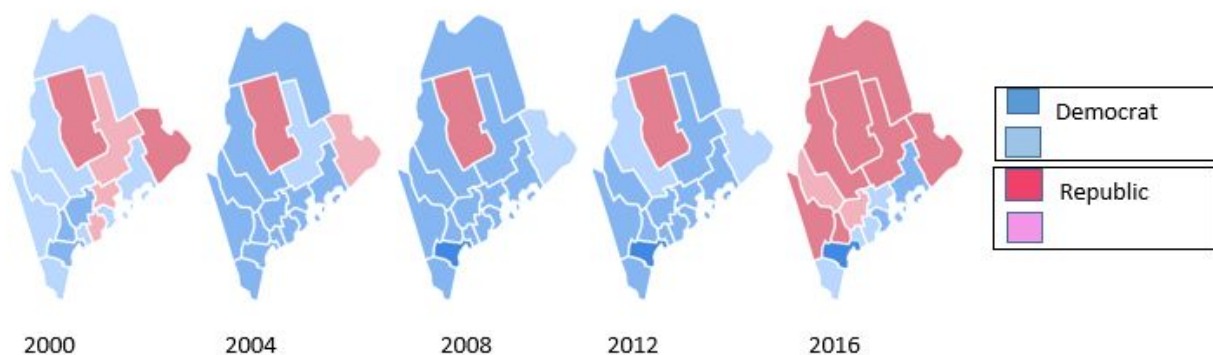
In 2016, women voted Democrat while men voted Republican with percentages of 55% and 52% respectively. All age groups voted Democrat except from 30 to 44 years old voted Republican. For education, all college graduate and postgraduates voted Democrat, while the high school or population that has some college voted Republican. Race is not the significant in Maine as more than 93% are white. (More demographic details are in the appendix).

Massachusetts

Democratic party has significant advantage with women. 37% of women associate with Democratic party vs. 24% for Republicans. Individual's likelihood of being a Democrat decreases as the income increases. (Sources: UMichigan.edu and debt.org)
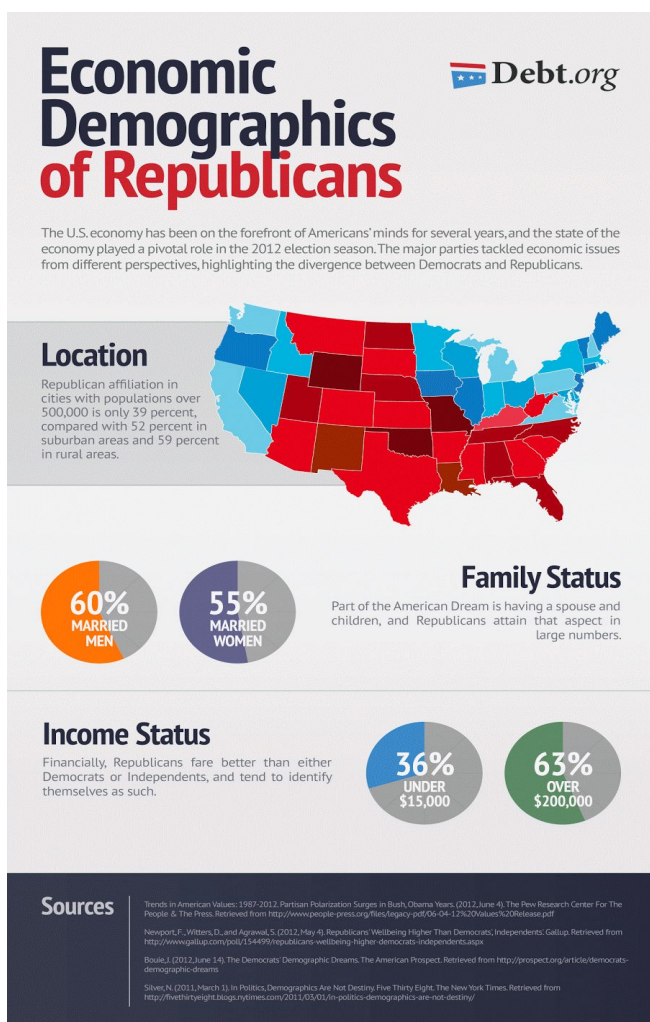
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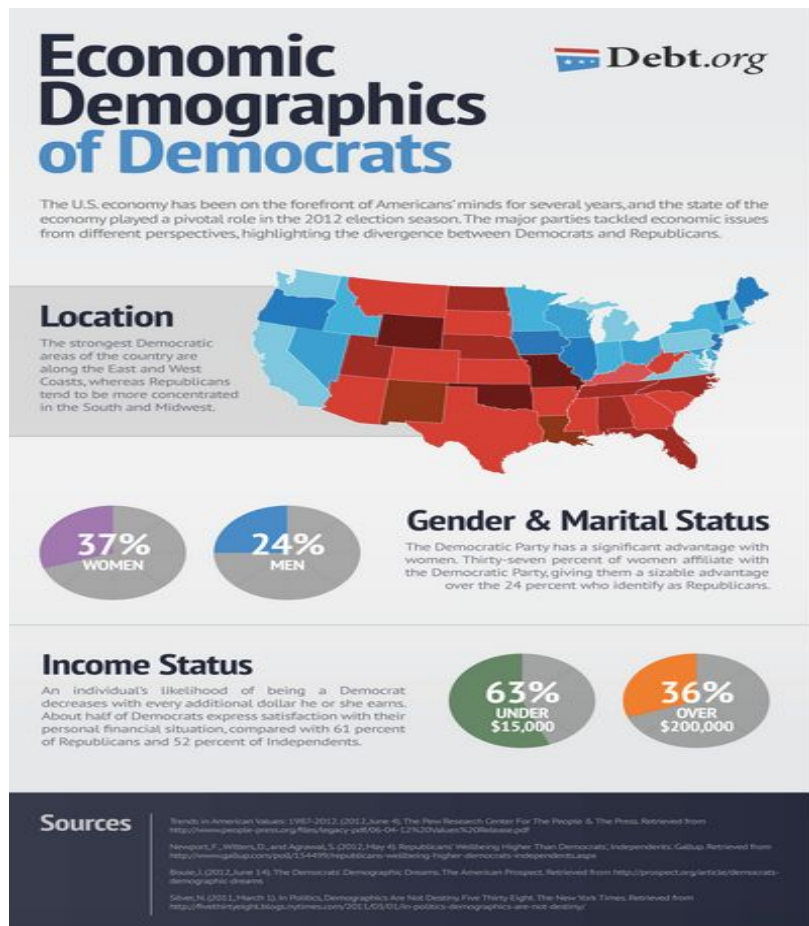
MA is predominantly democratic.   Women vote democratic and is aligned with the registered

voting patterns of rest of the nation.

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Nebraska

The Nebraska state is strongly Republican in presidential elections. It has some clear age, race and religious trends.60% of married men vote Republican, along with 55%t of married women. Additionally, 53 percent of families with children younger than 18 identify as Republican. This focus on traditional family values may explain in part why only 23 % of gay, lesbian or bisexual individuals identify as Republican.

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Older voters, on average, skew Republican. This advantage is partially offset by the Democratic slant of younger voters, although older voters are more likely to vote. The average Republican is 50, while the average Democrat is 47.Republicans are often cast as a party that is becoming increasingly religious.

New Mexico

- Male tend to vote for Republican party while female vote for Democratic.

- Older people tend to vote for Republican while young people favor Democratic.

- Rich people prefer Republican while people with less income tend to vote for Democratic.
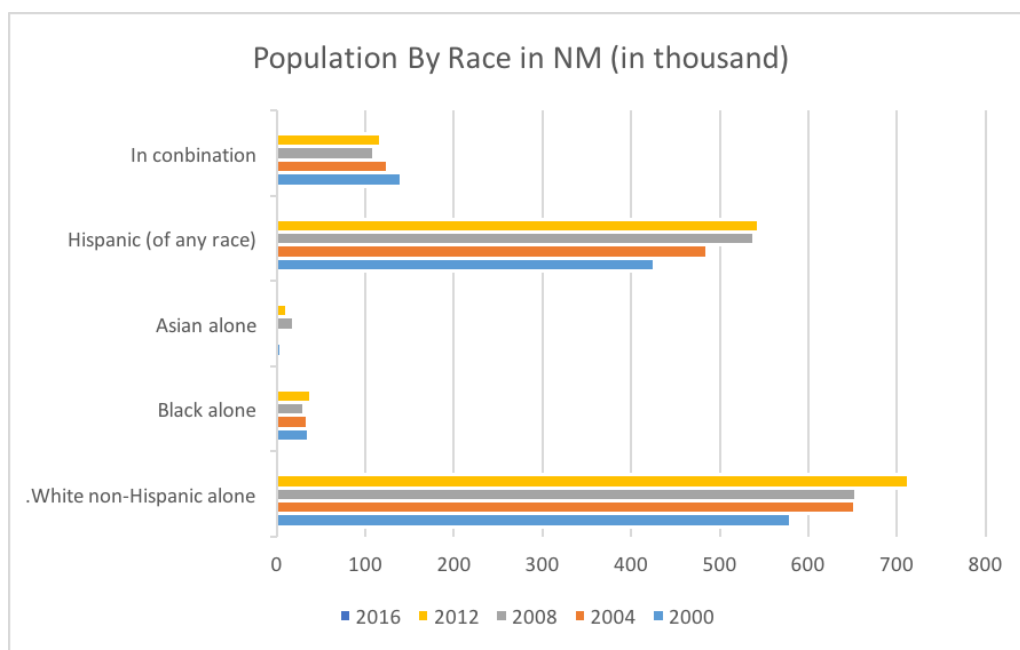
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North Carolina

If we look at groups over time in terms of percentage of all voters, we immediately notice

that the proportion of White people is decreasing; Black, Hispanic and American Indian people

are increasing slightly and the "Other" group is increasing significantly.
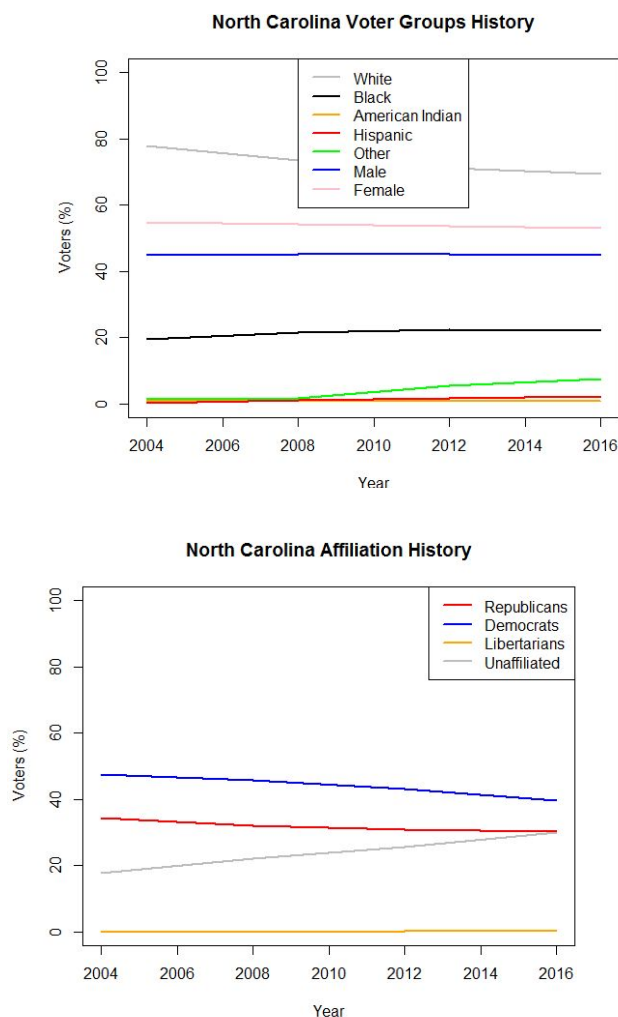
From the voter political affiliation graph, we see a clear tendency where voters to refuse

to become affiliated with a political party. Although this is a clear pattern in terms of

percentages, the Democratic Party has seen its affiliated voters decrease even in absolute size

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(down by 150 000 persons), while the Republican Party affiliation rate has severely slowed down. This trend may be an indication that these new voters who are increasingly refusing to align with a party could swing their votes to either side in the future, making presidential election predictions even more difficult. This decrease in voter affiliation with the major parties has not really been profitable to the Libertarian Party as their share of affiliated voters has moved up and down between 0.05% and 0.46% in the last 4 years, with only 0.2% in 2016.

Statistics tests and Best-fit Model

The methods used to predict the 2020 election results were tailored according to the specificities of each individual state and the available data.

Maine

Histogram:

Histogram of Candidates and their winning percentages in 2016
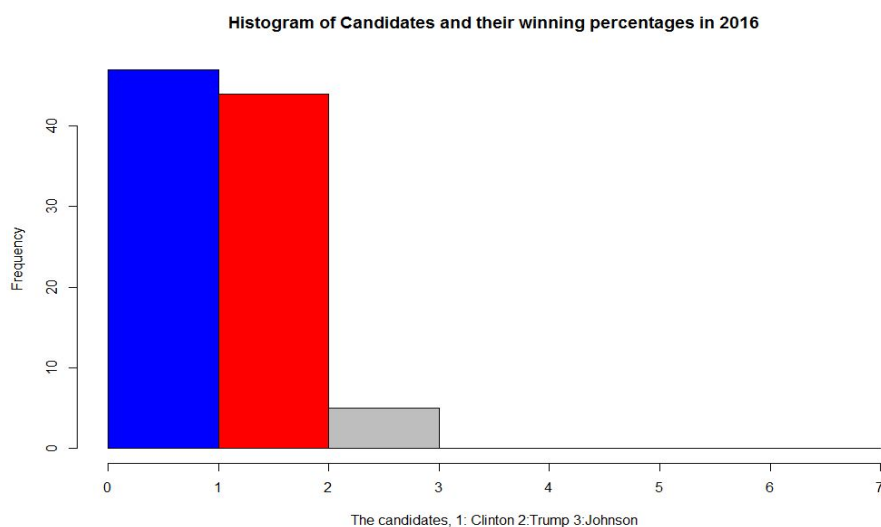
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Single Proportion test:

Based on the historical data of Maine (http://www.270towin.com/states/Maine) Since

1960, Republicans won 6 times out of 15 times, and Democratic won 9 times. The Null

Hypothesis will be Republicans win in 2020. It is a 2-tailed Hypothesis

Hypothesis:

H0: Republican party wins

Ha: Republican party loses

Can't reject the Null Hypothesis as p-value = 0.6056 > 0.5.

Can't reject that Republican can win the election in Maine in 2020!

```
1-sample proportions test with continuity correction

data:  6 out of 15, null probability 0.5
X-squared = 0.26667, df = 1, p-value = 0.6056
alternative hypothesis: true p is not equal to 0.5
95 percent confidence interval:
 0.1745677 0.6710894
sample estimates:
  p 0.4
```

T test:

Again running the Null Hypothesis as Republican will win by collecting the Republican

votes in the elections from 2016 till 1988.

Hypothesis:

H0: Republican party wins

Ha: Republican party loses

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Can reject the Null Hypothesis as p-value < 0.5.

Can reject that Republican can win the election in Maine in 2020!

```
One Sample t-test

data:  RepVote
t = 15.216, df = 14, p-value = 4.213e-10
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 219704.2 291807.1
sample estimates:
mean of x
 255755.7
```

Chi-squared Test

```
Chi-squared test for given probabilities

data:  MaineVoters2020
X-squared = 261340, df = 2, p-value < 2.2e-16
```
Hypothesis:

H0: Republican party wins

Ha: Republican party loses

Can reject the Null Hypothesis as p-value is < 0.5.

Can reject that Republican can win the election in Maine in 2020!

Final Project – Group 6
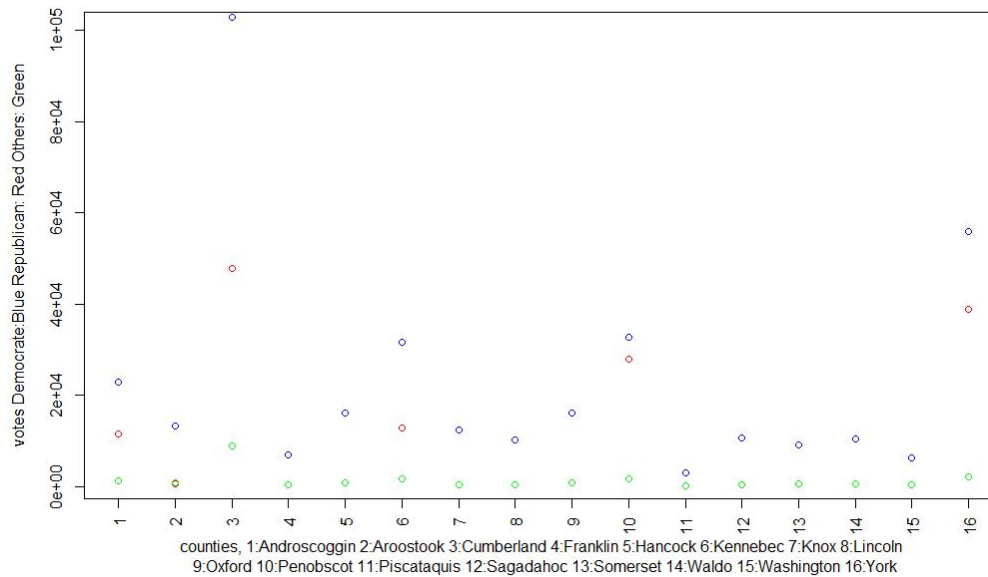
Scatter plot:

The scatter plot shows that the registered Democrat are of higher numbers in all counties.

