

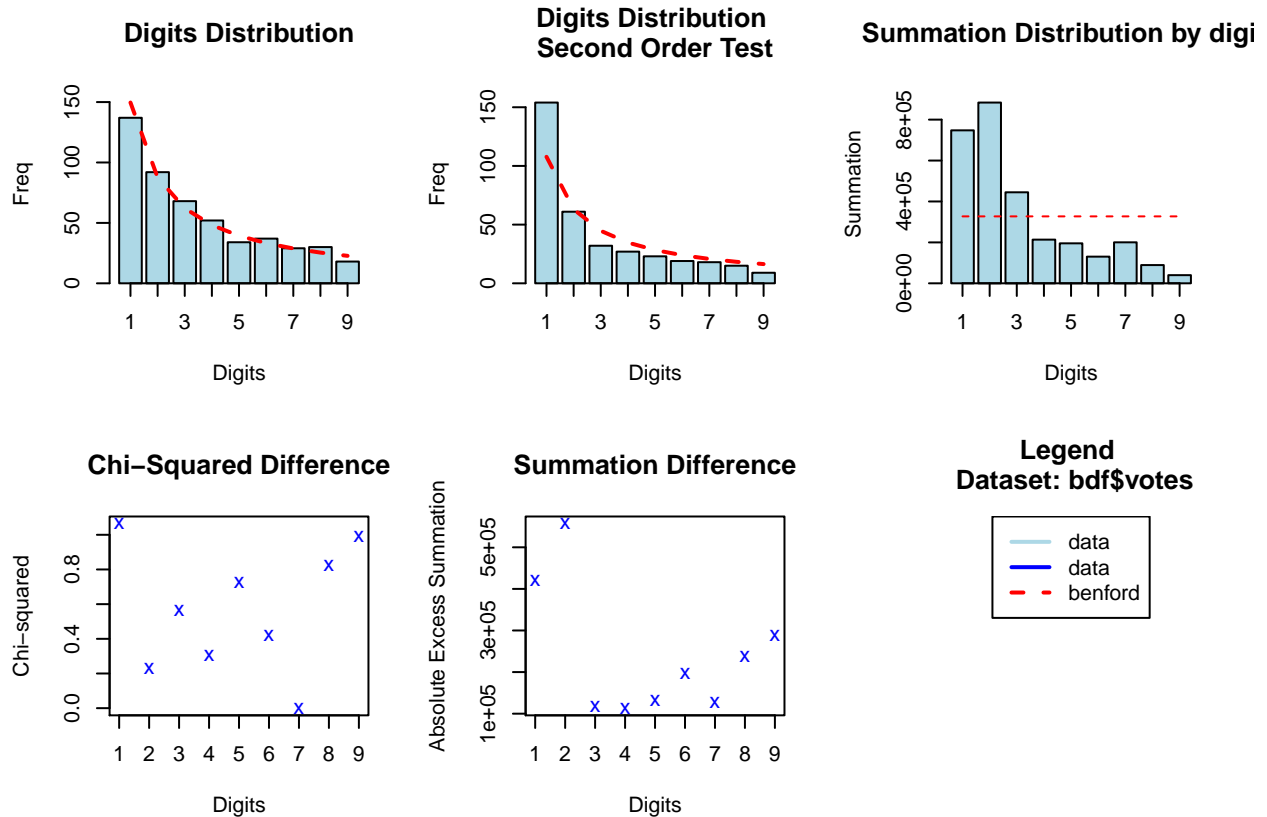
# Benford's Law in Wisconsin Election

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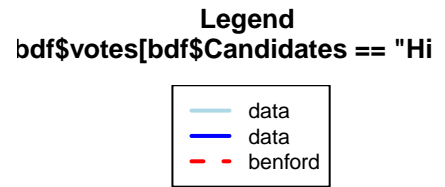
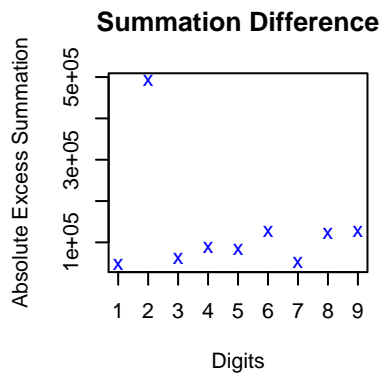
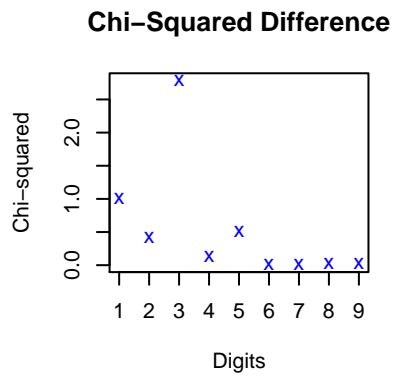
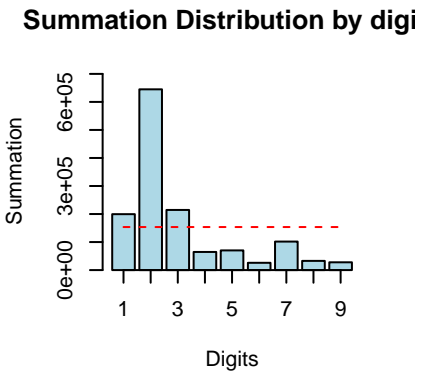
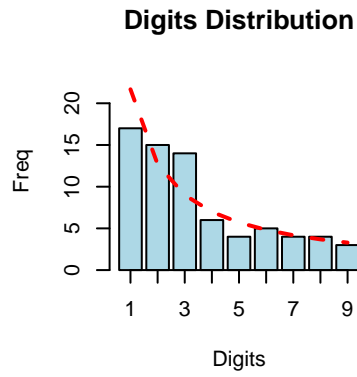
With the calls for recounts and suspicions of tampering or foul play in the Wisconsin 2016 presidential election, one way to determine if there is evidence of falsified data is to check if the data and vote counts fit Benford's Law. Benford's Law is a statistical distribution for the first digit of large data sets of big numbers that states the expected frequency of the lead digit of those numbers. First checking the whole state (at the county levels) with all candidates, we get the following. The data here was pulled directly from Wisconsin's online reporting.

