STAT535 Final Project

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2024-12-04

Goal

To compare the mean difference between winter temperatures in Boston vs. Amherst and mean difference between summer temperatures in Boston vs. Amherst to see if one city has a significantly higher/lower average temperature in either season.

Use bootstrapping techniques to compare.

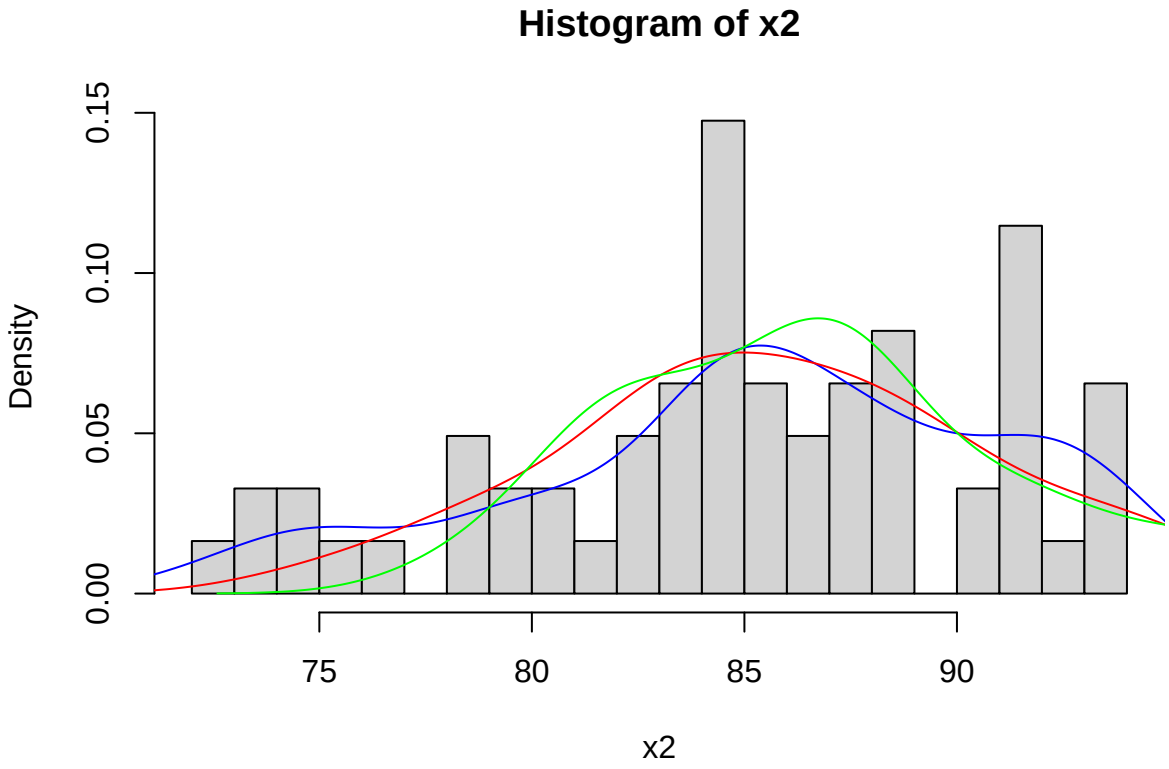
Data Collection

Collect winter 2024 data from Amherst and Boston in January 2024 and February 2024.

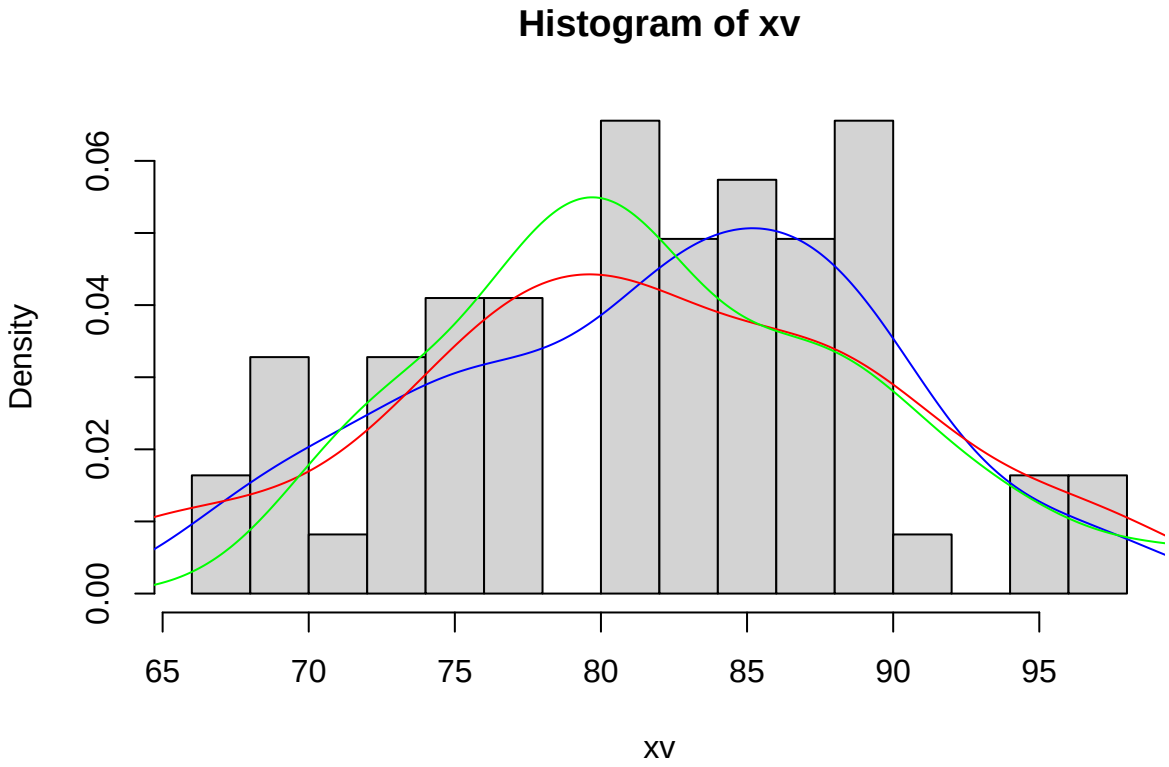
Collect summer 2024 data from Amherst and Boston in June 2024 and July 2024.