Monte Carlo Simulation:

It is close and on the edge prediction. The outcome is that Democrat can win by 50.8% only!

The sources are:
http://uselectionatlas.org/RESULTS/state.php?year=2016&fips=23&f=0&off=0&elect=0
http://www.politico.com/2012-election/results/president/maine/
http://uselectionatlas.org/RESULTS/state.php?f=0&fips=23&year=2008
http://uselectionatlas.org/RESULTS/state.php?f=0&fips=23&year=2004
http://uselectionatlas.org/RESULTS/datagraph.php?fips=23&year=2004&off=0&elect=0&f=0
http://uselectionatlas.org/RESULTS/datagraph.php?fips=23&year=2000&off=0&elect=0&f=0

The UNIVARIATE Procedure
Variable: SampleMean (Sample Mean of U(0,1) Data)

Moments			
N	16	Sum Weights	16

Final Project – Group 6

Mean	0. 50820313	Sum Observations	8. 13125
Std Deviation	0. 03322744	Variance	0. 00110406
Skewn ess	0. 065602	Kurtosis	0. 37831767
Uncorr ected SS	4. 14888761	Corrected SS	0. 01656095
Coeff Variation	6. 53822114	Std Error Mean	0. 00830686
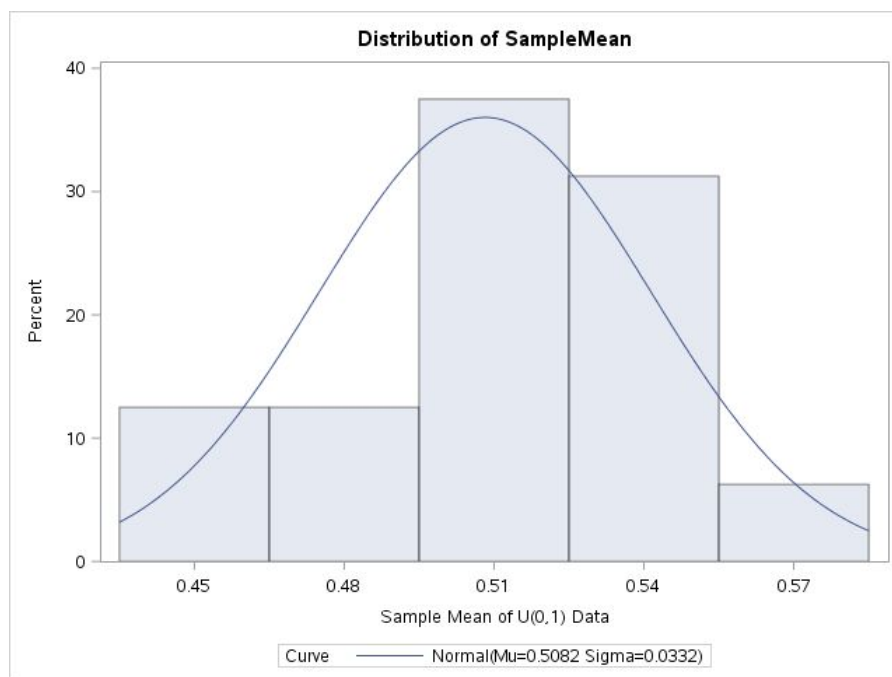
Best-fit Model:

The result is predicted based on historical data.

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The likelihood probability for Maine that the democrat will win 2020 by a minor difference of about +3% than the republicans where the historical data from 1960 to 2016 shows that the mean percentage of Democrats is about 43% while the mean percentage of the Republicans in Maine is 40%. It is the same difference between the Democrats and Republicans in 2016 in Maine.

In 2016, three electoral votes went to Clinton versus only one electoral vote went to Trump.

Massachusetts

Two sample proportion test

Hypothesis:

H0: Republican will win

Ha: Republicans will not win.

```
[1] "Prop Test:"

        2-sample test for equality of proportions with continuity correction

data:  c(democ_ma_votes, repub_ma_votes) out of c(totalVotes, totalVotes)
X-squared = 339310, df = 1, p-value < 2.2e-16
alternative hypothesis: greater
95 percent confidence interval:
 0.2307498 1.0000000
sample estimates:
   prop 1    prop 2
0.6065124 0.3751267
```

P value is less than 2.2e-16. So we reject the null hypothesis. So Republican will not win.

Final Project – Group 6

T-test

 All counties were won by Democrats in MA

```
        One Sample t-test

data:  repub_hist_data
t = -6.3358, df = 13, p-value = 1
alternative hypothesis: true mean is greater than 50
95 percent confidence interval:
 33.57564      Inf
sample estimates:
mean of x
 37.16357
```

Decision Tree

Democrat won.

```
                           levelName
1  Election Tree
2   °--State = MA
3        |--Debate
4        |    |--Won
5        |    |   °--Clinton (Won)
6        |    °--Lost
7        |        |--Trump (Lost)
8        |        °--All Others (Lost)
9        °--Voter Turnout
10            |-->= 70% Voter Turnout
11            |   °--Clinton (Won)
12            °--< 70% Voter Turnout
13                |--Trump (Lost)
14                °--All Others (Lost)
```

Final Project – Group 6

Histogram:

Massachusetts - Histogram for Party and Candidates

Box Plots

All Counties - BoxPlot for Party and Candidates
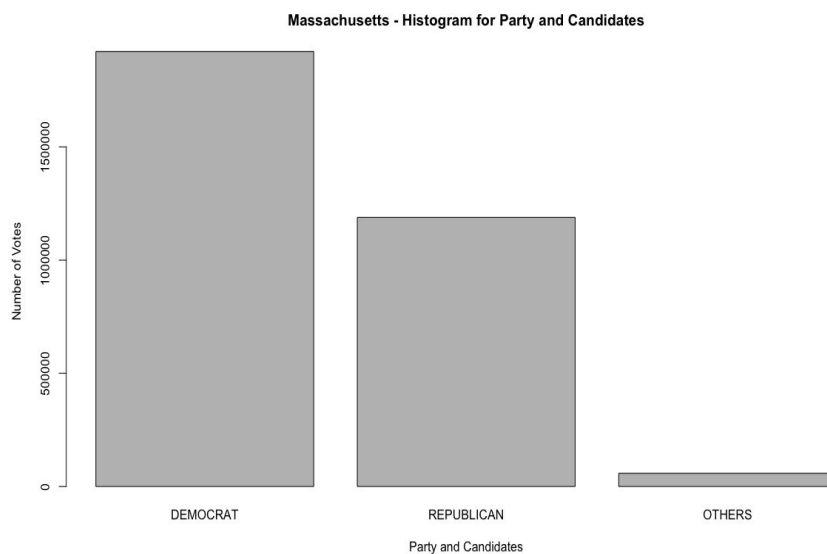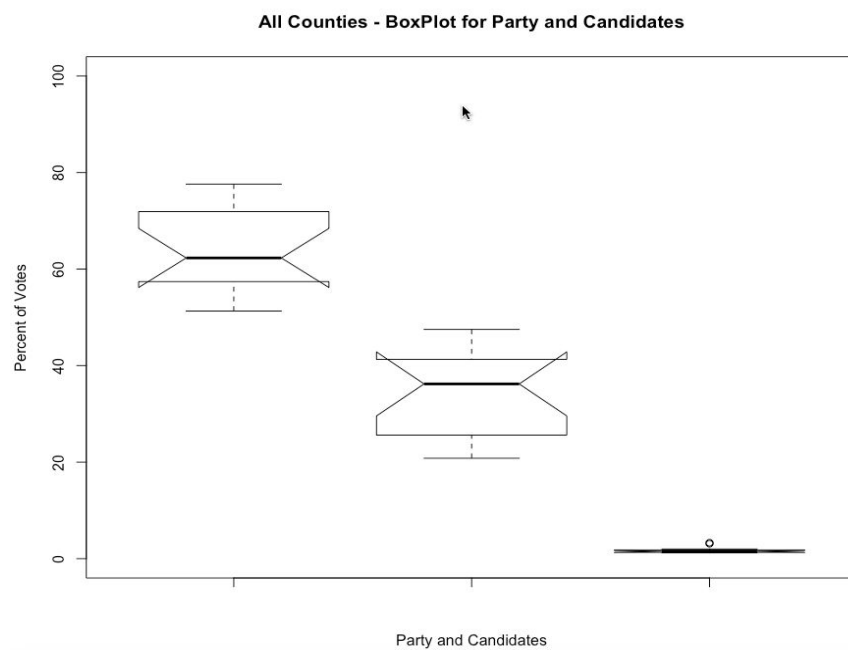
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All Counties in MA are won by Democrats as reflected in the statistical analysis below.

```
        County   Democrat_pct    Republican_pct      Other_pct^        whoWon
Barnstable:1   Min.   :51.30   Min.   :20.80   Min.   :1.200   Democrat:14
Berkshire :1   1st Qu.:57.42   1st Qu.:25.85   1st Qu.:1.325
Bristol   :1   Median :62.30   Median :36.20   Median :1.500
Dukes     :1   Mean   :63.46   Mean   :34.79   Mean   :1.743
Essex     :1   3rd Qu.:71.50   3rd Qu.:41.27   3rd Qu.:1.775
Franklin  :1   Max.   :77.60   Max.   :47.50   Max.   :3.300
(Other)   :8
       X             X.1
Min.   :0.5100   Min.   :0.2100
1st Qu.:0.5725   1st Qu.:0.2625
Median :0.6250   Median :0.3650
Mean   :0.6357   Mean   :0.3500
3rd Qu.:0.7150   3rd Qu.:0.4100
Max.   :0.7800   Max.   :0.4800
```

Chi-Square Test

Democrats win in all counties in MA

```
                Democrat
Barnstable         1
Berkshire          1
Bristol            1
Dukes              1
Essex              1
Franklin           1
Hampden            1
Hampshire          1
Middlesex          1
Nantucket          1
Norfolk            1
Plymouth           1
Suffolk            1
Worcester          1

        Chi-squared test for given probabilities

data:  countiesTbl
X-squared = 0, df = 13, p-value = 1
```

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Monte Carlo Simulation:
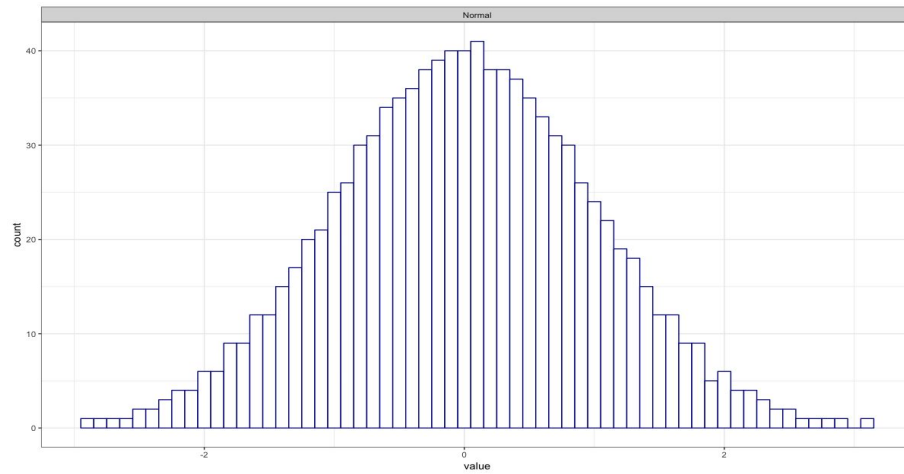
Best-fit Model

Predicted winner in Massachusetts: Democrat in 2020 based on historical data from 1960

to 2016.   Democrat Predicted to win by 26.50%+ in 2020 based on historical data.

Massachusetts favored Democrats in every election from 2000 to 2016.

The likelihood of a Democrat winning Massachusetts in 2020 is > 95%

Final Project – Group 6

Nebraska

Histogram and box plot:

2016 Nebraska Presidential Results

Box plot for party and candidates

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Scatter plot to show, for each county, the voting pattern of each party in Nebraska state
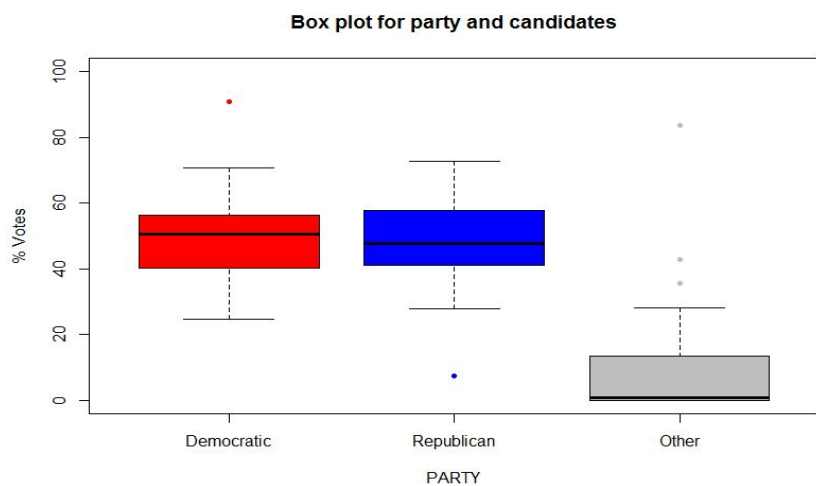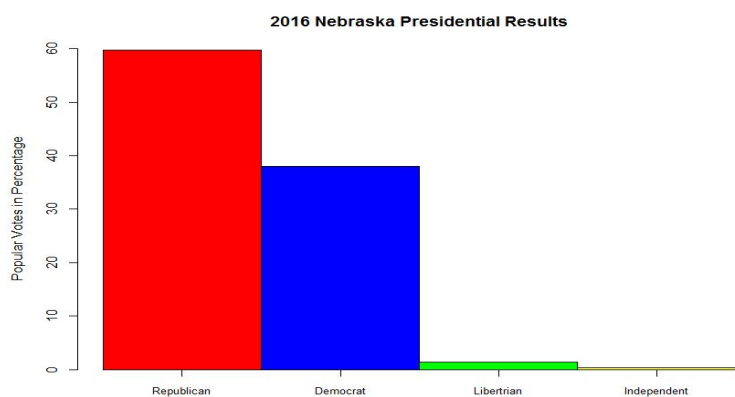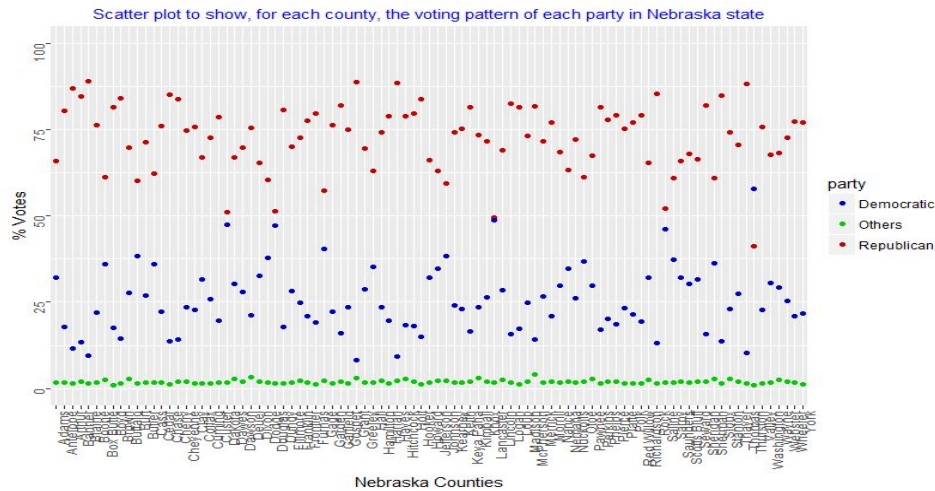
Using a single proportion:

The single proportion hypothesis test deals with finding the probability of success of an event.

The historical data for the republican party for Nebraska for last 14 years states that republican won 13times out of 14.

Single proportion test is used for binomial distribution when the measurement procedure classifies into 2 categories(win/loss).

H0 = Republican will win 2020 election

H1 = Republicans will not win the 2020 election

1-sample proportions test with continuity correction

```
> # Using a single proportion: Hypothesis test and confidence interval
```

Final Project – Group 6

```
> prop.test(13,14)
```

```
	1-sample proportions test with continuity correction


data:  13 out of 14, null probability 0.5

X-squared = 8.6429, df = 1, p-value = 0.003283

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval:

 0.6416809 0.9962601

sample estimates:

        p

0.9285714
```

Cannot reject NULL hypothesis as p-value > 0.5. Republican will win in 2020

T-test

```
One Sample t-test


data:  votes

t = -0.56763, df = 13, p-value = 0.71

alternative hypothesis: true mean is greater than 60

95 percent confidence interval:

 54.39991      Inf

sample estimates:

mean of x
```

Final Project – Group 6

```
58.64071
```

Best-fit Model

The best-fit model among all the statistical analysis is Monte Carlo.

The test was created using the historical data from 2000-2016 by counties.