```
wisconsin <- benford(bdf$votes, number.of.digits =1, sign = "positive", discrete = TRUE)  
plot(wisconsin)
```

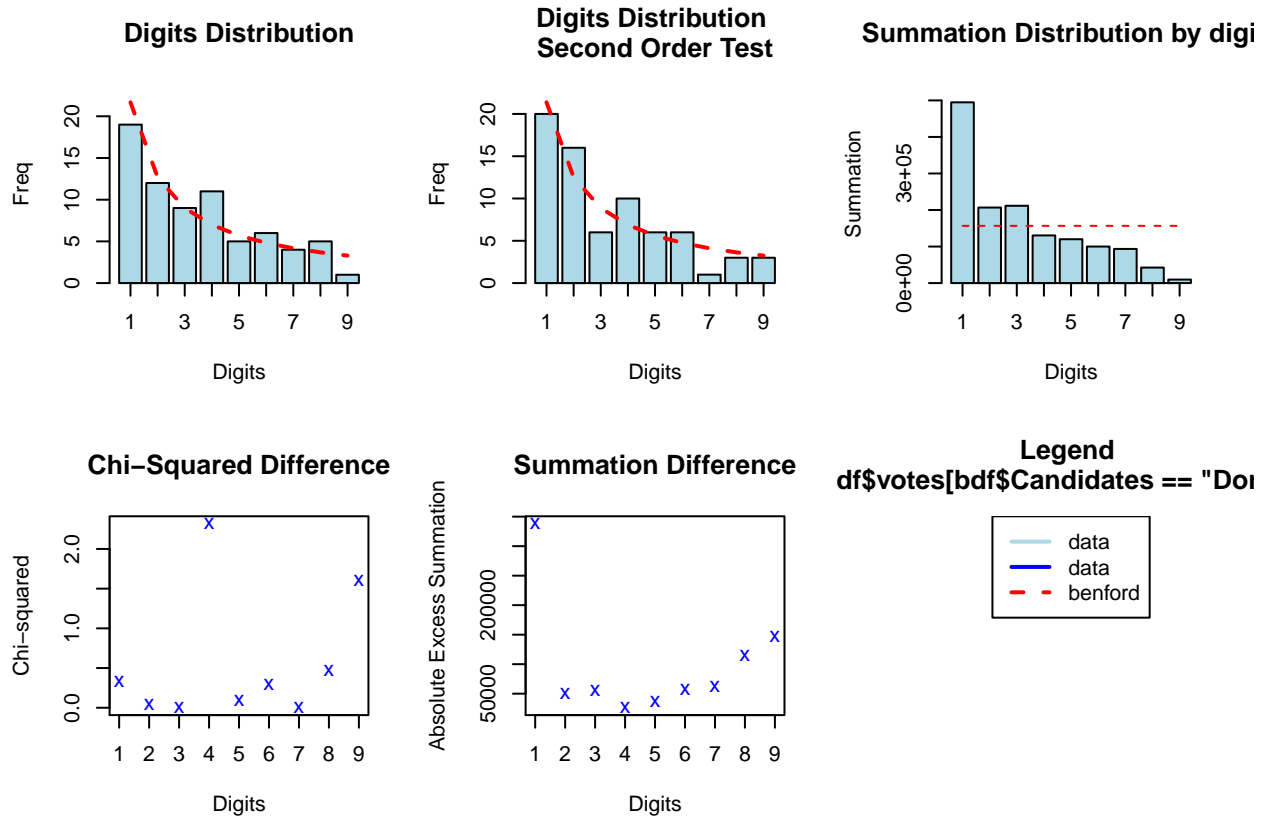


Statewide, the data seems to fit fairly well. This does not refute any possibility, but does decrease the likelihood of any tampering. Next, looking just at the numbers for Clinton and Trump (again at the county level), the distribution should be expected to still fit, although not quite as nicely due to the fact that there is now less data as well as the fact that the candidates did very well in different types of districts on different sizes.

```
clinton <- benford(bdf$votes[bdf$Candidates == "Hillary Clinton"], number.of.digits = 1, sign = "positi  
plot(clinton)
```