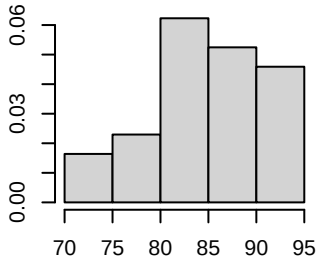
We will end up having a winter 2024 dataset for Amherst and Boston as well as a summer 2024 dataset for Amherst and Boston (4 total data sets).

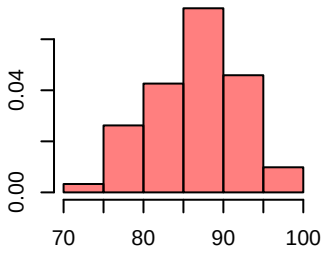
```
## Warning: package 'openxlsx' was built under R version 4.4.2
```

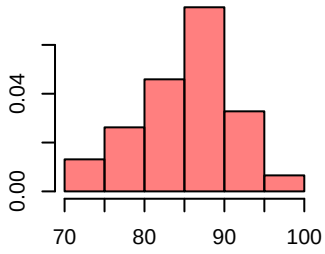

Histogram of x2
Density
0.00
0.05
0.10
0.15
75
80
85
90
x2

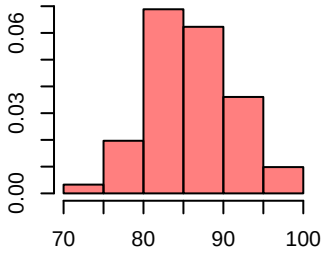
Boston Summer



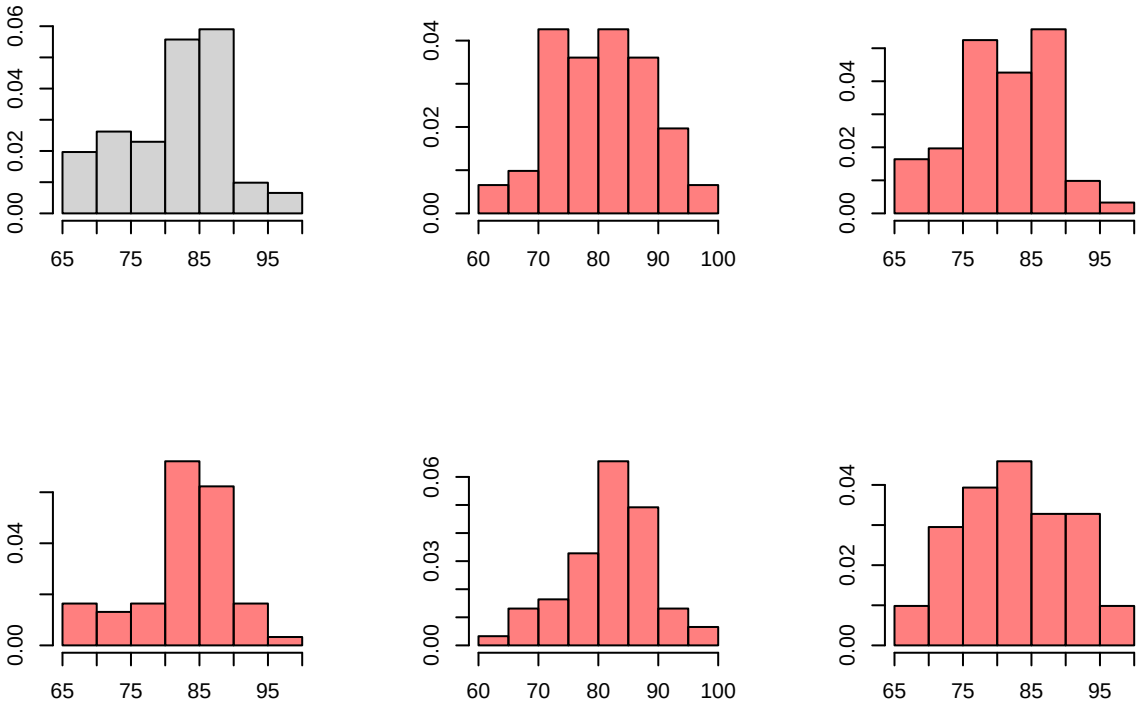