Nebraska is a strong Republican state. The prediction is Republican will win by 97.7%.
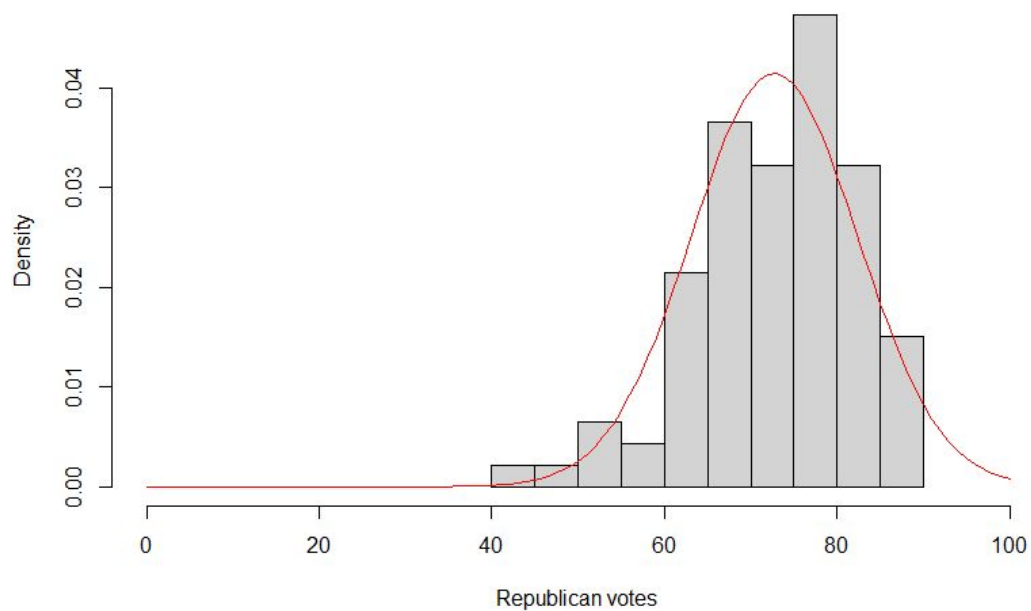
Final Project – Group 6

New Mexico

Histogram:
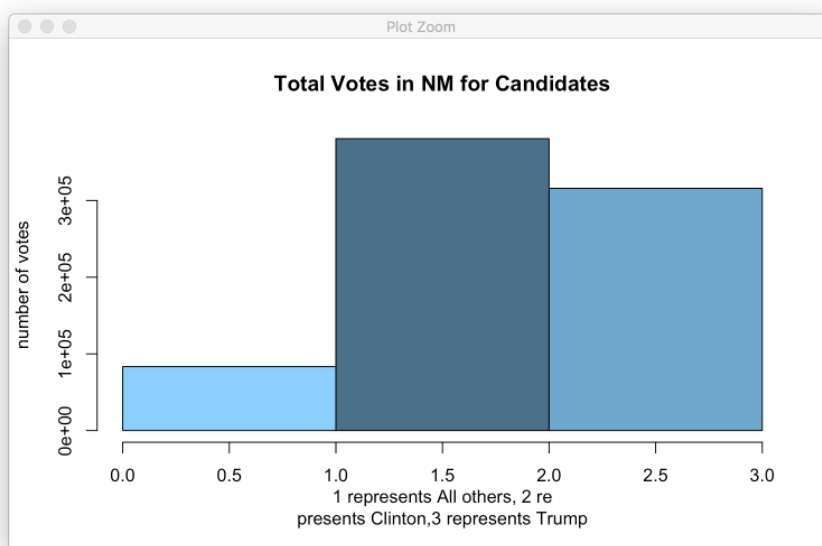
Single proportion test:

H0: true p is equal or smaller than 0.5 (we cannot tell which party will win)

Ha: true p is greater than 0.5 (Democratic party will win)

```
        1-sample proportions test with continuity correction

data:  8 out of 15, null probability 0.5
X-squared = 0, df = 1, p-value = 0.5
alternative hypothesis: true p is greater than 0.5
95 percent confidence interval:
 0.3045469 1.0000000
sample estimates:
        p
0.5333333
```

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P > 0.05, we failed to reject the null. we cannot tell if Democratic will win the party based on 15 elections.

T test

H0: true mean is equal or greater than 0.5 (Democratic Party will win)

Ha: true mean is smaller than 0.5 (Cannot tell if Democratic will win)

```
        One Sample t-test

data:  index
t = 0, df = 13, p-value = 0.5
alternative hypothesis: true mean is less than 0.5
95 percent confidence interval:
      -Inf 0.7455843
sample estimates:
mean of x
      0.5
```

P>0.5, we cannot tell if Democratic will win.

Best-fit Model

Monte Carlo Simulation is the best-fit model among all statistical analyses:

The Monte Carlo Simulation is created based on historical data from 1960 to 2012, using margin votes for Democratic by counties. The result shows that Democratic party will win New Mexico by a likelihood of 97.86%.

Final Project – Group 6

Histogram margin votes for Democratic in New Mexico
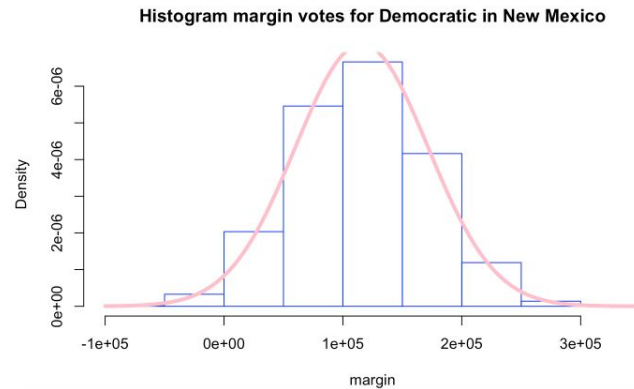
North Carolina

Data Sources for Statistical Analysis

We primarily used election results and voter data at the county level from the North

Carolina State Board of Elections ("Voters statistics", 2016) for presidential elections from 2004

to 2016.

Statistical Analysis of Monte Carlo Results

The execution of 1000 Monte Carlo simulations resulted in the Republican Party winning

by a margin ranging from 0.4% to 11.5%, with a mean and a median value of 5.8%. A t-test

computed on the results rejected the null hypothesis which was that Democrats would win, and

produced a 95% confidence interval of a win of the Republican Party by [5.7% , Inf].

Best-fit Model

As polling data was found to be unreliable for the 2016 presidential election, we decided

to base our 2020 prediction on historical data and use the Monte Carlo simulation method.

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Model Building

We decided to model the expected percentage of votes for each party by computing the mean and standard deviation at the county level. We also computed the mean increase of total vote counts of the last four years and applied that increase to the most recent value for each county.

Election Results Generation

For each county, we generate the percentage of votes that each party gets from a normal distribution with the mean and standard deviation that were computed for the model of that county for the party. The result is then normalized at the county level to ensure a percentage total of 100%, and we multiply each result by the expected number of total votes for that county. The final election result is the sum of the votes in each county.

Predictions

prediction for 2020 election

In this section, we predict the 2020 election based on analyses in the previous section.

Maine

We predict the Democratic party will win 3 of Maine's 4 electoral votes by 50.8%.

Massachusetts

We predict the Democratic party will win Massachusetts' 11 electoral votes by 27%

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Nebraska

We predict the Republican Party will win Nebraska's 5 electoral votes by 97.7%.

New Mexico

We predict the Democratic Party will win New Mexico's 5 electoral votes by 97.86%.

North Carolina

We predict the Republican Party will win North Carolina's 15 electoral votes by 5.8 %.

Discussion

In 2016, a majority of polls did not accurately predict the presidential election results. In this section, we will discuss whether that was the case for each state and the potential factors influencing the polls accuracy.

In this section, we introduce the Gallup polls that accurately supported the 2016 election, and use them to support our predictions.

Maine

http://projects.fivethirtyeight.com/2016-election-forecast/maine/

http://www.nytimes.com/interactive/2016/upshot/maine-election-forecast.html

http://www.governing.com/topics/elections/gov-electoral-college-handicapping-october-2016.html

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They all predicted that Democrats will win Maine in 2016, and this what happened. Clinton won 3 electoral votes out of the 4 votes of Maine with popular vote of 48% while Trump was 45% and Johnson was 5%. Moreover, Maine caucus counties voted for Sanders and none voted for Clinton. On the other hand, Ted Cruz won 15 out of 16 counties in Maine and Trump won only one county.

Massachusetts

All the polls were right in predicting Democrat win in Massachusetts. The 4 Gallup polls were New York Times poll, NBC, Washington Post and CNN were all correct in predicting the Democrat win in Massachusetts. (Sources: NewYorkTimes.com, NBCNews.com, WashingtonPost.com and Turner.com)

Nebraska

http://www.nytimes.com/interactive/2016/upshot/nebraska-election-forecast.html?_r=0

https://projects.fivethirtyeight.com/2016-election-forecast/nebraska/

http://www.politico.com/2016-election/results/nebraska

All of the above predicted that Republican will win in Nebraska.

New Mexico

Almost all the polls were right predicting Democratic party win the state, since New Mexico has been consistently lean to Democratic in the past few elections. CNN, Washington

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Post, and CBS news all predicted New Mexico would vote for Democratic party in 2016, which were accurate.

North Carolina

North Carolina was a tight race in 2016, and as such, many predictions gave Clinton winning by a slight margin and a Trump victory was within the error margin. Most polls gave almost equal chances of winning to both candidates ("North Carolina", 2016).

FiveThirtyEight ended with a 55.5% chance of winning North Carolina 15 electoral votes to Hillary Clinton. However, on the graph below, we can see that their prediction moved a lot and Trump was seen as the winner for a short time before the last days before the election ("Who will win North Carolina?",2016).
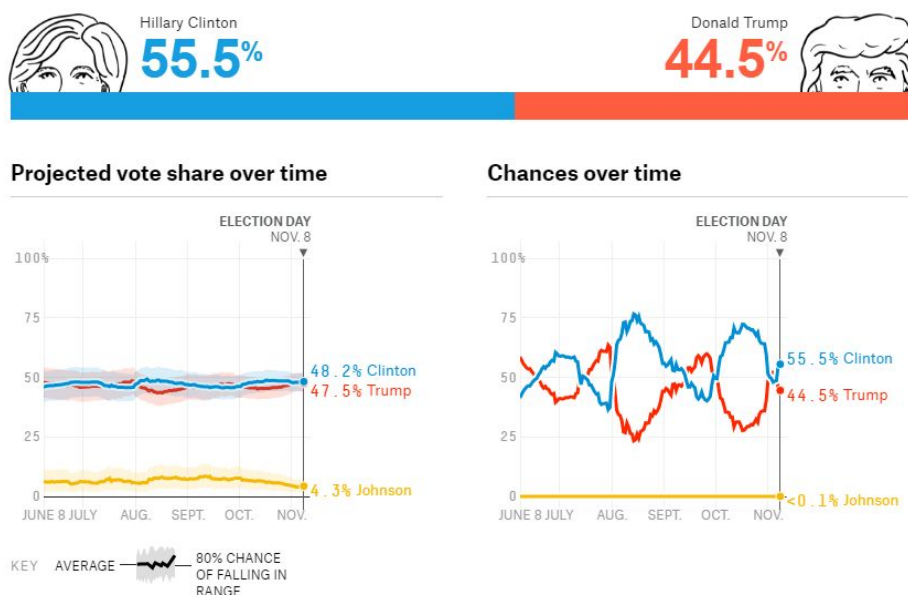
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The FiveThirtyEight website ("Who will win North Carolina?",2016) presents a series of poll results from different sources, as shown in the figure below. We can see that most poll results were close.

The state of North Carolina was the second closest race in percentage both in 2008 and 2012 presidential elections ("North Carolina", 2016). In 2008, 2012 and 2016, the percentage difference between the two major parties was respectively 0.3%, 2% and 3.6%. It is very difficult to predict the winner of the next presidential election with confidence when the past results were so close.

Conclusion

Our overall prediction is that the Republican party will win 21 electoral votes (NC=15+NB=5+ME=1) while the Democratic Party will win 19 electoral votes

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(ME=3+MA=11+NM=5) of the 40 Electoral College votes representing the five states that our group analyzed.

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Appendix

Dataset

Maine

CountyID	year	D
1	2016	0.4138
1	2012	0.55
1	2008	0.5655
1	2004	0.544
1	2000	0.533
1	1996	0.566
2	2016	0.3814
2	2012	0.527
2	2008	0.5375
2	2004	0.519
2	2000	0.489
2	1996	0.518
3	2016	0.5994
3	2012	0.605
3	2008	0.641

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3	2004	0.582
3	2000	0.52
3	1996	0.536
4	2016	0.4255
4	2012	0.577
4	2008	0.5887
4	2004	0.548
4	2000	0.492
4	1996	0.532
5	2016	0.5016
5	2012	0.57
5	2008	0.5874
5	2004	0.545
5	2000	0.454
5	1996	0.463
6	2016	0.4426
6	2012	0.554
6	2008	0.5643
6	2004	0.533
6	2000	0.53
6	1996	0.544

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7	2016	0.5376
7	2012	0.601
7	2008	0.5974
7	2004	0.546
7	2000	0.461
7	1996	0.468
8	2016	0.4763
8	2012	0.547
8	2008	0.5507
8	2004	0.513
8	2000	0.439
8	1996	0.447
9	2016	0.3901
9	2012	0.559
9	2008	0.5668
9	2004	0.527
9	2000	0.496
9	1996	0.52
10	2016	0.4077
10	2012	0.503
10	2008	0.5172

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10	2004	0.492
10	2000	0.449
10	1996	0.51
11	2016	0.3374
11	2012	0.509
11	2008	0.5072
11	2004	0.444
11	2000	0.405
11	1996	0.487
12	2016	0.4933
12	2012	0.57
12	2008	0.5705
12	2004	0.527
12	2000	0.48
12	1996	0.497
13	2016	0.3488
13	2012	0.494
13	2008	0.5177
13	2004	0.5
13	2000	0.482
13	1996	0.509

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14	2016	0.4598
14	2012	0.538
14	2008	0.5477
14	2004	0.518
14	2000	0.443
14	1996	0.464
15	2016	0.3712
15	2012	0.495
15	2008	0.4951
15	2004	0.485
15	2000	0.427
15	1996	0.474
16	2016	0.4887
16	2012	0.571
16	2008	0.5936
16	2004	0.533
16	2000	0.493
16	1996	0.51

Where the counties are as follows:

1   Androscoggin

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2	Aroostook
3	Cumberland
4	Franklin
5	Hancock
6	Kennebec
7	Knox
8	Lincoln
9	Oxford
10	Penobscot
11	Piscataquis
12	Sagadahoc
13	Somerset
14	Waldo
15	Washington
16	York

Year	D	D%	R	R%
2016	357,735	47.80%	335,593	44.90%
2012	401,306	56.27%	292,276	40.98%
2008	421,923	57.71%	295,273	40.38%
2004	396,842	53.57%	330,201	44.58%

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2000	319,951	49.10%	286,616	44.00%
1996	312,788	51.60%	186,378	30.80%
1992	263,420	38.80%	206,820	30.40%
1988	243,569	43.90%	307,131	55.30%
1984	214,515	38.80%	336,500	60.80%
1980	220,974	42.30%	238,522	45.60%
1976	232,279	48.07%	236,320	48.91%
1972	160,584	38.50%	256,458	61.50%
1968	217,312	55.30%	169,254	43.10%
1964	62,264	68.84%	118,701	31.16%
1960	181,159	42.95%	240,608	57.05%

	2004			2008			2012			2016		
	D	R	O	D	R	O	D	R	O	D	R	O
Voter Turn Out	396,842	330,201	8,069	421,923	295,273	10,636	401,306	292,276	9,352	357,735	335,593	38,105
%	53.57%	44.58%	1.09%	57.71%	40.38%	1.45%	56.27%	40.98%	1.31%	47.80%	44.90%	5.10%
18 to 24	48%	50%	1%	71%	26%	3%	65%	30%		50%	42%	5%

Final Project – Group 6

25 to 29	48%	50%	1%	62%	36%	2%	60%	35%		46%	44%	8%
30 to 39	48%	50%	1%	60%	38%	2%	59%	36%		40%	50%	7%
40 to 49	59%	39%	1%	54%	44%	2%	51%	44%		48%	46%	6%
50 to 64	59%	39%	1%	61%	36%	3%	58%	40%		47%	48%	4%
65+	54%	45%	1%	45%	53%	2%	55%	43%	56%	39%	3%	
Male	48%	49%	1%	52%	46%	2%	50%	46%	41%	52%	6%	
Female	57%	42%	1%	64%	34%	2%	64%	34%	55%	39%	5%	
White	53%	45%	11%	58%	40%	2%	57%	40%	47%	46%	5%	
Non-White									56%	33%	10%	
Total	824000			801000			787000			1056410		

Final Project – Group 6

Massachusetts

The data set is embedded in the program code in the next section; hence, testing the program will be easier without bothering about datasets.