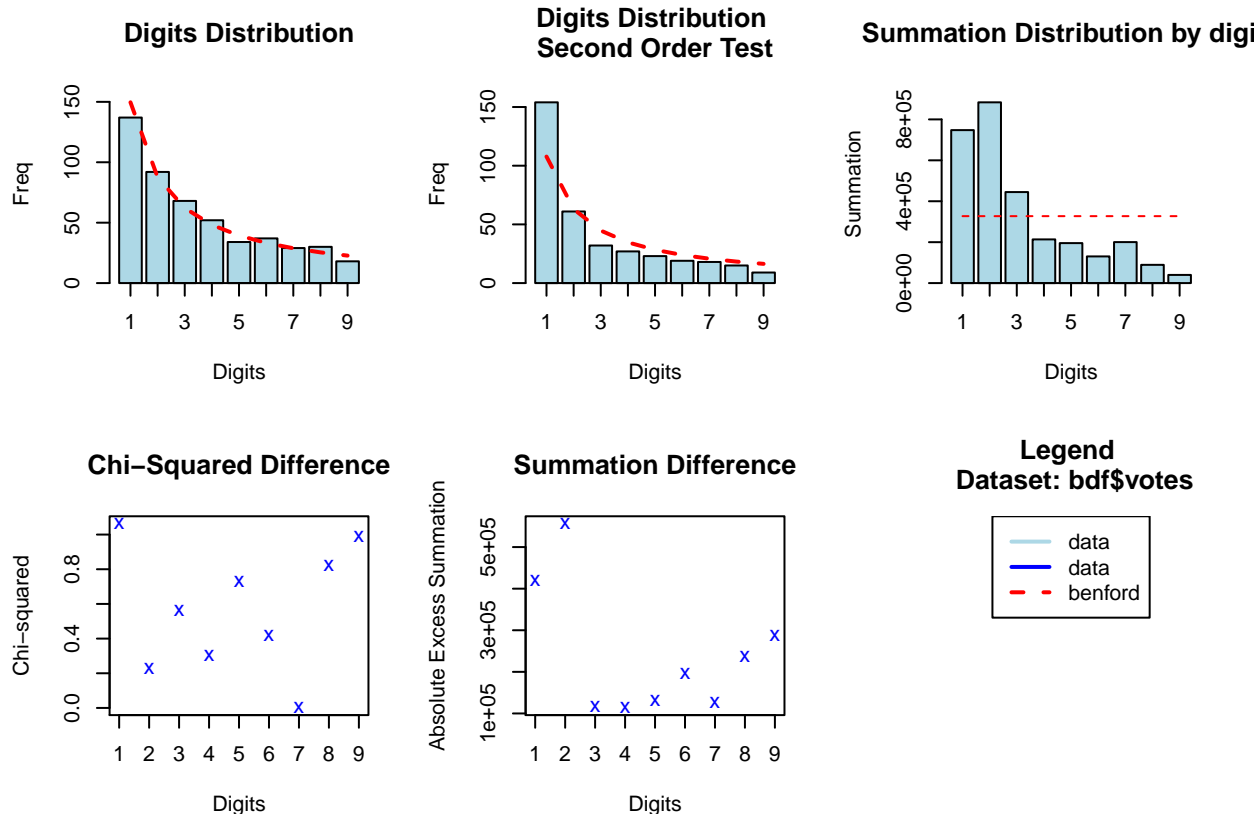


```
trump <- benford(bdf$votes[bdf$Candidates == "Donald J. Trump"], number.of.digits = 1, sign = "positive")
plot(trump)
```



From the above, it can be seen that again no major flags are raised. One final check can be to investigate the percentages (to ensure the percentages were not tampered with at all). This requires a non-discrete test as opposed to the discrete tests prior.

```
percentages <- benford(bdf$votes, number.of.digits = 1, sign = "positive", discrete = FALSE)
plot(percentages)
```



Again no red flags are raised. Nothing here provides any major evidence to indicate any cheating or tampering was done by any groups or individuals. While it does not strictly rule out foul play, it is convincing evidence in the argument that the election was more than likely true overall.

This data is freely available at <http://wisconsinvote.org/results/President%20-%20General/county-results> Special thanks to Purude undergraduate student James Marshall Reber for assistance in scraping the data from the website and to Dr. Jamees McCann and John Megson for support in understanding the theory that prompted investigation.