Simulating data with truncated Normal distribution,

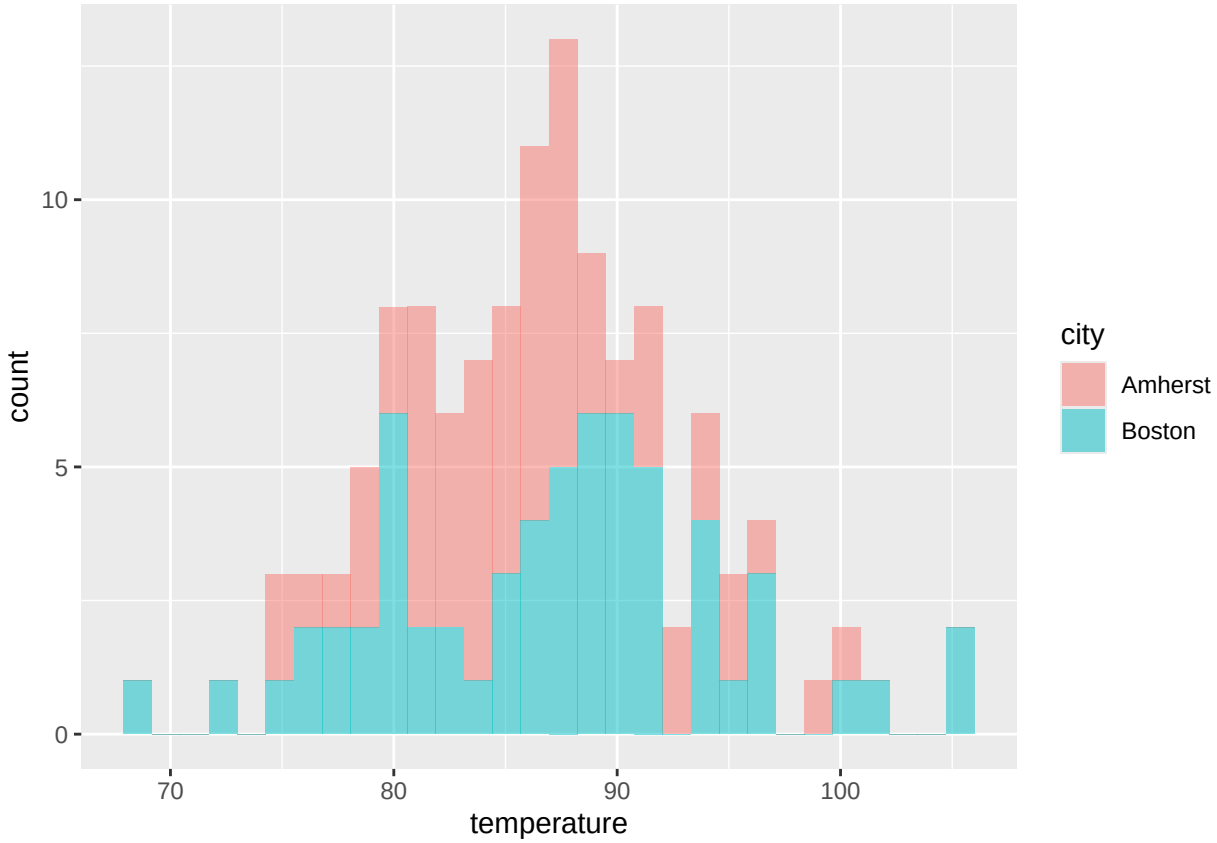


Power Test:

```
##    n     mean       sd
## 1 61 82.11475 7.583092
```

```
##    n     mean       sd
## 1 61 85.42623 5.619784
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
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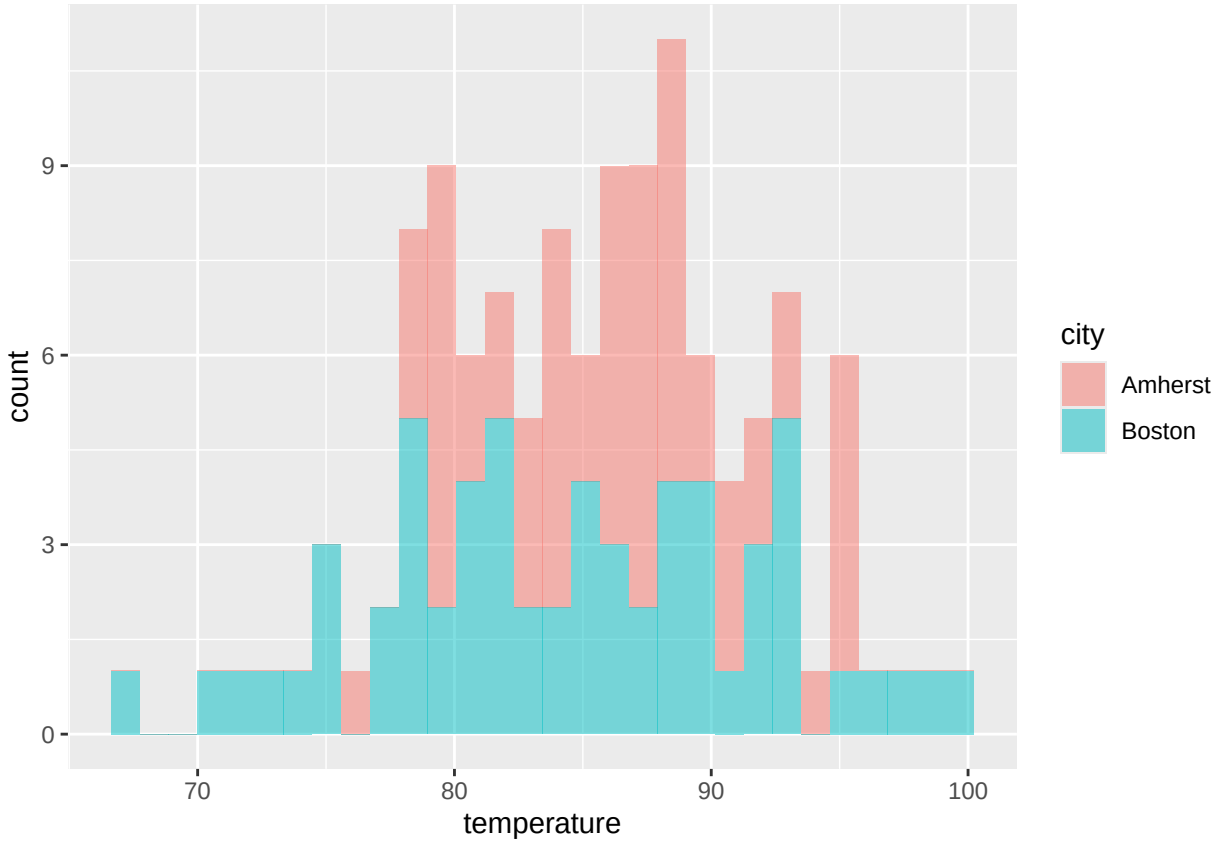
```




```
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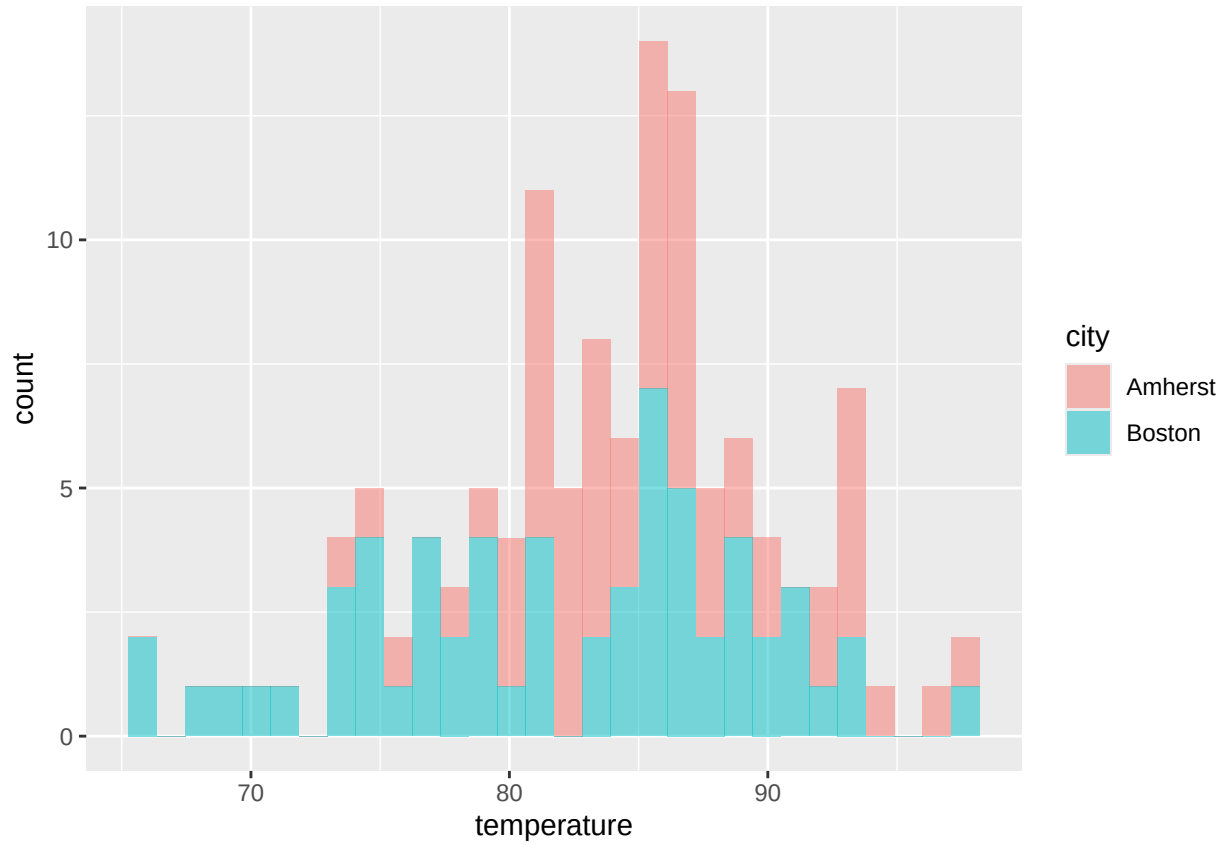
```