Nebraska

County		Party	s	Vote
		Republican		65.9
Adams				8
		Democrati		32.2
Adams	c			3
Adams		Others		1.79
		Republican		80.5
Antelope				5
		Democrati		17.7
Antelope	c			9
Antelope		Others		1.65
		Republican		86.9
Arthur				7
		Democrati		11.4
Arthur	c			9
Arthur		Others		1.53
		Republican		84.5
Banner				6
		Democrati		13.4
Banner	c			8
Banner		Others		1.96
		Republican		89.0
Blaine				4
		Democrati		
Blaine	c			9.63
Blaine		Others		1.33
		Republican		76.3
Boone				1
		Democrati		21.9
Boone	c			7
Boone		Others		1.71

Final Project – Group 6

			61.29
Box Butte		Republican	
Box Butte	c	Democrati	36.15
Box Butte		Others	2.56
Boyd		Republican	81.51
Boyd	c	Democrati	17.55
Boyd		Others	0.93
Brown		Republican	84.01
Brown	c	Democrati	14.43
Brown		Others	1.55
Buffalo		Republican	69.76
Buffalo	c	Democrati	27.58
Buffalo		Others	2.66
Burt		Republican	60.31
Burt	c	Democrati	38.29
Burt		Others	1.41
Butler		Republican	71.48
Butler	c	Democrati	26.93
Butler		Others	1.6
Cass		Republican	62.36
Cass	c	Democrati	35.96
Cass		Others	1.68
Cedar		Republican	76
Cedar	c	Democrati	22.21
Cedar		Others	1.79
Chase		Republican	85.07

Final Project – Group 6

County		Party	Value
		Democrati	13.6
Chase	c		4
Chase		Others	1.29
		Republican	83.7
Cherry			8
		Democrati	14.2
Cherry	c		9
Cherry		Others	1.93
		Republican	74.6
Cheyenne			7
		Democrati	23.4
Cheyenne	c		2
Cheyenne		Others	1.91
		Republican	75.8
Clay			9
		Democrati	
Clay	c		22.7
Clay		Others	1.41
		Republican	66.9
Colfax			6
		Democrati	31.6
Colfax	c		4
Colfax		Others	1.4
		Republican	72.7
Cuming			6
		Democrati	25.8
Cuming	c		4
Cuming		Others	1.4
		Republican	78.5
Custer			2
		Democrati	19.6
Custer	c		9
Custer		Others	1.79
Dakota		Republican	51
		Democrati	47.3
Dakota	c		6
Dakota		Others	1.64
		Republican	67.0
Dawes			1
		Democrati	30.3
Dawes	c		2
Dawes		Others	2.67

Final Project – Group 6

County		Party	Value
			69.9
Dawson		Republican	3
		Democrati	28.0
Dawson	c		8
Dawson		Others	1.99
Deuel		Republican	75.4
		Democrati	21.2
Deuel	c		5
Deuel		Others	3.36
		Republican	65.4
Dixon			5
		Democrati	32.6
Dixon	c		3
Dixon		Others	1.91
		Republican	60.5
Dodge			5
		Democrati	37.8
Dodge	c		6
Dodge		Others	1.59
		Republican	51.4
Douglas			4
		Democrati	47.1
Douglas	c		7
Douglas		Others	1.39
		Republican	80.6
Dundy			5
		Democrati	17.9
Dundy	c		2
Dundy		Others	1.43
		Republican	70.0
Fillmore			5
		Democrati	28.2
Fillmore	c		1
Fillmore		Others	1.74
		Republican	72.6
Franklin			9
		Democrati	24.9
Franklin	c		5
Franklin		Others	2.36
		Republican	77.4
Frontier			9

Final Project – Group 6

County	c	Party	Value
		Democrati	20.8
Frontier	c		9
Frontier		Others	1.62
		Republican	79.7
Furnas			7
		Democrati	19.0
Furnas	c		5
Furnas		Others	1.17
		Republican	57.2
Gage			7
		Democrati	40.5
Gage	c		2
Gage		Others	2.22
		Republican	76.1
Garden			9
		Democrati	22.2
Garden	c		4
Garden		Others	1.56
		Republican	82.0
Garfield			7
		Democrati	
Garfield	c		15.9
Garfield		Others	2.03
		Republican	75.1
Gosper			3
		Democrati	23.5
Gosper	c		4
Gosper		Others	1.33
		Republican	88.7
Grant			1
		Democrati	
Grant	c		8.26
Grant		Others	3.03
		Republican	69.4
Greeley			3
		Democrati	28.7
Greeley	c		9
Greeley		Others	1.78
		Republican	62.9
Hall			4
		Democrati	35.3
Hall	c		5

Final Project – Group 6

Hall	Others	1.71
	Republican	74.2
Hamilton		5
	Democrati	23.5
Hamilton	c	5
Hamilton	Others	2.2
	Republican	78.7
Harlan		9
	Democrati	19.6
Harlan	c	3
Harlan	Others	1.58
	Republican	88.4
Hayes		1
	Democrati	
Hayes	c	9.35
Hayes	Others	2.24
	Republican	79.0
Hitchcock		2
	Democrati	18.2
Hitchcock	c	9
Hitchcock	Others	2.69
	Republican	79.7
Holt		9
	Democrati	18.1
Holt	c	5
Holt	Others	2.06
	Republican	83.7
Hooker		6
	Democrati	14.9
Hooker	c	7
Hooker	Others	1.27
	Republican	66.1
Howard		8
	Democrati	
Howard	c	32
Howard	Others	1.82
	Republican	63.1
Jefferson		1
	Democrati	34.6
Jefferson	c	9
Jefferson	Others	2.2

Final Project – Group 6

Johnson	Republican	59.46
Johnson	Democrati c	38.41
Johnson	Others	2.14
Kearney	Republican	74.18
Kearney	Democrati c	24.11
Kearney	Others	1.71
Keith	Republican	75.29
Keith	Democrati c	22.95
Keith	Others	1.76
Keya Paha	Republican	81.5
Keya Paha	Democrati c	16.63
Keya Paha	Others	1.87
Kimball	Republican	73.39
Kimball	Democrati c	23.48
Kimball	Others	3.12
Knox	Republican	71.68
Knox	Democrati c	26.28
Knox	Others	2.04
Lancaster	Republican	49.63
Lancaster	Democrati c	48.69
Lancaster	Others	1.67
Lincoln	Republican	69.08
Lincoln	Democrati c	28.49
Lincoln	Others	2.43
Logan	Republican	82.6
Logan	Democrati c	15.78

Final Project – Group 6

Logan		Others	1.62
		Republican	81.4
Loup			6
		Democrati	17.4
Loup	c		2
Loup		Others	1.12
		Republican	73.0
Madison			8
		Democrati	24.9
Madison	c		3
Madison		Others	2
McPherson		Republican	81.7
			2
McPherson		Democrati	14.1
	c		4
McPherson		Others	4.14
		Republican	71.6
Merrick			5
		Democrati	26.6
Merrick	c		2
Merrick		Others	1.73
		Republican	77.1
Morrill			1
		Democrati	20.8
Morrill	c		7
Morrill		Others	2.02
		Republican	68.4
Nance			5
		Democrati	29.7
Nance	c		4
Nance		Others	1.81
		Republican	63.3
Nemaha			1
		Democrati	34.8
Nemaha	c		4
Nemaha		Others	1.86
		Republican	72.0
Nuckolls			3
		Democrati	26.1
Nuckolls	c		3
Nuckolls		Others	1.84
Otoe		Republican	61.2

Final Project – Group 6

County		Party	Value
		Democrati	36.8
Otoe	c		1
Otoe		Others	1.98
		Republican	67.4
Pawnee			4
		Democrati	29.7
Pawnee	c		7
Pawnee		Others	2.78
		Republican	81.4
Perkins			2
		Democrati	17.0
Perkins	c		7
Perkins		Others	1.51
		Republican	77.9
Phelps			1
		Democrati	20.2
Phelps	c		2
Phelps		Others	1.87
		Republican	79.2
Pierce			9
		Democrati	18.6
Pierce	c		6
Pierce		Others	2.05
Platte		Republican	75.2
		Democrati	23.3
Platte	c		6
Platte		Others	1.44
		Republican	77.1
Polk			1
		Democrati	21.5
Polk	c		5
Polk		Others	1.35
Red Willow		Republican	79.1
			9
Red Willow		Democrati	19.3
	c		1
Red Willow		Others	1.5
Richardson		Republican	65.4
			1
Richardson		Democrati	32.0
	c		7
Richardson		Others	2.53

Final Project – Group 6

Rock	Republican	85.39
Rock	c Democrati	13.09
Rock	Others	1.52
Saline	Republican	52.11
Saline	c Democrati	46.19
Saline	Others	1.7
Sarpy	Republican	60.93
Sarpy	c Democrati	37.34
Sarpy	Others	1.72
Saunders	Republican	65.91
Saunders	c Democrati	32.14
Saunders	Others	1.95
Scotts Bluff	Republican	67.98
Scotts Bluff	c Democrati	30.24
Scotts Bluff	Others	1.78
Seward	Republican	66.46
Seward	c Democrati	31.7
Seward	Others	1.85
Sheridan	Republican	82.09
Sheridan	c Democrati	15.84
Sheridan	Others	2.07
Sherman	Republican	60.94
Sherman	c Democrati	36.41
Sherman	Others	2.65
Sioux	Republican	84.76

Final Project – Group 6

		Democrati	13.7
Sioux	c		4
Sioux		Others	1.5
		Republican	74.1
Stanton			5
		Democrati	23.1
Stanton	c		4
Stanton		Others	2.71
		Republican	70.5
Thayer			4
		Democrati	27.5
Thayer	c		6
Thayer		Others	1.9
		Republican	88.2
Thomas			4
		Democrati	10.2
Thomas	c		9
Thomas		Others	1.47
		Republican	41.2
Thurston			9
		Democrati	57.8
Thurston	c		5
Thurston		Others	0.85
		Republican	75.7
Valley			8
		Democrati	22.7
Valley	c		9
Valley		Others	1.43
Washingto		Republican	67.7
n			5
Washingto		Democrati	30.6
n	c		6
Washingto			
n		Others	1.59
		Republican	68.1
Wayne			3
		Democrati	29.3
Wayne	c		5
Wayne		Others	2.51
		Republican	72.5
Webster			4

Final Project – Group 6

Candidate		Party	Value
Webster	c	Democrati	25.43
Webster		Others	2.02
Wheeler		Republican	77.35
Wheeler	c	Democrati	20.85
Wheeler		Others	1.79
York		Republican	77.08
York	c	Democrati	21.64
York		Others	1.28

candidates	Votes	Year
CLINTON	34.3	2016
TRUMP	59.9	2016
OBAMA	38.03	2012
ROMNEY	59.8	2012
OBAMA	41.6	2008
MCCAIN	56.53	2008
KERRY	32.68	2004
BUSH	65.9	2004
GORE	33.25	2000
BUSH	62.2	2000
CLINTON	34.95	1996
BUSH	53.6	1996

Final Project – Group 6

Year	Total	Dem	Rep	Ind	Others
2016	844,227	33.70%	58.75%	0.00%	7.55%
2012	794,379	38.03%	59.80%	0.00%	2.17%
2008	801,281	41.60%	56.53%	0.00%	1.87%
2004	778,186	32.68%	65.90%	0.00%	1.42%
2000	697,019	33.25%	62.25%	3.52%	0.98%
1996	677,415	34.95%	53.65%	10.52%	0.87%
1992	739,283	29.40%	46.58%	23.63%	0.39%

Source:

https://www.kansascityfed.org/en/publications/research/ne/articles/2016/2q2016/diverging-economic-growth-in-nebraska

https://en.wikipedia.org/wiki/Economy_of_Omaha,_Nebraska

http://uselectionatlas.org/RESULTS/compare.php?year=2000&fips=31&f=0&off=0&elect=0&type=state

http://www.netstate.com/economy/ne_economy.htm

https://data.bls.gov/cgi-bin/print.pl/eag/eag.ne.htm

New Mexico

Margin of votes (Dem - Rep) by county

County	Margin_12	Margin_08	Margin_04	Margin_96	Margin_92	Avg_margin	stdv_margin
Bernalillo	44331	61035	10798	9308	13559	27806.2	23514.18265
Catron	-934	-734	-876	-500	-306	-670	263.450185

Final Project – Group 6

Chaves	-6484	-5454	-8047	-2977	-2512	-5094.8	2341.490914
Cibola	1963	2696	436	1785	1283	1632.6	839.2379281
Colfax	129	685	-258	684	877	423.4	472.5138093
Curry	-5229	-4929	-7108	-3262	-3132	-4732	1631.877293
De Baca	-299	-317	-425	20	-75	-219.2	184.5919825
Dona Ana	9817	12214	2214	5225	3586	6611.2	4244.916807
Eddy	-6441	-5149	-6388	425	96	-3491.4	3465.750179
Grant	1732	2736	960	1867	2686	1996.2	738.8052517
Guadalupe	931	937	426	772	534	720	232.0269381
Harding	-67	-98	-121	-57	-44	-77.4	31.48491702
Hidalgo	96	57	-220	154	124	42.2	150.8747825
Lea	-8468	-8239	-10784	-2268	-2874	-6526.6	3751.798342
Lincoln	-3019	-2466	-3248	-1187	-939	-2171.8	1055.004123
Los Alamos	395	760	-604	-1016	-423	-177.6	733.470722

Final Project – Group 6

Luna	-87	441	-824	385	471	77.2	552.5605849
McKinley	10295	10190	5700	5654	4685	7304.8	2712.450497
Mora	1360	1599	948	1085	887	1175.8	298.5677478
Otero	-5622	-4196	-7633	-3127	-2104	-4536.4	2167.158808
Quay	-819	-820	-1239	-113	-1	-598.4	524.5567653
Rio Arriba	8068	8617	4604	5414	5152	6371	1833.604647
Roosevelt	-2316	-2008	-2915	-1148	-1043	-1886	792.7669897
Sandoval	2849	7476	-1207	2066	2460	2728.8	3104.530351
San Juan	-12994	-9841	-14682	-5408	-2113	-9007.6	5226.791205
San Miguel	6547	7842	5370	5057	4003	5763.8	1473.717985
Santa Fe	35372	39760	28608	15492	17505	27347.4	10694.38291
Sierra	-964	-665	-1236	14	209	-528.4	621.9045747
Socorro	1336	1664	329	1059	722	1022	520.1869856
Taos	9248	10950	7321	4509	4791	7363.8	2792.044717

Final Project – Group 6

Torrance	-1101	-648	-1640	-82	-5	-695.2	691.3643757
Union	-764	-735	-1043	-476	-456	-694.8	241.1155325
Valencia	686	2230	-3204	1390	1190	458.4	2121.712704
TOTAL	79547	125590	-5988	40744	48793	57737.2	48757.91864

Data source: http://electionresults.sos.state.nm.us/

Demographic data:

	2000		2004		2008		2012		2016
	Total Citizen Population	Total voted	Total Citizen Population	Total voted	Total Citizen Population	Total voted	Total Citizen Population	Total voted	Estimated Total Citizen Population
Total	1,188	647	1,301	837	1,352	846	1,426	878	1,470
Male	559	286	621	392	653	395	684	404	720
Female	629	361	680	445	699	451	742	474	750
gender difference	0.125223614	0.262237762	0.095008052	0.135204082	0.070444104	0.141772152	0.084795322	0.173267327	0.040694648

Final Project – Group 6

perce ntage									
White alone	995	581	1,087	715	1,176	748	1,215	789	1,113
.Whit e non-H ispani c alone	580	392	653	471	654	468	713	503	666
Black alone	36	9	34	23	31	20	39	24	33
Asian alone	5	2	3	3	19	14	12	3	15
Hispa nic (of any race)	426	191	486	276	539	289	544	306	610
In conbi nation	141	53	125	64	109	55	118	42	146
18 to 24	162	39	177	74	151	69	163	66	168
25 to 44	462	231	442	284	486	239	472	253	493
45 to 64	361	244	471	323	496	368	551	390	489
65+	204	132	211	156	218	171	240	169	319

Final Project – Group 6

| 64.22 | 67.72 | 78.74 | 82.62 | 83.35 | 85.85 |
| | 1.05 | 1.16 | 1.05 | 1.01 | 1.03 |

Data Source: US Census

North Carolina

Voters Data

Year	Democrats	Republicans	Libertarians	Unaffiliated	Total
2016	2725054	2079619	32097	2059579	6896349
2012	2870693	2052250	19321	1706924	6649188
2008	2866669	2002416	3637	1392011	6264733
2004	2392156	1732789	10101	891563	5026616

Year	White	Black	American Indian	Other	Hispanic	Male	Female
2016	4789218	1530967	56455	519709	165571	3086398	3654287
2012	4728843	1492831	53485	374029	113782	3000187	3573312
2008	4596479	1354976	48605	101217	68053	2822503	3391427
2004	3914286	972830	43172	70454	8136	2261837	2756135

Historical Election Results Data by County

	2016			2012			2008		
County	R	D	O	R	D	O	R	D	O

Final Project – Group 6

ALAMANCE	38576	29584	2490	38170	28875	731	34859	28918	576
ALEXANDER	13833	3756	609	12253	4611	332	11790	5167	297
ALLEGHANY	3789	1300	190	3390	1583	94	3124	2021	118
ANSON	4505	5858	180	4166	7019	71	4207	6456	70
ASHE	9353	3476	509	8242	4116	252	7916	4872	281
AVERY	6226	1670	259	5766	1882	111	5681	2178	84
BEAUFORT	14540	8760	630	13977	9435	208	13460	9454	96
BERTIE	3424	5681	104	3387	6695	41	3376	6365	22
BLADEN	8511	7021	287	7748	8062	147	7532	7853	95
BRUNSWICK	42709	23278	2348	34743	22038	581	30753	21331	524
BUNCOMBE	55339	74937	7692	54701	70625	2370	52494	69716	1585
BURKE	26233	11251	1431	22267	13701	576	22102	14901	440
CABARRUS	53224	35048	3876	49557	32849	1160	45924	31546	524
CALDWELL	26499	8403	1266	23229	10898	605	22526	12081	548
CAMDEN	3546	1274	186	3109	1508	87	3140	1597	84
CARTERET	26228	9806	1235	24775	10301	441	23131	11130	336
CASWELL	5758	4549	242	5594	5348	97	5208	5545	109
CATAWBA	48062	21050	2784	44538	24069	994	42993	25656	802
CHATHAM	17012	20953	1656	16665	18361	408	14668	17862	350
CHEROKEE	10711	2809	470	9278	3378	211	8643	3785	158
CHOWAN	3983	2965	220	3891	3556	58	3773	3688	51
CLAY	4395	1352	201	3973	1579	90	3707	1734	102
CLEVELAND	28474	14961	1230	25793	17062	485	26078	17363	394
COLUMBUS	14177	8991	395	12941	11050	252	12994	11076	212
CRAVEN	27556	17481	1620	26928	18763	479	24901	19352	345
CUMBERLAND	50617	70616	4526	50666	75792	1183	52151	74693	731
CURRITUCK	9070	2879	585	7496	3562	246	7234	3737	131
DARE	11283	7079	885	10248	7393	333	9745	8074	229
DAVIDSON	52870	17328	2372	49383	20624	928	45419	22433	729
DAVIE	15594	5269	884	14687	5735	248	13981	6178	209
DUPLIN	12151	8196	349	11416	9033	143	10834	8958	112
DURHAM	27879	118783	6352	33769	111224	1742	32353	103456	1088
EDGECOMBE	8242	16188	399	8546	18310	116	8445	17403	82
FORSYTH	74493	92488	7637	79768	92323	1978	73674	91085	1374
FRANKLIN	16329	12821	1121	14603	13436	350	13273	13085	281

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GASTON	61467	30982	3428	56138	33171	1174	52507	31384	511
GATES	2851	2371	131	2564	2786	46	2547	2830	43
GRAHAM	3260	761	116	2750	1119	78	2824	1265	82
GRANVILLE	13530	12856	850	12405	13598	272	11447	13074	204
GREENE	4360	3577	116	4411	3778	47	4272	3796	35
GUILFORD	97461	147949	9972	104789	146365	2698	97718	142101	1952
HALIFAX	8954	15642	380	8763	17176	140	8961	16047	83
HARNETT	27278	16452	1681	25565	17331	519	23579	16785	341
HAYWOOD	18865	10452	1322	15633	11833	508	14910	12730	427
HENDERSON	35652	19735	2524	32994	18642	756	30930	20082	602
HERTFORD	3081	6886	177	3007	7843	68	3089	7513	48
HOKE	7676	9608	727	6819	10076	194	6293	9227	107
HYDE	1275	956	51	1193	1163	27	1212	1241	16
IREDELL	54164	24441	2986	49299	26076	990	45148	27318	696
JACKSON	9706	7564	1112	8254	8095	352	7854	8766	246
JOHNSTON	54062	28153	3137	48427	27290	974	43622	26795	600
JONES	2972	2065	96	2837	2352	41	2817	2378	32
LEE	13625	10380	889	13158	10801	280	12775	10784	229
LENOIR	13381	12091	557	13980	13948	158	13401	13378	118
LINCOLN	28653	9836	1306	25267	11024	484	23631	11713	454
MACON	12035	4841	720	10835	5712	314	10317	6620	301
MADISON	6783	3926	560	5404	4484	225	5192	5026	161
MARTIN	5897	5843	221	5995	6583	74	5957	6539	45
MCDOWELL	14517	4645	629	11775	6031	293	11534	6571	281
MECKLENBURG	154303	292258	22464	171668	272262	4970	153848	253958	3011
MITCHELL	6225	1585	217	5806	1838	121	5499	2238	109
MONTGOMERY	7070	4108	258	6404	4706	121	6155	4926	129
MOORE	30273	16147	1837	29495	16505	415	27314	17624	390
NASH	23142	23024	1090	23842	24313	337	23728	23099	291
NEW HANOVER	54665	50219	5440	53385	48668	1575	50544	49145	976
NORTHAMPTON	3556	6113	121	3483	7232	41	3671	6903	44
ONSLOW	36342	17156	2417	32243	18490	702	30278	19499	426
ORANGE	18373	59105	3780	21539	53901	1317	20266	53806	838
PAMLICO	4239	2444	163	4051	2647	64	3823	2838	51

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PASQUOTANK	8082	8455	577	7633	10282	192	7778	10272	130
PENDER	17424	9240	878	14617	9632	278	13618	9907	224
PERQUIMANS	4177	2319	212	3822	2759	71	3678	2772	51
PERSON	11154	7791	597	10496	8418	192	10030	8446	156
PITT	35191	40967	2934	36214	41843	799	33927	40501	456
POLK	6738	3715	429	6236	4013	140	5990	4396	176
RANDOLPH	49156	13074	1926	45160	14773	782	40998	16414	735
RICHMOND	10212	8303	435	9332	9904	181	9424	9713	190
ROBESON	20294	18377	1053	17510	24988	448	17433	23058	343
ROCKINGHAM	26807	14221	1217	25227	16351	442	23899	17255	458
ROWAN	42388	19208	2104	38775	22650	887	37451	23391	718
RUTHERFORD	21694	7451	912	18954	9374	374	18769	9641	310
SAMPSON	14761	10486	540	14422	11566	186	14038	11836	164
SCOTLAND	6212	7279	351	5831	8215	110	6005	8151	61
STANLY	21788	7008	844	19904	8431	382	19329	8878	299
STOKES	16976	4645	759	15237	6018	364	14488	6875	380
SURRY	23663	7486	1037	19923	9112	435	18730	10475	320
SWAIN	3557	2186	360	2976	2618	134	2900	2806	92
TRANSYLVANIA	10464	6536	787	9634	6826	303	9401	7275	233
TYRRELL	974	718	44	930	837	16	960	933	17
UNION	66265	34051	4585	61107	32473	1148	54123	31189	777
VANCE	7304	12168	411	7429	13323	102	7606	13166	99
WAKE	194698	300277	28493	211596	267262	7569	187001	250891	4353
WARREN	3289	6520	229	3140	6978	44	3063	7086	46
WASHINGTON	2560	3490	91	2622	3833	44	2670	3748	36
WATAUGA	13521	13953	2087	13861	13002	811	13344	14558	470
WAYNE	27360	21520	1348	27641	23314	397	26952	22671	259
WILKES	23637	6610	897	20515	8148	482	20288	8934	502
WILSON	17410	19527	927	17954	20875	280	17375	19652	164
YADKIN	13815	3140	579	12578	3957	278	12409	4527	211
YANCEY	6367	3181	378	5278	3981	192	5045	4486	186

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		2004			2000	
County	R	D	O	R	D	O
ALAMANCE	33302	20686	187	29305	17459	327
ALEXANDER	10928	4618	54	9242	4166	84
ALLEGHANY	2883	1922	22	2531	1715	67
ANSON	3796	5413	16	3161	4792	32
ASHE	7292	4477	54	6226	4011	79
AVERY	5678	1805	41	4956	1686	52
BEAUFORT	12432	7025	65	10531	6634	148
BERTIE	3057	4938	37	2488	4660	28
BLADEN	6174	6109	30	4977	5889	42
BRUNSWICK	22925	14903	149	15427	13118	294
BUNCOMBE	52491	51868	654	46101	38545	830
BURKE	18922	11728	112	18466	11924	268
CABARRUS	40780	19803	241	32704	16284	529
CALDWELL	21186	9999	163	17337	8588	190
CAMDEN	2480	1339	11	1628	1187	16
CARTERET	17716	7732	127	17381	8839	360
CASWELL	4868	4539	30	4270	4091	61
CATAWBA	39602	18858	228	34244	16246	351
CHATHAM	12892	12897	133	10248	10461	222
CHEROKEE	7517	3635	47	6305	3239	130
CHOWAN	2967	2406	13	2415	2430	45
CLAY	3209	1628	29	2416	1361	75
CLEVELAND	22750	14215	114	19064	13455	227
COLUMBUS	10773	10343	75	8342	9986	97
CRAVEN	23575	14019	162	19494	12213	278
CUMBERLAND	49139	45788	299	38129	38626	396
CURRITUCK	6013	2909	54	4095	2595	49
DARE	9345	6136	67	7301	5589	112
DAVIDSON	42075	17191	230	35387	16199	461
DAVIE	12372	4233	75	10184	3651	163
DUPLIN	9611	6923	49	7840	6475	75
DURHAM	34614	74524	513	30150	53907	1144
EDGECOMBE	8163	12877	39	6836	11315	51
FORSYTH	75294	63340	491	67700	52457	785
FRANKLIN	11540	9286	92	8501	7454	96

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GASTON	43252	20254	249	39453	19281	445
GATES	1924	2121	8	1480	1944	22
GRAHAM	2693	1272	22	2304	1006	51
GRANVILLE	9491	9057	53	7364	7733	97
GREENE	3800	2665	7	3353	2478	39
GUILFORD	98254	100042	1018	84394	80787	1083
HALIFAX	8088	11528	31	6698	10222	50
HARNETT	20922	11563	86	14762	9155	250
HAYWOOD	14545	11237	150	12118	9793	1946
HENDERSON	28025	15003	206	25688	12562	357
HERTFORD	2942	5141	49	2382	5484	31
HOKE	5257	5794	37	3532	5099	127
HYDE	1235	1048	10	1039	1006	16
IREDELL	38675	18065	233	29853	15434	299
JACKSON	7351	6737	86	6237	5722	162
JOHNSTON	36903	17266	188	27212	13704	239
JONES	2607	1893	13	2114	1822	28
LEE	11834	7657	52	9406	6785	92
LENOIR	12939	10207	33	11512	9527	124
LINCOLN	20052	9434	93	15951	8412	166
MACON	9448	5489	87	8406	4683	145
MADISON	5175	4234	54	4676	3505	144
MARTIN	5334	5102	16	4420	4929	17
MCDOWELL	10590	5330	82	9109	4747	155
MECKLENBURG	155084	166828	1190	134068	126911	2057
MITCHELL	5686	2080	32	4976	1532	81
MONTGOMERY	5745	4313	22	4954	3982	49
MOORE	24714	13555	113	19882	11232	187
NASH	21902	15693	78	17995	12376	142
NEW HANOVER	45351	35572	324	36503	29292	524
NORTHAMPTON	3176	5584	10	2667	5513	20
ONSLOW	25890	11250	137	19657	10269	289
ORANGE	20771	42910	472	17930	30921	493
PAMLICO	3679	2335	24	2999	2188	55
PASQUOTANK	6609	6984	55	4943	5874	86
PENDER	10037	6999	49	7661	6415	78
PERQUIMANS	2965	1971	22	2230	2033	43
PERSON	8973	6198	43	6722	5042	69

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PITT	28590	24924	129	23192	19685	198
POLK	5140	3787	94	5074	3114	115
RANDOLPH	37771	12966	173	30959	11366	371
RICHMOND	7709	8383	53	6263	7935	71
ROBESON	15909	17868	94	11721	17834	192
ROCKINGHAM	22840	14430	118	18979	13260	289
ROWAN	34915	16735	217	28922	14891	320
RUTHERFORD	16343	8184	131	13755	7697	264
SAMPSON	12600	9649	39	10410	8768	61
SCOTLAND	5141	6386	20	3740	5627	36
STANLY	17814	7650	89	15548	7066	204
STOKES	13583	5767	64	12028	5030	124
SURRY	17587	8304	101	15401	7757	200
SWAIN	2593	2419	32	2224	2097	49
TRANSYLVANIA	9386	6097	105	9011	5044	170
TYRRELL	855	731	4	706	849	11
UNION	42820	17974	207	31876	14890	522
VANCE	6884	8762	31	5564	7092	45
WAKE	177324	169909	1611	142494	123466	3425
WARREN	2840	5171	16	2202	4576	17
WASHINGTON	2484	2969	18	2169	2704	17
WATAUGA	12659	11232	159	10438	7959	326
WAYNE	24883	15076	87	20758	13005	121
WILKES	19197	7862	95	16826	7226	271
WILSON	16264	14206	65	13466	11266	94
YADKIN	11816	3451	46	10435	3127	120
YANCEY	4940	4434	57	4970	3714	80

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Code

Maine

The code and Console output for the past elections analysis in R

```
>  summary(MyData);
      Year             D      D_percentage        R      R_percentage
Min.  :1960   160,584:1   38.80% :2  118,701:1   30.40% :1
1st Qu.:1974   181,159:1   38.50% :1          169,254:1   30.80% :1
Median :1988   214,515:1   42.30% :1          186,378:1   31.16% :1
Mean  :1988   217,312:1   42.95% :1          206,820:1   40.38% :1
3rd Qu.:2002   220,974:1   43.90% :1          236,320:1   40.98% :1
Max.  :2016   232,279:1   47.80% :1          238,522:1   43.10% :1
        (Other):9  (Other):8        (Other):9  (Other):9
```

Monte Carlo SAS code to predict 2020 elections in Maine

```
/*Step 1:*/
data work.MaineCounty;
infile '/folders/myfolders/sasuser.v94/counties.csv' dlm=',' firstobs=2;
input CountyID year D;
run;
/* Step 2: Compute the mean of each sample */
proc means data=work.MaineCounty noprint;
by CountyID;
var D;
output out=OutStats mean=SampleMean;
run;
/* Step 3: Visualize and compute descriptive statistics for the ASD */
ods select Moments Histogram;
proc univariate data=OutStats;
label SampleMean = "Sample Mean of U(0,1) Data";
var SampleMean;
histogram SampleMean / normal; /* overlay normal fit */
run;
```
Single proportion hypothesis for Maine in R code:

Based on the historical data of Maine: http://www.270towin.com/states/Maine

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#Since 1960, Republicans won 6 times out of 15 times, and Democratic won 9 times
#My Null Hypothesis will be Republicans win in 2020
#It is a 2-tailed Hypothesis
#H0: R wins
#Ha: R loses
>prop.test(6, 15)

       1-sample proportions test with continuity correction

data: 6 out of 15, null probability 0.5
X-squared = 0.26667, df = 1, p-value = 0.6056
alternative hypothesis: true p is not equal to 0.5
95 percent confidence interval:
 0.1745677 0.6710894
sample estimates:
  p
0.4

T-Test code for Maine in R

#Again running the Null Hypothesis as Republican will win by

#collecting the Republican votes in the elections from 2016 till 1988

>
RepVote=c(335593,292276,295273,330201,286616,186378,206504,307131,336500,238522,236
320,256458,169254,118701,240608)
> t.test(RepVote)

       One Sample t-test

data: RepVote
t = 15.216, df = 14, p-value = 4.213e-10
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
219704.2 291807.1
sample estimates:
mean of x
 255755.7

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```
>
> # Two-sided t-test
> t.test(RepVote, alternative = "two.sided")

        One Sample t-test

data:  RepVote
t = 15.216, df = 14, p-value = 4.213e-10
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
219704.2 291807.1
sample estimates:
mean of x
 255755.7
```

Chi-Square Test for Maine in R

```
> MaineVoters2020=matrix(c(335593,357735,38105),ncol=3)
> colnames(MaineVoters2020) <-c("R","D","others")
> MaineVoters2020 <- as.table(MaineVoters2020)
> round(prop.table(MaineVoters2020), 2)  # Show as proportions w/2 digits
        R      D others
A 0.46 0.49   0.05
>
> chi1 <- chisq.test(MaineVoters2020)  # Save tests as object "chi1"
> chi1  # Check results

        Chi-squared test for given probabilities

data:  MaineVoters2020
X-squared = 261340, df = 2, p-value < 2.2e-16


>
> #compare it with 2016 percentages
> chi2 <- chisq.test(MaineVoters2020, p = c(0.449,0.478,0.073))
> chi2

        Chi-squared test for given probabilities

data:  MaineVoters2020
```

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X-squared = 4723.3, df = 2, p-value < 2.2e-16

Scatter plot of the counties and parties for Maine in R

```
>
counties=c("Androscoggin","Aroostook","Cumberland","Franklin","Hancock","Kennebec","Kno
x","Lincoln","Oxford","Penobscot","Piscataquis","Sagadahoc","Somerset","Waldo","Washingto
n","York");
>
Democrate=c(22975,13377,102935,7001,16107,31753,12440,10241,16214,32832,3098,10679,9
092,10442,6358,55828)
>
Republican=c(28189,19419,57697,7900,13682,29296,9148,9727,12172,41601,5403,9304,14998
,10378,9037,50388)
> MaineCounties=data.frame(Democrate,Republican,count = c(1:16));
> counties1=c(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16)
> plot(counties1,Democrate,col="blue",xlab = "counties, 1:Androscoggin 2:Aroostook
3:Cumberland 4:Franklin 5:Hancock 6:Kennebec 7:Knox 8:Lincoln \n 9:Oxford 10:Penobscot
11:Piscataquis 12:Sagadahoc 13:Somerset 14:Waldo 15:Washington 16:York", ylab="votes
Democrate:Blue Republican: Red Others: Green",xaxt="n",ylim=c(1417,1e+05))
> axis(1, at = seq(1, 16, by = 1), las=2)
> par(new=TRUE)
> plot(counties1,Republican,col="red",ylim=c(2e+04,1e+05),axes=FALSE,ann=FALSE)
> par(new=TRUE)
> plot(counties1,others,col="green",ylim=c(1417,1e+05),axes=FALSE,ann=FALSE)
>
>
> library(ggplot2)
> library(reshape2)
>
>
> countychoice=c("D","D","D","D","D","D","D","D","D","D","R","D","D","D","D","D");
> #countychoice=c(1,1,1,1,1,1,1,1,1,1,2,1,1,1,1,1)
> MaineCounties=data.frame(counties,Democrate,Republican);
> plot(Democrate~Republican,col=c("blue","red"))
>
> vote.mod1 = lm(Democrate~Republican, data = MaineCounties)
> abline(lm(Democrate~Republican))
>
```

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```
> #----------------------------------------
> #Scatter plot as in Lynda
>
> MaineCounties=data.frame(Republican,Democrate,counties);
> MaineCounties[1:3]
   Republican Democrate       counties
1       28189  22975 Androscoggin
2       19419  13377  Aroostook
3       57697  102935   Cumberland
4        7900   7001   Franklin
5       13682  16107          Hancock
6       29296  31753 Kennebec
7        9148  12440          Knox
8        9727  10241          Lincoln
9       12172  16214          Oxford
10      41601  32832 Penobscot
11       5403   3098 Piscataquis
12       9304  10679 Sagadahoc
13      14998          9092   Somerset
14      10378  10442          Waldo
15       9037   6358  Washington
16      50388  55828          York
>
> # Modified scatterplot matrices
>
> # Create palette with RColorBrewer
> require("RColorBrewer")
Loading required package: RColorBrewer
> display.brewer.pal(3, "Pastel2")
>
> # Put histograms on the diagonal (from "pairs" help)
> panel.hist <- function(x, ...)
+ {
+   usr <- par("usr"); on.exit(par(usr))
+   par(usr = c(usr[1:2], 0, 1.5) )
+   h <- hist(x, plot = FALSE)
+   breaks <- h$breaks; nB <- length(breaks)
+   y <- h$counts; y <- y/max(y)
+   rect(breaks[-nB], 0, breaks[-1], y,  ...)
+   # Removed "col = "cyan" from code block; original below
+   # rect(breaks[-nB], 0, breaks[-1], y, col = "cyan", ...)
```