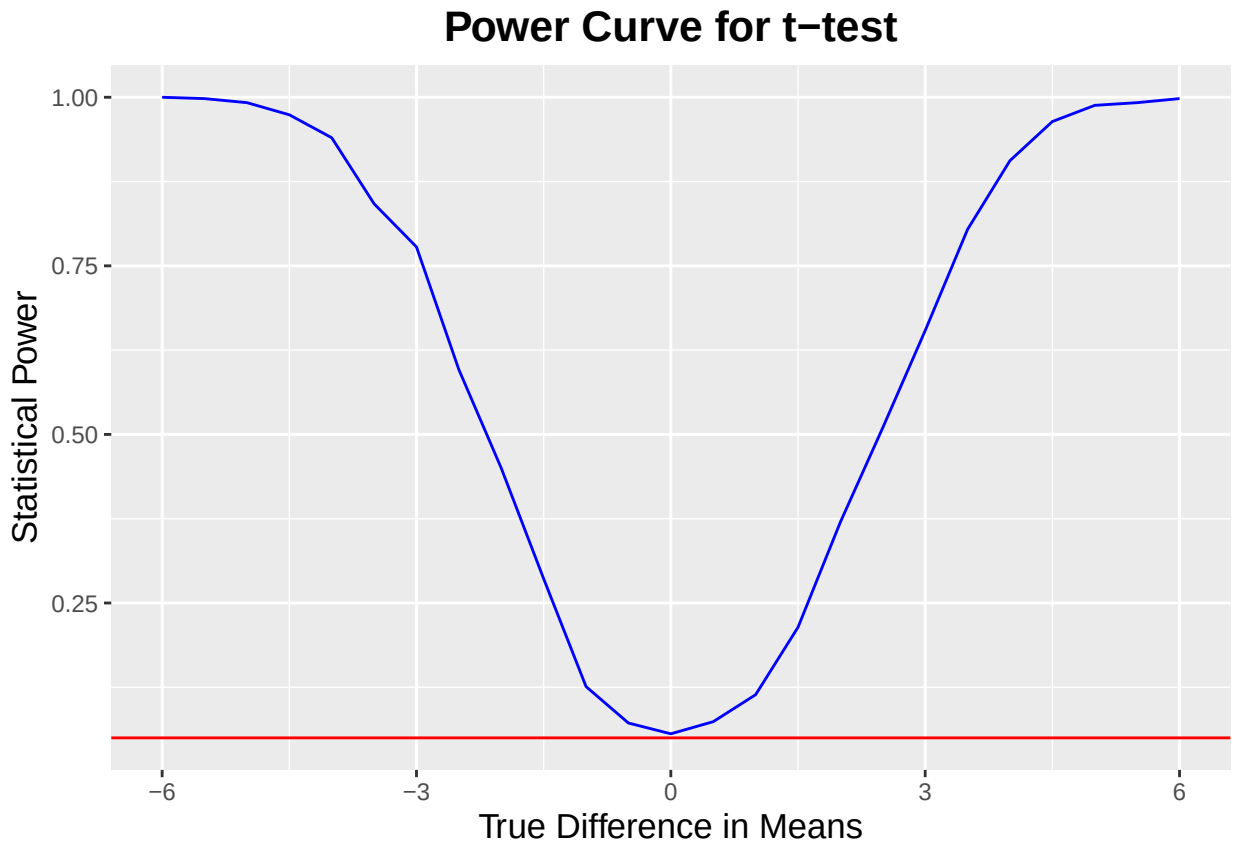



```
## [1] 0.7425
```

```
## [1] 0.051
```

```
## [1] 0.687
```

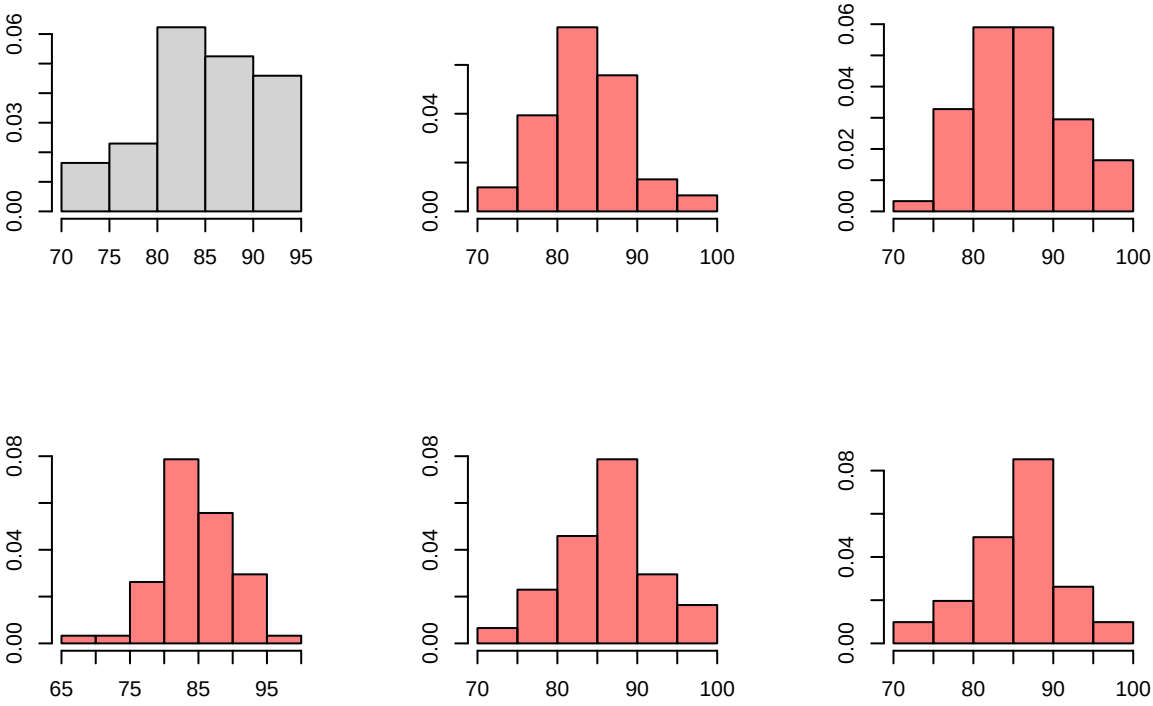
```
## [1] 0.8375
```

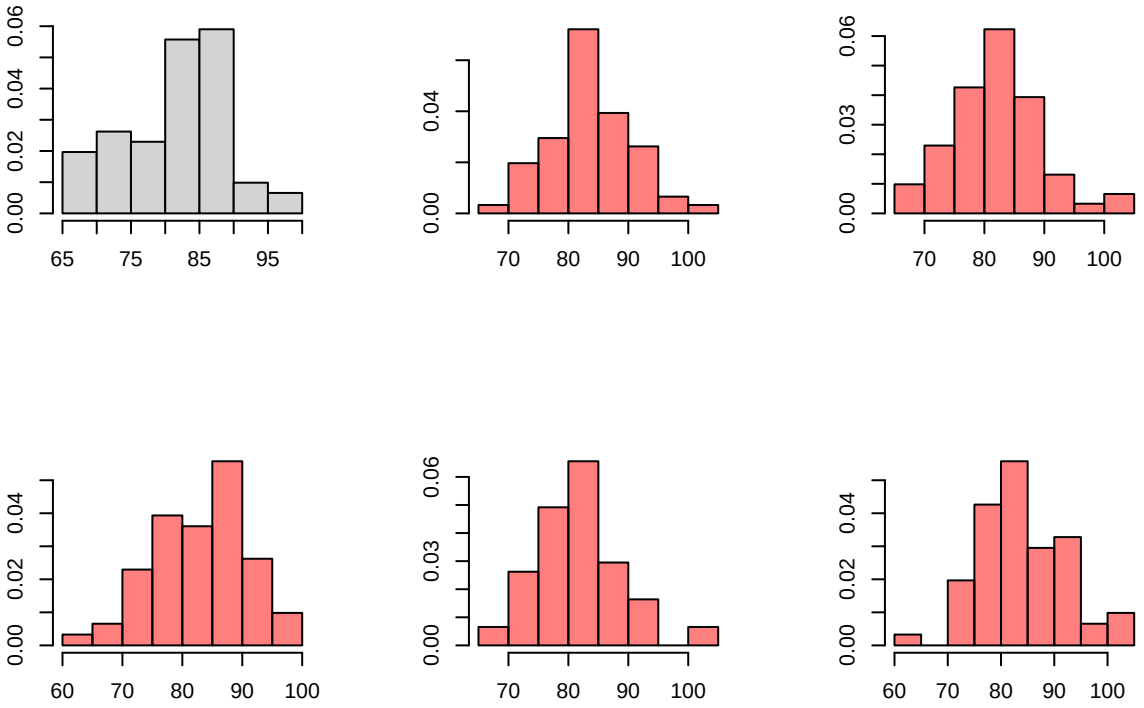


Trying out gamma:

```
##    n     mean       sd      a         s
## 1 61 82.11475 7.583092 117.26 0.7002795
```

```
##    n     mean       sd        a         s
## 1 61 85.42623 5.619784 231.0699 0.3696987
```