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```
+ }
>
> pairs(MaineCounties[1:3],
+     panel = panel.smooth,  # Optional smoother
+     main = "Scatterplot Maine Counties",
+     diag.panel = panel.hist,
+     pch = 16,
+     col = brewer.pal(3, "Pastel2"))
>
> # Similar with "car" package
> # Gives kernal density and rugplot for each variable
> library(car)
> scatterplotMatrix(~Democrate+Republican | counties,
+           data = MaineCounties,
+           col = brewer.pal(3, "Dark2"),
+           main="Scatterplot Matrix for Maine Counties Data Using \"car\" Package")
```

Massachusetts

```
#Referred r-blogger and stackoverflow websites to get some ideas


#setwd("/Users/rvemulapalli/Desktop/R DataScience")

#inputData <- read.table("./rvemulapalli_MA_HW2.csv",
#               header = TRUE, sep=",")

#allStates <- read.table("./rvemulapalli_AllStates_2012_HW2.csv",
#               header = TRUE,
#               sep=",",
 #              strip.white = TRUE
 #              )

#allCounties <- read.table("./rvemulapalli_MA_County_HW2.csv",
#                 header = TRUE,
#                 sep=",",
```

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```
#                              strip.white = TRUE)

#histData <- read.table("./rvemulapalli_1960_now.csv",
#              header = TRUE,
#              sep=",",
#              strip.white = TRUE
#)

numVotes_Pct <- c(60.65,37.51,1.84)
numVotes <- c(1921290,1188314,58163)
parties <- c("DEMOCRAT","REPUBLICAN","OTHERS")
inputData <- data.frame(parties,numVotes,numVotes_Pct)
colnames(inputData)<-c("PartyandCandidate","numVotes","numVotes_Pct")

STATE <-
c("AL","AK","AZ","AR","CA","CO","CT","DE","DC","FL","GA","HI","ID","IL","IN",
       "IA","KS","KY","LA","ME","MD","MA","MI","MN","MS","MO","MT","NE",
       "NV","NH", "NJ","NM", "NY","NC","ND","OH", "OK","OR","PA","RI","SC",
       "SD","TN","TX","UT","VT","VA","WA","WV","WI","WY")
Democrat_pct <- c(38.36,
              40.81,
              44.59,
              36.88,
              60.24,
              51.49,
              58.06,
              58.61,
              90.91,
              50.01,
              45.48,
              70.55,
              32.62,
              57.6,
              43.93,
              51.99,
              37.99,
              37.8,
              40.58,
              56.27,
              61.97,
              60.65,
              54.21,
              52.65,
```

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43.79,
44.38,
41.7,
38.03,
52.36,
51.98,
58.38,
52.99,
63.35,
48.35,
38.69,
50.67,
33.23,
54.24,
51.97,
62.7,
44.09,
39.87,
39.08,
41.38,
24.75,
66.57,
51.16,
56.16,
35.54,
52.83,
27.82)

Republican_pct <- c(60.55,
54.8,
53.65,
60.57,
37.12,
46.13,
40.73,
39.98,
7.28,
49.13,
53.3,
27.84,
64.53,
40.73,
54.13,

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```
                              46.18,
                              59.71,
                              60.49,
                              57.78,
                              40.98,
                              35.9,
                              37.51,
                              44.71,
                              44.96,
                              55.29,
                              53.76,
                              55.35,
                              59.8,
                              45.68,
                              46.4,
                              40.59,
                              42.84,
                              35.17,
                              50.39,
                              58.32,
                              47.69,
                              66.77,
                              42.15,
                              46.59,
                              35.24,
                              54.56,
                              57.89,
                              59.48,
                              57.17,
                              72.79,
                              30.97,
                              47.28,
                              41.29,
                              62.3,
                              45.89,
                              68.64)
                  Other_pct <- c(1.1,
                        4.39,
                        1.76,
                        2.55,
                        2.64,
                        2.38,
                        1.22,
```

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1.41,
1.81,
0.86,
1.22,
1.62,
2.85,
1.67,
1.95,
1.83,
2.29,
1.71,
1.64,
2.75,
2.13,
1.84,
1.08,
2.39,
0.92,
1.85,
2.95,
2.17,
1.97,
1.62,
1.03,
4.16,
1.48,
1.26,
2.99,
1.64,
0,
3.61,
1.44,
2.06,
1.35,
2.24,
1.45,
1.45,
2.46,
2.46,
1.56,
2.54,
2.16,
1.29,

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3.54)

```
whoWon <- c("Republican",
        "Republican",
        "Republican",
        "Republican",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Republican",
        "Democrat",
        "Republican",
        "Democrat",
        "Republican",
        "Democrat",
        "Republican",
        "Republican",
        "Republican",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Republican",
        "Republican",
        "Republican",
        "Republican",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Republican",
        "Republican",
        "Democrat",
        "Republican",
        "Democrat",
        "Democrat",
        "Democrat",
        "Republican",
```

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```
                "Republican",
                "Republican",
                "Republican",
                "Republican",
                "Democrat",
                "Democrat",
                "Democrat",
                "Republican",
                "Democrat",
                "Republican")

    allStates<-data.frame(STATE,Democrat_pct,Republican_pct,Other_pct,whoWon)
    colnames(allStates)<-c("STATE",
"Democrat_pct","Republican_pct","Other_pct","whoWon")

    counties <- c("Barnstable",
            "Berkshire",
            "Bristol",
            "Dukes",
            "Essex",
            "Franklin",
            "Hampden",
            "Hampshire",
            "Middlesex",
            "Nantucket",
            "Norfolk",
            "Plymouth",
            "Suffolk",
            "Worcester")
    Democrat_pct <- c(53.2,
                75.8,
                59.5,
                72.9,
                57.5,
                71.9,
                62,
                70.3,
                62.6,
                62.8,
                57.4,
                51.3,
                77.6,
                53.7)
```

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```
Republican_pct <- c(45.5,
            22.2,
            39,
            25.6,
            41.2,
            24.8,
            36.6,
            26.6,
            35.7,
            35.8,
            41.3,
            47.5,
            20.8,
            44.5)
Other_pct <- c(1.3,
        2,
        1.5,
        1.5,
        1.3,
        3.3,
        1.4,
        3.1,
        1.7,
        1.4,
        1.3,
        1.2,
        1.6,
        1.8)
whoWon <- c("Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat",
        "Democrat")
allCounties <- data.frame(counties,Democrat_pct,Republican_pct,Other_pct,whoWon)
```

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```
        colnames(allCounties)<-c("County",
"Democrat_pct","Republican_pct","Other_pct","whoWon")

        #hist(inputData)
        y=as.numeric(inputData$numVotes)
        hist(y,
                main = "Histogram for Party and Candidates",
                xlab = "Number of Votes",
                las=1
        )
        barplot(y,
                main = "Massachusetts - Histogram for Party and Candidates",
                xlab = "Party and Candidates",
                ylab = "Number of Votes",
                names.arg = inputData$PartyandCandidate
                )
        #hist(inputData)


        parties <- inputData$PartyandCandidate

        boxplot(as.numeric(allStates$Democrat_pct),
                as.numeric(allStates$Republican_pct),
                as.numeric(allStates$Other_pct),
                notch = TRUE, ylim=c(0,100),
                main="All States - BoxPlot for Party and Candidates",
                xlab="Party and Candidates",ylab="Percent of Votes",
                names.arg=inputData$PartyandCandidate
                )


        boxplot(as.numeric(allCounties$Democrat_pct),
                as.numeric(allCounties$Republican_pct),
                as.numeric(allCounties$Other_pct),
                notch = TRUE, ylim=c(0,100),
                main="All Counties - BoxPlot for Party and Candidates",
                xlab="Party and Candidates",ylab="Percent of Votes",
                names.arg=inputData$PartyandCandidate
                )

        x=as.numeric(allStates$STATE)
        y=as.numeric(allStates$Democrat_pct)
        plot(x,y, col = "blue",
```

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```
              xlab="States",ylab="Democrats Vote Percent",
              ylim=c(0,100),main="Parties And Candidates",
              pch=16)

      x=as.numeric(allStates$STATE)
      y=as.numeric(allStates$Republican_pct)
      plot(x, y, col="red",
              xlab="States",ylim=c(0,100),
              add=TRUE,pch=16)
      x=as.numeric(allStates$STATE)
      y=as.numeric(allStates$Other_pct)
      plot(x, y, xlab="States",col="green", add=TRUE)

      y=as.numeric(inputData$numVotes)
      hist(y,
              main = "Massachusetts - Histogram for Party and Candidates",
              las=1,
              prob=TRUE
      )

      #barplot(y,
      #       main = "Massachusetts - Histogram for Party and Candidates",
       #      xlab = "Party and Candidates",
      #       ylab = "Percent of Votes",
      #       names.arg = inputData$PartyandCandidate
      #)
      curve(dnorm(x, mean=mean(y),
              sd=sd(y)), add=TRUE)


      print(summary(allStates))

      repub_ma<-inputData$numVotes
      democ_ma_votes <- repub_ma[1]
      repub_ma_votes <- repub_ma[2]
      other_ma_votes <- repub_ma[3]
      totalVotes <- democ_ma_votes+repub_ma_votes+other_ma_votes
      print("Prop Test:")
      #print(prop.test(repub_ma[2],totalVotes))
      print(prop.test(x = c(democ_ma_votes,repub_ma_votes), n = c(totalVotes, totalVotes),
alternative = "greater"))

      print("Prop Test:  Lesser - Type errors")
```

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```
print(prop.test(x = c(democ_ma_votes, repub_ma_votes), n = c(totalVotes, totalVotes),
alternative = "less"))



#repub_hist_data<-histData[,"MA_Republican_Pct"]
#democ_hist_data<-histData["MA_Democrat_Pct"]
repub_hist_data <- c(49.83,
            38.8,
            49.93,
            61.79,
            48.95,
            55.18,
            58.58,
            53.76,
            46.31,
            45.18,
            49.5,
            51.08,
            46.13,
            47.59)
democ_hist_data<-c(50,
            61.2,
            48.65,
            38.21,
            51.05,
            44.6,
            40.43,
            45.99,
            53.18,
            54.47,
            50.03,
            48.6,
            53.46,
            51.41)
print(t.test(repub_hist_data, alternative="greater", mu=50))


library(data.tree)

elections <- Node$new("Election Tree")
state <- elections$AddChild("State = MA")
```

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```
debate <- state$AddChild("Debate")
debateWon <- debate$AddChild("Won")
candidateWon <- debateWon$AddChild("Clinton (Won)")
debateLost <- debate$AddChild("Lost")
candidateLost <- debateLost$AddChild("Trump (Lost)")
candidateLost <- debateLost$AddChild("All Others (Lost)")
voterTurnout <- state$AddChild("Voter Turnout")
highvoter <- voterTurnout$AddChild(">= 70% Voter Turnout")
candidateWon <- highvoter$AddChild("Clinton (Won)")
lowVoter <- voterTurnout$AddChild("< 70% Voter Turnout")
candidateLost <- lowVoter$AddChild("Trump (Lost)")
candidateLost <- lowVoter$AddChild("All Others (Lost)")

print(elections)
# Classification Tree with rpart
#library(rpart)

# grow tree
#fit <- rpart(inputData$numVotes ~ democ_ma_votes+repub_ma_votes+other_ma_votes,
#       method="class", data=inputData)

#printcp(fit) # display the results

x=as.numeric(allCounties$County)
y=as.numeric(allCounties$Democrat_pct)
plot(x,y,
       xlab="Counties",ylab="County Vote Percentage",
       ylim=c(0,100),main="MA Democrat County Voting",
       col="blue",pch=4)

reg<-lm(y~x)
summary(reg)
abline(reg)

x=as.numeric(allCounties$County)
y=as.numeric(allCounties$Republican_pct)
plot(x,y,
       xlab="Counties",ylab="County Vote Percentage",
       ylim=c(0,100),main="MA Republican County Voting",
       col="red",pch=4,add=TRUE)

reg<-lm(y~x)
summary(reg)
```

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```
abline(reg)

x=as.numeric(allCounties$County)
y=as.numeric(allCounties$Other_pct)
plot(x,y,
        xlab="Counties",ylab="County Vote Percentage",
        ylim=c(0,100),main="MA Other County Voting",
        col="green",pch=4,add=TRUE)
reg<-lm(y~x)
summary(reg)
abline(reg)

countiesTbl = table(allCounties$County,allCounties$whoWon)
print(summary(allCounties))
print(countiesTbl)
print(chisq.test(countiesTbl))
#print(chisq.test(countiesTbl,))

stateTbl = table(allStates$STATE,allStates$whoWon )
print(summary(stateTbl))
print(stateTbl)
print(chisq.test(stateTbl))
```

Nebraska

```
repub <- rep(1,475064)

democrat <- rep(2,302081)

lib <- rep(3,11109)

ind <- rep(4,2408)

#combine the vectors

votes <- c(repub, democrat, lib, ind)

#plot a histogram

hist(votes, breaks=seq(0,6), col=c("red","blue","green", "gray"),
```

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```
                xlab="1.Romney  2.Obama  3.Johnson  4.Terry", main="2016 United States
presidential election results in Nebraska")

        rm(list=ls())#clean up
```

Create a box and scattered plot

Democratic <-

c(38.36,40.81,44.59,36.88,60.24,51.49,58.06,58.61,90.91,50.01,45.48,70.55,32.62,57.60,43.93,51.99,

37.99,37.80,40.58,56.27,61.97,60.65,54.21,52.65,43.79,44.38,41.70,38.03,52.36,51.98,58.38,52.99,

63.35,48.35,38.69,50.67,33.23,54.24,51.97,62.70,44.09,39.87,39.08,41.38,24.75,66.57,51.16,56.16,35.54,

52.83,27.82)

Republican <-

c(60.55,54.80,53.65,60.57,37.12,46.13,40.73,39.98,7.28,49.13,53.30,27.84,64.53,40.73,54.13,46.18,59.71

,60.49,57.78,40.98,35.90,

37.51,44.71,44.96,55.29,53.76,55.35,59.80,45.68,46.40,40.59,42.84,35.17,50.39,58.32,47.69,66.77,42.15,

46.59,35.24,54.56,57.89,59.48,

        57.17,72.79,30.97,47.28,41.29,62.30,45.89,68.64)

Other <- c

(0,0,0,0,23.12,5.37,17.33,18.63,83.63,0.88,0,42.71,0,0.00,0,5.81,0,0,0,15.29,26.08,23.14,9.50,7.69,0,0,0,

0,6.68,5.58,17.81,

  10.15,28.18,0,0,2.98,0,12.09,5.39,27.46,0,0,0,0,0,35.60,3.87,14.87,0,6.94,0)

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state <-

c("Alabama","Alaska","Arizona","Arkansas","California","Colorado","Connecticut","Delaware","District

of ColumbiaD.C.","Florida",

"Georgia","Hawaii","Idaho","Illinois","Indiana","Iowa","Kansas","Kentucky","Louisiana","Maine","Mar

yland","Massachusetts",

 "Michigan","Minnesota","Mississippi","Missouri","Montana","Nebraska","Nevada","New

Hampshire","New Jersey","New Mexico",

 "New York","North Carolina","North

Dakota","Ohio","Oklahoma","Oregon","Pennsylvania","Rhode Island","South Carolina",

 "South Dakota","Tennessee","Texas","Utah","Vermont","Virginia","Washington","West

Virginia","Wisconsin","Wyoming")

#dataframe

presidentialdata <- data.frame(Democratic,Republican,Other)

#boxplot

boxplot(presidentialdata,pch=20, outcol= c("red","blue","gray") ,ylim=c(0,100),

 col=c("red","blue","gray"),xlab="PARTY", ylab="% Votes", main="Box plot for party and

candidates")

results <- data.frame(state,party,votes)

qplot(results$state,results$votes, data=results, ylim=c(0,100),

color=party)+scale_color_manual(values=c("#0000CC","#00CC00","#CC0000"))

#calculating the descriptive statistics

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```
summary(results$votes)
```

```
#Proportion test
```

```
# Using a single proportion: Hypothesis test and confidence interval
```

```
prop.test(13,14)
```

```
rm(list=ls())#clean up
```

```
#Using a single mean(when)
```

```
#Nebraska presidential elections Republican data from 1960-2012
```

```
votes <- c(59.8,56.53,65.9,62.24,53.65,46.52,60.15,70.55,65.53,70.55,59.19,59.82,52.61,37.93)
```

```
summary(votes)
```

```
#use t test for one sample
```

```
t.test(votes,mu=59, alternative="greater",conf.level = 0.95)
```

```
rm(list=ls())#clean up
```

```
#One sample chi-square test
```

```
#Nebraska presidential elections Republican data from 1960-2016
```

```
votes<-c(59.8,56.53,65.9,62.24,53.65,46.52,60.15,70.55,65.53,70.55,59.19,59.82,52.61,62.7,38.03,41.06,
32.68,33.25,34.95,29.4,39.2,28.81,26.04,29.5,38.46,31.81,47.39,37.93)
demvotes<-c(38.03,41.06,32.68,33.25,34.95,29.4,39.2,28.81,26.04,29.5,38.46,31.81,47.39,37.93)
year<-c(2016,2012,2008,2004,2000,1996,1992,1988,1984,1980,1976,1972,1968,1964,1960,2012,2008,2
004,2000,1996,1992,1988,1984,1980,1976,1972,1968,1964,1960)
```