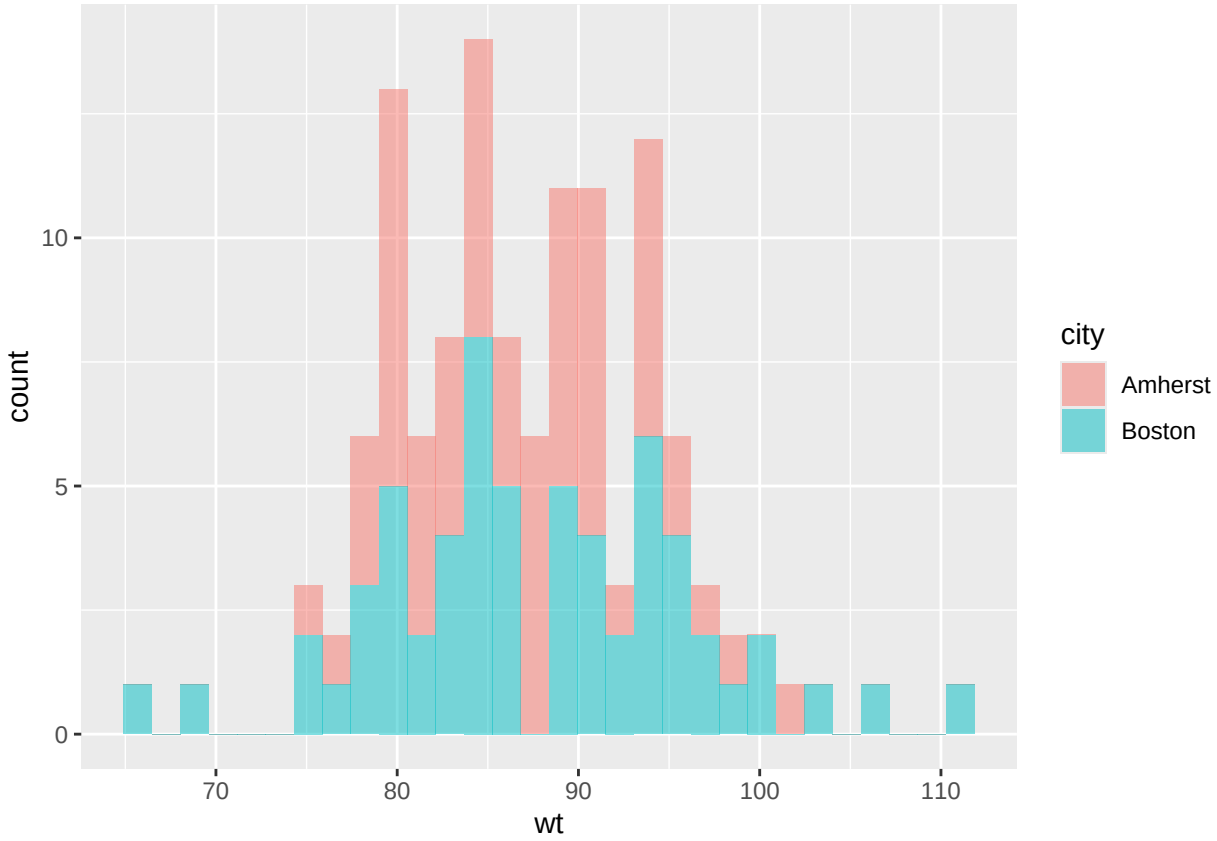

0.00
0.03
0.06
70 75 80 85 90 95
0.00
0.04
70 80 90 100
0.00
0.02
0.04
0.06
70 80 90 100
0.00
0.04
0.08
65 75 85 95
0.00
0.04
0.08
70 80 90 100
0.00
0.04
0.08
70 80 90 100




```
##    n     mean       sd        a         s    city
## 1 61 85.42623 5.619784 