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```
didwin<-c("yes","yes","yes","yes","yes","yes","yes","yes","yes","yes","yes","yes","yes","no")
party<-
c("Republican","Republican","Republican","Republican","Republican","Republican","Republican","Rep
ublican","Republican","Republican","Republican","Republican","Republican","Republican","Democratic
","Democratic","Democratic","Democratic","Democratic","Democratic","Democratic","Democratic","De
mocratic","Democratic","Democratic","Democratic","Democratic","Democratic")


results <-data.frame(votes, party, year)


TAB = table(didwin,party)


chisq.test(TAB,correct=T)


#Decisin tree
#Create a decision tree in your state based on voter turnout
library(rpart)
party<-c("D","R","D","R","D","R","D","R","D","R")
winner<-c("L","W","W","L","W","L","W","W","L","W")
votes<-c(38.03,59.8,41.06,56.53,32.68,65.9,33.25,62.24,34.95,53.66)


results <-data.frame(party,winner,votes)
```

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```
# Create the tree.

tree <-rpart(results$winner~results$party+results$votes,data=results,method=class)


# Plot the tree.

plot(tree)

summary(tree)

# rm(list=ls())#clean up
```

New Mexico

Monte Carlo Simulation:

```
Avg = margin_by_county$Avg_margin

Stv = margin_by_county$stdv_margin

runs <- 10000

sims = matrix(0, nrow = 10000, ncol = 33)

sims = data.frame(sims)

for(i in 1:length(Avg)){

  sims[i] <- rnorm(runs,mean=Avg[i],sd=Stv[i])

}


sims$total_percent = rowSums(sims)
```

Final Project – Group 6

```
hist(sims$total_percent, prob = TRUE, main="Histogram percent of votes for Democratic in
New Mexico",

   xlab="percent",

   border="blue",

   breaks=10)

curve(dnorm(x, mean = mean(sims$total_percent), sd = sd(sims$total_percent)), col = "pink",

   lwd = 4, add = TRUE)
```

Histogram:

```
cols <- c("skyblue1","skyblue4","skyblue3","white","skyblue2","black")

candidates = c("Clinton","Trump","All Others")

votes = c(380724,315875,73669+9729)

df1 = data.frame(candidates,votes)

data <- c(rep(candidates[1],votes[1]),rep(candidates[2],votes[2]),rep(candidates[3],votes[3]))

data1 = factor(data,labels = (length(levels(factor(data)))))

datan = as.numeric(data1)

hist(datan, breaks = c(0,1,2,3),main="Total Votes in NM for Candidates",xlab = "1 represents
All others, 2 re

   presents Clinton,3 represents Trump", ylab = "number of votes",col = cols)
```

Single proportion test and t-test:

```
# H0: true p is equal or smaller than 0.5 (we cannot tell which party will win)

# Ha: true p is greater than 0.5 (Democratic party will win)
```

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```
prop.test(4,5,alternative = "greater")
```

```
# H0: true mean is smaller than 0.5 (Democratic Party will win)

# Ha: true mean is equal or greater than 0.5 (Democratic Party will not win)


historyNM = c('D','D','R','R','R','R','R','R','D','D','D','R','D','D')

index = as.numeric(unclass(as.factor(historyNM))-1)



t.test(index,alternative = "less", mu = 0.5)
```

North Carolina

```
# Final Project
# Valérie Lavigne
# North Carolina

rm(list=ls())
numIt=1000

# Read historical results data
histCountyData <- read.csv("NC_Data_Counties_Results.csv", header=TRUE, sep=",")

# Augment this table with total votes and party %
histCountyData["TotalVotes"] <- histCountyData[,2]+histCountyData[,3]+histCountyData[,4]
histCountyData["R"] <- histCountyData[,2]/histCountyData[,6]
histCountyData["D"] <- histCountyData[,3]/histCountyData[,6]
histCountyData["O"] <- histCountyData[,4]/histCountyData[,6]
```

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```
# For each county compute mean and sd of the % vote for each party and the expected votes in
2016
NCmodel <- data.frame(County=unique(histCountyData[,1]))
NCmodel[,2:8] <- 0
names(NCmodel)[2:8] <- c("Rmean","Rsd","Dmean","Dsd","Omean","Osd","TotalVotes")
for(i in 1:nrow(NCmodel)) {
  countyName <- NCmodel[i,1]
  countyData <- subset(histCountyData,histCountyData$County==countyName)

  # Compute mean % and standard deviation for each party
  NCmodel[i,2] <- mean(countyData[,7]) # R mean
  NCmodel[i,3] <- sd(countyData[,7])   # R sd
  NCmodel[i,4] <- mean(countyData[,8]) # D mean
  NCmodel[i,5] <- sd(countyData[,8])   # D sd
  NCmodel[i,6] <- mean(countyData[,9]) # O mean
  NCmodel[i,7] <- sd(countyData[,9])   # O sd

  # Compute expected total votes in 2016
  NCmodel[i,8] <- round(countyData[1,6]*mean(countyData[1:4,6]/countyData[2:5,6]))
  # mean increase of the last four years is applied to most recent value
}

# Function that generates the votes in NC from the historical model
NCelection <- function() {
  results <- data.frame(County=NCmodel[,1])
  results[,2:4] <- 0
  names(results)[2:4] <- c("R","D","O")

  # Generate vote % for each party from county mean and std
  for(i in 1:nrow(NCmodel)) {
    results[i,2] <- rnorm(1,mean=NCmodel[i,2],sd=NCmodel[i,3]) # R
    results[i,3] <- rnorm(1,mean=NCmodel[i,4],sd=NCmodel[i,5]) # D
    results[i,4] <- rnorm(1,mean=NCmodel[i,6],sd=NCmodel[i,7]) # O
    if (results[i,4]<0) results[i,4]=0
  }

  # Normalize to 100% total
  results[,2:4] <- results[,2:4]/rowSums(results[,2:4])

  # Compute total of votes for each party
  results[,2:4] <- round(results[,2:4]*NCmodel[,8])

  # Return sum of all votes
```

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```
  final <- colSums(results[,2:4])
  final[4] = sum(final[1:3])
  names(final)[4]="total"
  final[5] = final[1]/final[4]
  names(final)[5]="Rp"
  final[6] = final[2]/final[4]
  names(final)[6]="Dp"
  final[7] = final[3]/final[4]
  names(final)[7]="Op"

  final
}


# Do the Monte Carlo simulation 1000 times
outcomes <- replicate(numIt, NCelection())

# Compute the percentage margin between the parties
# positive % = Republicans win, negative % Democrats win
margin <- outcomes[5,]-outcomes[6,]

# Compute the confidence interval
error <- qnorm(0.975)*sd(margin)/sqrt(numIt)
interval <- c(mean(margin)-error, mean(margin)+error)

# Hypothesis testing
# H0: The Democrats will win
# Ha: The Republicans will win, (the mean of the margin is higher than 0)
t.test(margin, alternative=c("greater"), mu=0, conf.level = 0.95)

# the result obtained is:
#> t.test(margin, alternative=c("greater"), mu=0, conf.level = 0.95)
#
#One Sample t-test
#
#data:  margin
#t = 111.07, df = 999, p-value < 2.2e-16
#alternative hypothesis: true mean is greater than 0
#95 percent confidence interval:
#  0.05774722      Inf
#sample estimates:
#  mean of x
#0.05861606
```

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```
# Statistical analysis
e2016 <- histCountyData[which(histCountyData["Year"]==2016),]
rep2016 = sum(e2016[,2])
dem2016 = sum(e2016[,3])
oth2016 = sum(e2016[,4])
# Create the barplot
NClabels <- c("Rep","Dem","Oth")
NCvalues <- c(rep2016,dem2016,oth2016)
barplot(NCvalues, names.arg = NClabels, main="North Carolina 2016",
     xlab="Party", ylab="Votes",
     col = c("red", "blue", "green"))

# Density plot
# plot the results
# Code adapted from https://stat.ethz.ch/pipermail/r-help/2006-August/111865.html
d1 <- density(outcomes[1,])
d2 <- density(outcomes[2,])
plot(range(d1$x, d2$x), range(d1$y, d2$y), type = "n", xlab = "Votes", ylab = "Density")
lines(d1, col = "red")
lines(d2, col = "blue")
title("North Carolina Monte Carlo Prediction\n Red=Republican Party, Blue=Democratic Party")
```

Other Materials

Maine

Percentage change in US-GDP by State, Maine scored 0.6%

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Chart 1. Percent Change in Real GDP by State, 2016:Q1–2016:Q2, Seasonally Adjusted at Annual Rates

U.S. Bureau of Economic Analysis
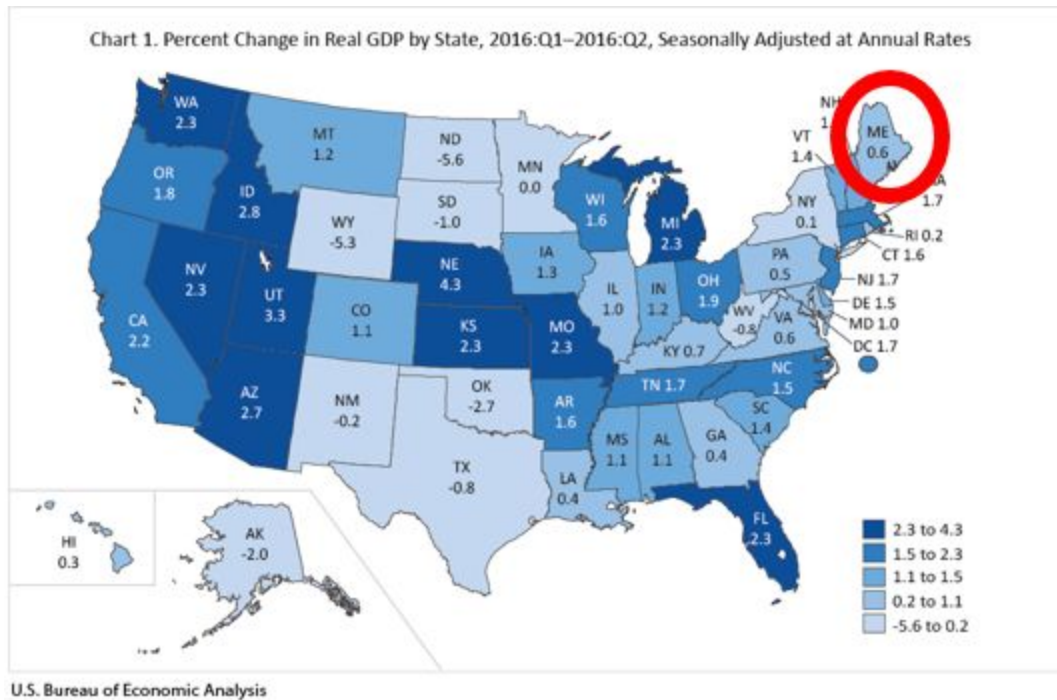
Source: http://www.bea.gov/newsreleases/regional/gdp_state/qgsp_newsrelease.htm

Unemployment rate in Maine
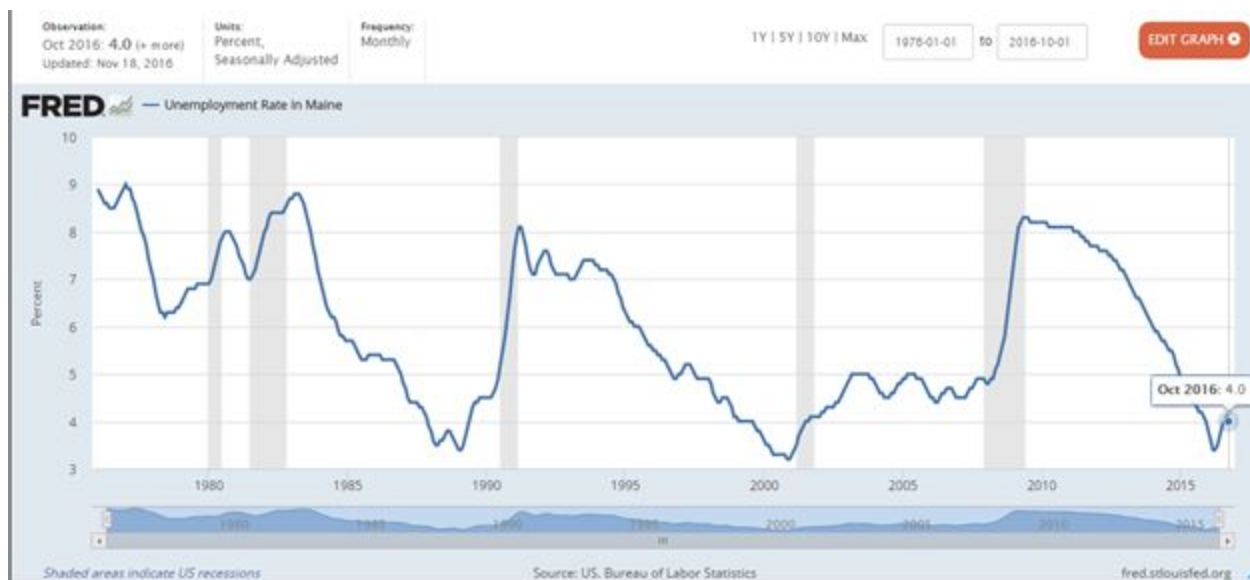
Source:https://fred.stlouisfed.org/series/MEUR?utm_source=series_page&utm_medium=related_content&utm_term=related_re sources&utm_campaign=categories

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Comparing the unemployment rate of Maine to the rest of the states
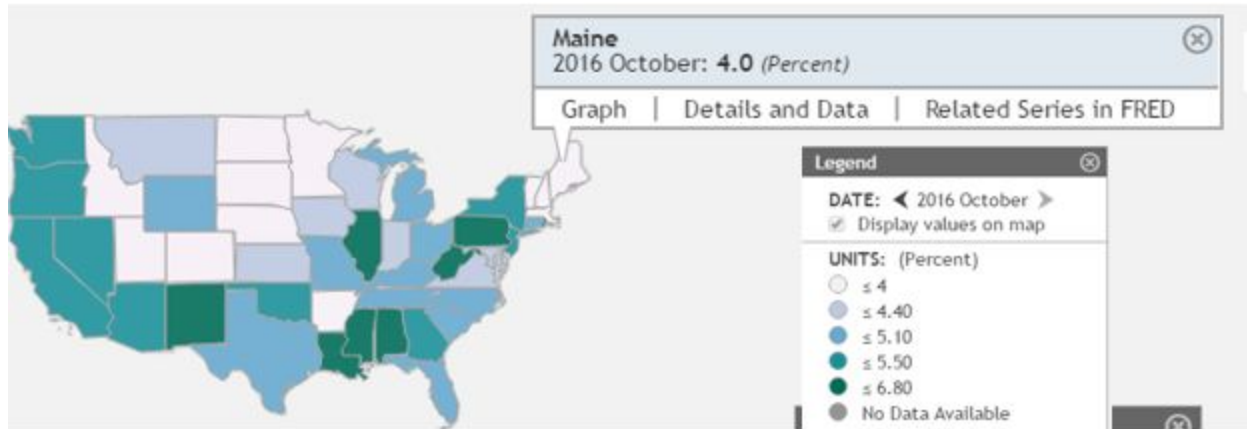
Source:https://geofred.stlouisfed.org/map/?th=pubugn&cc=5&rc=false&im=fractile&lng=-99.67&lat=26.59&zm=3&sl&sv&st i=1224&rt=state&at=Seasonally%20Adjusted,%20Monthly,%20Percent&fq=Monthly&am=Average&un=lin&dt=2016-10-01

Median Income for Maine

Historical Real Median Household Income for Maine

Date	US	Maine
2015	$55,775	$51,494
2014	$53,719	$49,519
2013	$53,166	$47,798
2012	$53,031	$48,219
2011	$53,223	$48,513
2010	$54,405	$49,806
2009	$55,478	$50,522
2008	$57,276	$51,279
2007	$58,003	$52,456
2006	$56,957	$51,065
2005	$56,122	$51,946

Source: http://www.deptofnumbers.com/income/maine/

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Income forecast for Maine

Calendar Years	2014	2015	2016	2017	2018	2019
Wage & Salary Employment (Annual Percentage Change)						
CEFC Forecast 11/2015	0.5	0.9	0.7	0.4	0.2	0.1
CEFC Forecast 02/2016	0.5	0.8	0.7	0.4	0.2	0.0
Personal Income (Annual Percentage Change)						
CEFC Forecast 11/2015	3.1	3.5	3.7	4.0	3.7	3.3
CEFC Forecast 02/2016	3.1	3.4	3.7	4.0	3.7	3.3
Wage and Salary Income (Annual Percentage Change)						
CEFC Forecast 11/2015	3.7	3.4	4.1	4.1	3.9	3.6
CEFC Forecast 02/2016	3.7	3.4	4.1	4.1	3.9	3.6
CPI (Annual Percentage Change)						
CEFC Forecast 11/2015	1.6	0.0	1.8	2.4	2.6	2.3
CEFC Forecast 02/2016	1.6	0.1	1.7	2.4	2.6	2.3

Consensus Economic Forecasting Commission (February 1, 2016)

Source: http://umaine.edu/soe/files/2016/02/OverviewMEEcon2016.pdf

How exit polls showed the income factor in 2016 election in Maine

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Arranging the Pew Research Center issues for Maine

(http://www.people-press.org/2016/07/07/4-top-voting-issues-in-2016-election/)
1. Economy
2. Education
3. Environment
4. Health care
5. Gun control
6. Trade policy
7. Social security
8. Abortion
9. Treatment of gay, lesbian, transgender people
10. Foreign policy
11. Supreme court appts
12. Terrorism
13. Immigration

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14. Treatment of racial, ethnic minorities

More about Maine demographics
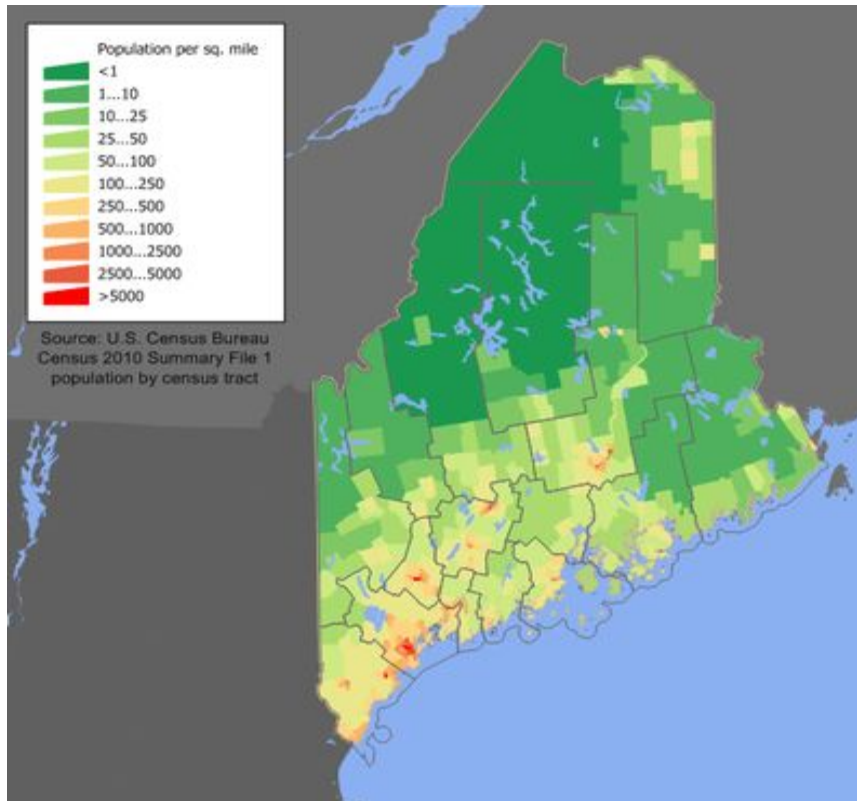
Maine population density map. Source: https://en.wikipedia.org/wiki/Maine

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Massachusetts

2016 issue importance by age groups

% of registered voters saying each is "very important" to their vote in 2016 ...

	18-29	30-49	50-64	65+	Young-old diff
	%	%	%	%	
Supreme Court appointments	45	60	74	74	-29
Social Security	57	58	75	78	-21
Terrorism	68	77	85	86	-18
Health care	66	71	76	79	-13
Foreign policy	70	72	77	81	-11
Trade policy	50	53	63	59	-9
Immigration	68	64	75	74	-6
Education	67	64	63	72	-5
Gun policy	71	67	76	75	-4
Economy	80	83	87	83	-3
Abortion	46	43	44	48	-2
Environment	54	47	58	50	+4
Treatment of racial and ethnic minorities	74	67	58	56	+18
Treatment of gay, lesbian and transgender people	50	42	39	32	+18

Note: Based on registered voters. Q40.
Source: Survey conducted June 15-26, 2016.

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More see immigration as very important to '16 vote

% of registered voters who say immigration is "very important" to their vote ...

2008: 54
2012: 41
2016: 70

Republican/Lean Republican
Democrat/Lean Democrat

Republican/Lean Republican — 2008: 64, 2012: 47, 2016: 77
Democrat/Lean Democrat — 2008: 46, 2012: 37, 2016: 65

2008   2012   2016
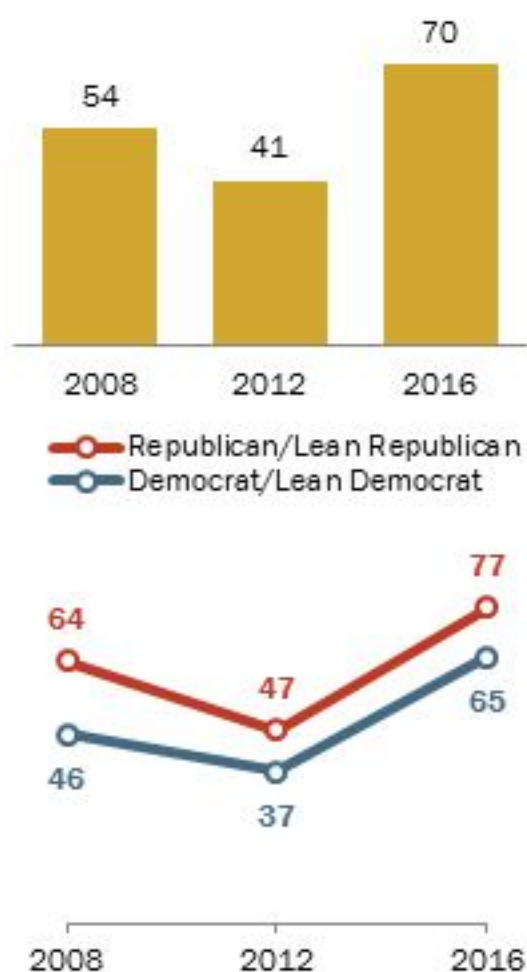
Notes: Based on registered voters. Trends from comparable points in previous election cycles. Q40d.
Source: Survey conducted June 15-26, 2016.

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Trump and Clinton on the issues

Which candidate would do the better job of ... (%)

■ Trump   ■ Clinton

Issue	Trump	Clinton
Dealing with race relations	26	66
Reflecting your views on abortion	30	53
Making wise foreign policy decisions	36	54
Dealing with health care	37	54
Selecting Supreme Court justices	40	52
Dealing with immigration	42	51
Managing the federal government	42	49
Making wise trade policy decisions	46	48
Dealing with gun policy	45	46
Improving economic conditions	48	43
Defending future terrorist attacks	48	43
Reducing special interest influence	50	30

Notes: Based on registered voters. Other/Don't know responses not shown. Q50.
Source: Survey conducted June 15-26, 2016.

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	Massachusetts	
	Estimate	Margin of Error
Total:	6,794,422	*****
Male:	3,297,384	+/-2,458
Under 18 years:	709,598	+/-1,818
Native	679,564	+/-3,919
Foreign born:	30,034	+/-3,612
Naturalized U.S. citizen	9,523	+/-1,755
Not a U.S. citizen	20,511	+/-2,900
18 years and over:	2,587,786	+/-1,605
Native	2,090,056	+/-10,362
Foreign born:	497,730	+/-10,252
Naturalized U.S. citizen	254,863	+/-8,986
Not a U.S. citizen	242,867	+/-9,771
Female:	3,497,038	+/-2,458
Under 18 years:	677,596	+/-1,852
Native	648,410	+/-3,306
Foreign born:	29,186	+/-2,849
Naturalized U.S. citizen	9,278	+/-1,853
Not a U.S. citizen	19,908	+/-2,599
18 years and over:	2,819,442	+/-1,507
Native	2,280,439	+/-10,277
Foreign born:	539,003	+/-10,433
Naturalized U.S. citizen	299,101	+/-8,016
Not a U.S. citizen	239,902	+/-8,312

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Electorate Profile: Massachusetts
Selected Characteristics of the Voting-Age Population

Massachusetts 5,354,940   U.S. 245,273,438

Voting-Age Population
18 to 44 years — 46.1% / 47.1%
45 to 64 years — 35.0% / 34.1%
65 years and over — 19.0% / 18.9%

Race and Hispanic Origin
White* — 77.8% / 66.3%
Black* — 6.9% / 12.5%
Asian* — 6.6% / 6.0%
American Indian and Alaska Native* — 0.5% / 1.2%
Native Hawaiian and Other Pacific Islander* — 0.1% / 0.3%
Hispanic — 9.3% / 15.3%

Median Household Income (all households) — $69,160 / $53,657
Poverty Rate — 10.7% / 13.6%

Bachelor's Degree or Higher (population age 25 and older) — 41.2% / 30.1%

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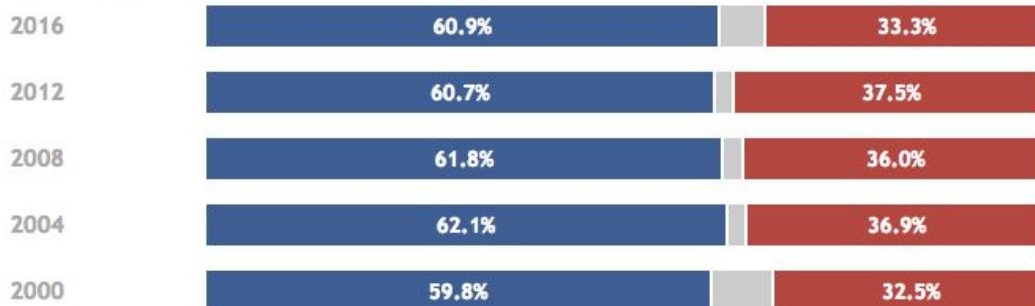
The Commonwealth of Massachusetts   Page 1 of 18

Enrollment Breakdown as of 02/10/2016

County	Registered Voters	Democrat	% of Total	Republican	% of Total	Green-Rainbow	% of Total	United Independent Party	% of Total	Unenrolled	% of Total	Political Designations	% of Total
BARNSTABLE	165,635	42,822	25.85%	25,834	15.60%	208	0.13%	501	0.30%	95,784	57.83%	486	0.29%
BERKSHIRE	86,719	31,871	36.75%	7,609	8.77%	245	0.28%	228	0.26%	46,459	53.57%	307	0.35%
BRISTOL	345,332	117,743	34.10%	36,484	10.56%	394	0.11%	1,750	0.51%	187,590	54.32%	1,371	0.40%
DUKES	14,382	5,315	36.96%	1,411	9.81%	30	0.21%	41	0.29%	7,549	52.49%	36	0.25%
ESSEX	496,186	157,996	31.84%	58,159	11.72%	456	0.09%	2,026	0.41%	275,901	55.60%	1,648	0.33%
FRANKLIN	49,064	15,203	30.99%	4,337	8.84%	121	0.25%	175	0.36%	29,066	59.24%	162	0.33%
HAMPDEN	299,864	113,360	37.80%	37,757	12.59%	407	0.14%	1,266	0.42%	146,035	48.70%	1,039	0.35%
HAMPSHIRE	102,823	39,076	38.00%	8,766	8.53%	323	0.31%	335	0.33%	53,982	52.50%	341	0.33%
MIDDLESEX	976,886	351,708	36.00%	96,626	9.89%	1,178	0.12%	2,949	0.30%	521,535	53.39%	2,890	0.30%
NANTUCKET	8,807	2,537	28.81%	1,286	14.60%	24	0.27%	17	0.19%	4,905	55.69%	38	0.43%
NORFOLK	452,187	150,555	33.29%	51,534	11.40%	353	0.08%	1,665	0.37%	246,896	54.60%	1,184	0.26%
PLYMOUTH	337,200	92,796	27.52%	45,989	13.64%	308	0.09%	1,671	0.50%	195,330	57.93%	1,106	0.33%
SUFFOLK	435,292	229,507	52.72%	28,575	6.56%	579	0.13%	1,454	0.33%	174,030	39.98%	1,147	0.26%
WORCESTER	501,458	139,846	27.89%	63,928	12.75%	659	0.13%	2,398	0.48%	292,698	58.37%	1,929	0.38%
Statewide Totals:	4,271,835	1,490,335	34.89%	468,295	10.96%	5,285	0.12%	16,476	0.39%	2,277,760	53.32%	13,684	0.32%

RECENT ELECTIONS

Year	Democrat	Republican
2016	60.9%	33.3%
2012	60.7%	37.5%
2008	61.8%	36.0%
2004	62.1%	36.9%
2000	59.8%	32.5%

Year	Office	District	Stage	Candidates
2012	President	State-wide	General Election	**Obama and Biden** won (61%) against 3 opponents. Candidates »
2008	President	State-wide	General Election	**Obama and Biden** won (62%) against 5 opponents. Candidates »
2004	President	State-wide	General Election	**Kerry and Edwards** won (62%) against 4 opponents. Candidates »
2000	President	State-wide	General Election	**Gore and Lieberman** won (60%) against 6 opponents. Candidates »

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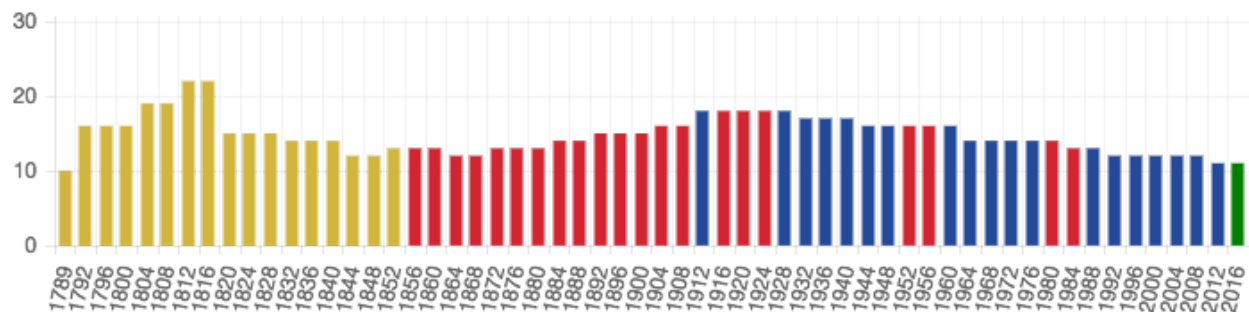
Views of 2016 issue importance among Clinton and Trump supporters

% of registered voters saying each is "very important" to their vote in 2016 ...
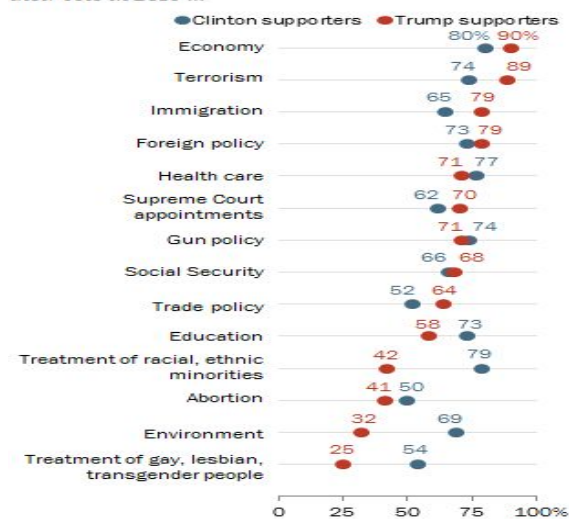
● Clinton supporters ● Trump supporters

Issue	Clinton	Trump
Economy	80%	90%
Terrorism	74	89
Immigration	65	79
Foreign policy	73	79
Health care	71	77
Supreme Court appointments	62	70
Gun policy	71	74
Social Security	66	68
Trade policy	52	64
Education	58	73
Treatment of racial, ethnic minorities	79	42
Abortion	41	50
Environment	69	32
Treatment of gay, lesbian, transgender people	54	25

Note: Based on registered voters. Q40.
Source: Survey conducted June 15-26, 2016.
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Year	Registered Voters	Democratic	Republican	Other Parties	Political Designations	Unenrolled
Oct. 1992	3,351,918	1,346,097	447,181	9,016	1,006	1,548,618
Oct. 1996	3,459,193	1,319,753	476,581	8,157	1,826	1,652,876
Oct. 2000	4,008,796	1,460,881	546,333	LIB. 16,071	7,738	1,977,773
Oct. 2004	4,098,634	1,526,711	532,319	LIB. 23,900 GRN.-RNB. 9,509	6,133	2,000,062
Oct. 2008	4,220,488	1,559,464	490,259	GRN.-RNB. 6,728 WRK. 5,534	16,625	2,141,878
Oct. 2012	4,342,841	1,551,693	484,099	GRN.-RNB. 6,507	17,269	2,283,273
Feb. 2016	4,271,835	1,490,335	468,295	GRN.-RNB. 5 UIP 16,476	13,684	2,277,760