231.0699 0.3696987 Amherst
## 2 61 82.11475 7.583092 117.2600 0.7002795  Boston
```

```
## [1] 3.311475
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

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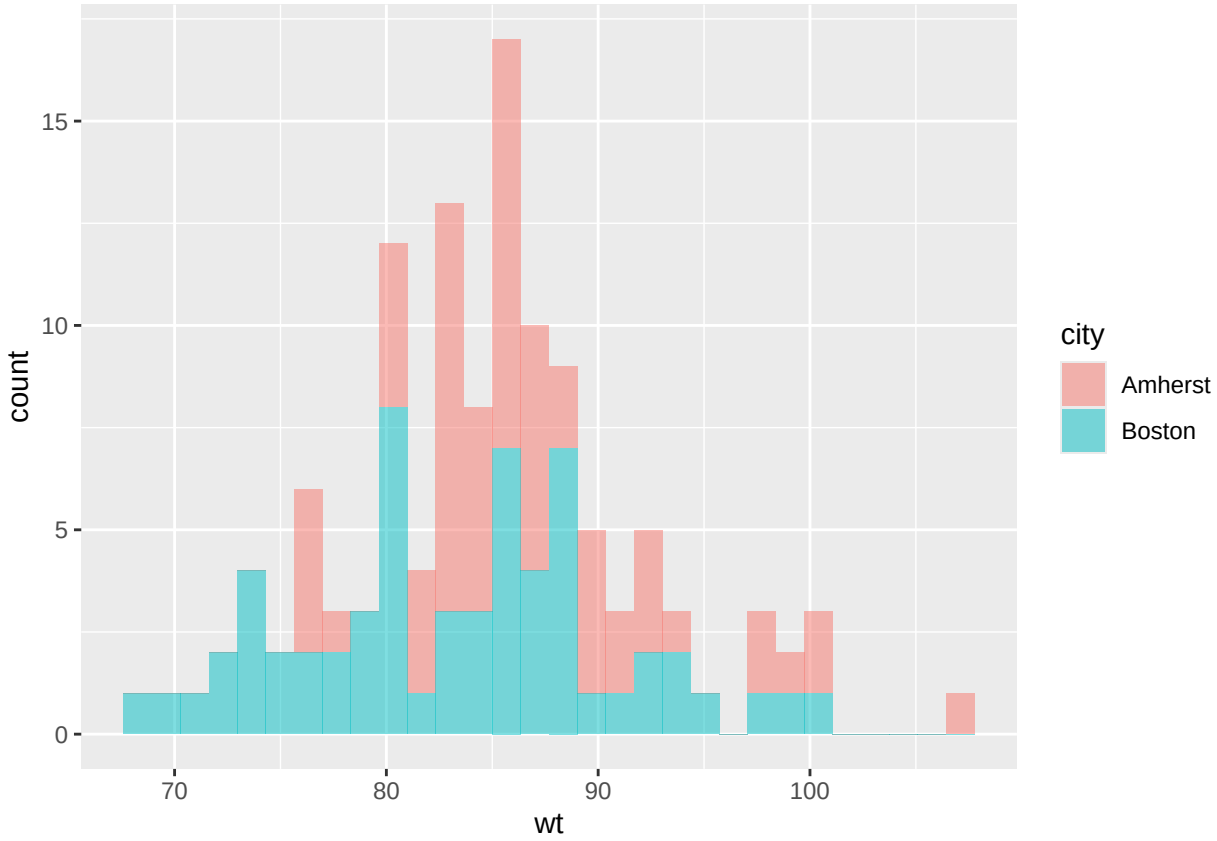
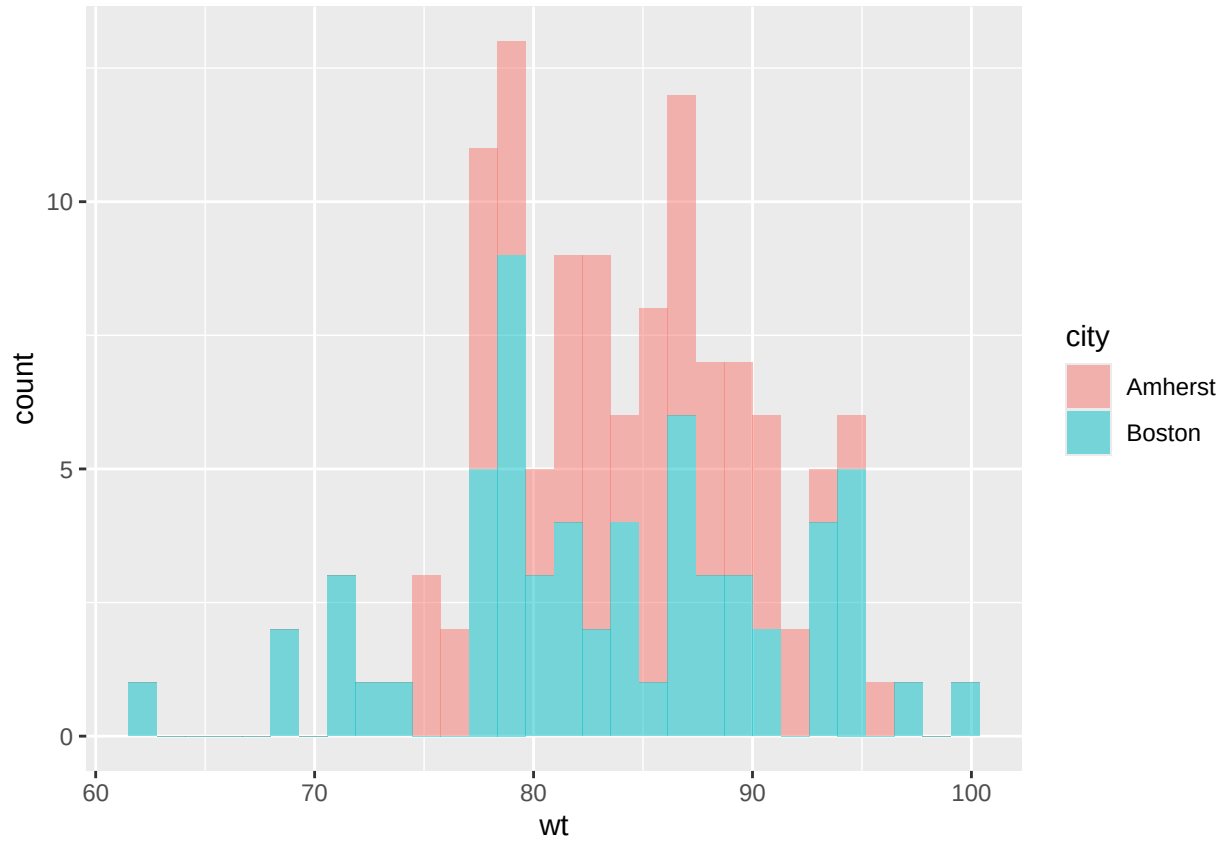
```



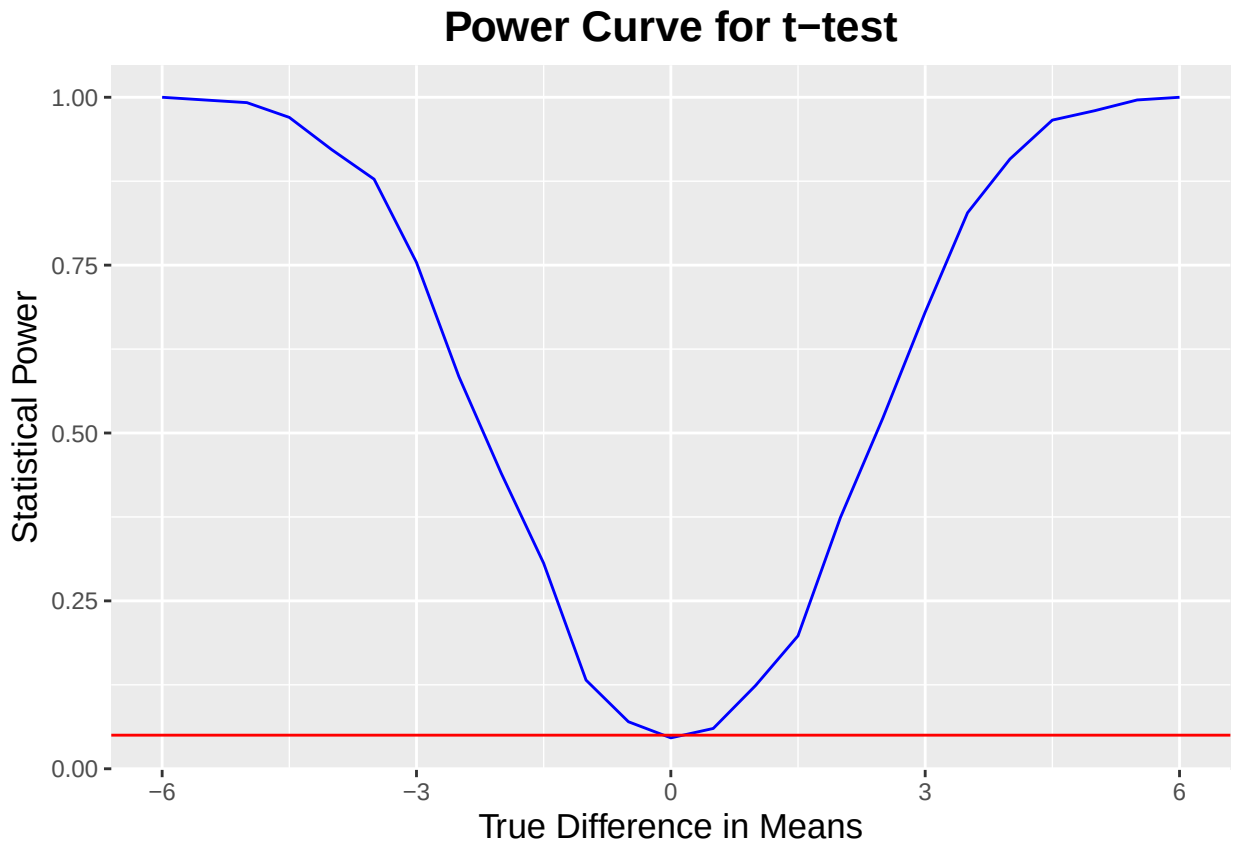

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
## [1] 0.054
```

```
## [1] 0.7345
```

```
## [1] 0.783
```

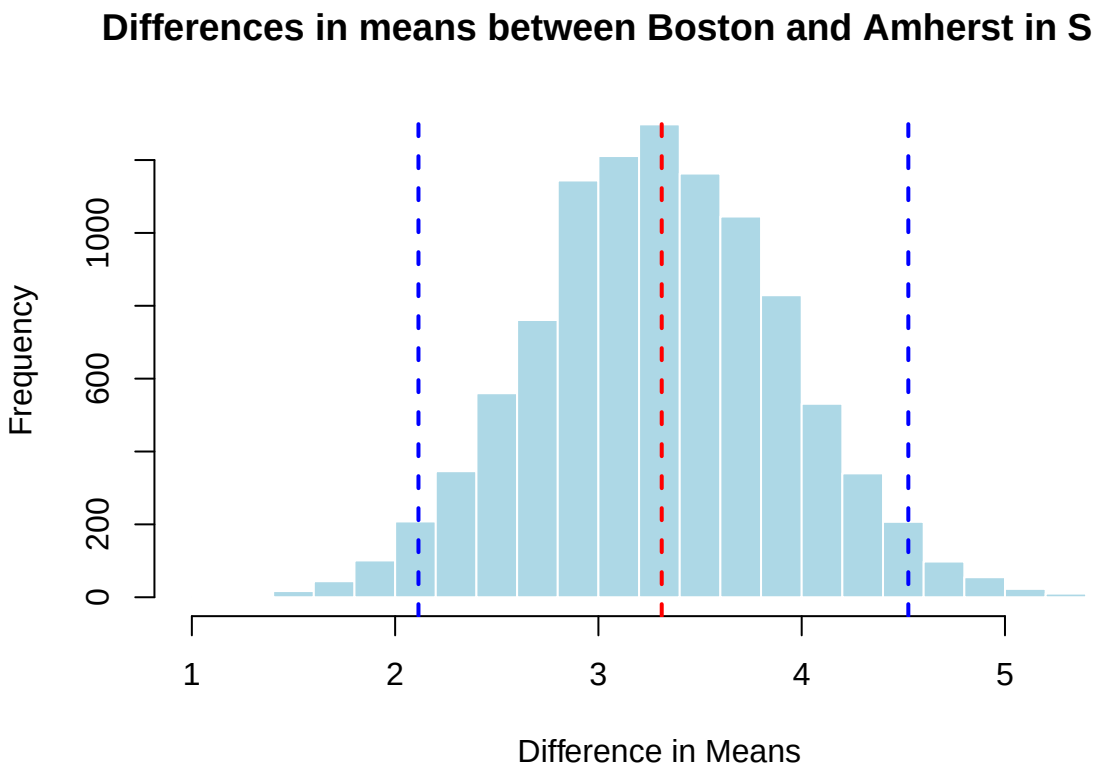


Confidence Intervals

```
## [1] TRUE
```

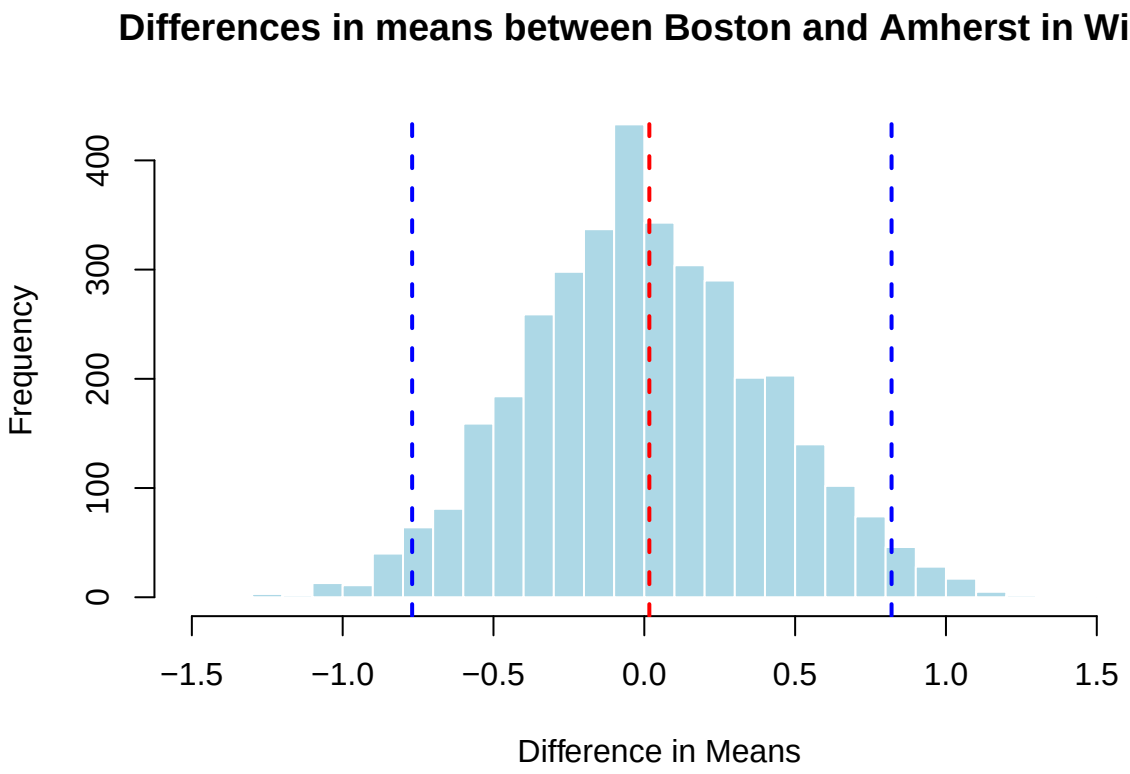
```
##     2.5%
## 2.114754
```

```
##   97.5%
## 4.52459
```




```
##       2.5%
## -0.7696721

##     97.5%
## 0.8196721
```



Conclusion

We find that there is a statistically significant difference in means between Amherst and Boston in the summer months. There is not a statistically significant difference in means in the winter months.