interp_confidence

July 17, 2018

```
In [1]: # HIDDEN
        from datascience import *
        %matplotlib inline
        import matplotlib.pyplot as plots
        plots.style.use('fivethirtyeight')
        import numpy as np
```

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```
In [2]: births = Table.read_table('baby.csv')

In [3]: births
```

```
Out[3]: Birth Weight | Gestational Days | Maternal Age | Maternal Height | Maternal Pregnancy W
        120          | 284              | 27           | 62              | 100
        113          | 282              | 33           | 64              | 135
        128          | 279              | 28           | 64              | 115
        108          | 282              | 23           | 67              | 125
        136          | 286              | 25           | 62              | 93
        138          | 244              | 33           | 62              | 178
        132          | 245              | 23           | 65              | 140
        120          | 289              | 25           | 62              | 125
        143          | 299              | 30           | 66              | 136
        140          | 351              | 27           | 68              | 120
        ... (1164 rows omitted)
```

```
In [4]: babies = births.select('Birth Weight', 'Gestational Days')

In [5]: babies = babies.with_column(
            'Ratio BW/GD', babies.column(0) / babies.column(1)
        )

In [6]: babies
```

```
Out[6]: Birth Weight | Gestational Days | Ratio BW/GD
        120          | 284              | 0.422535
        113          | 282              | 0.400709
        128          | 279              | 0.458781
```

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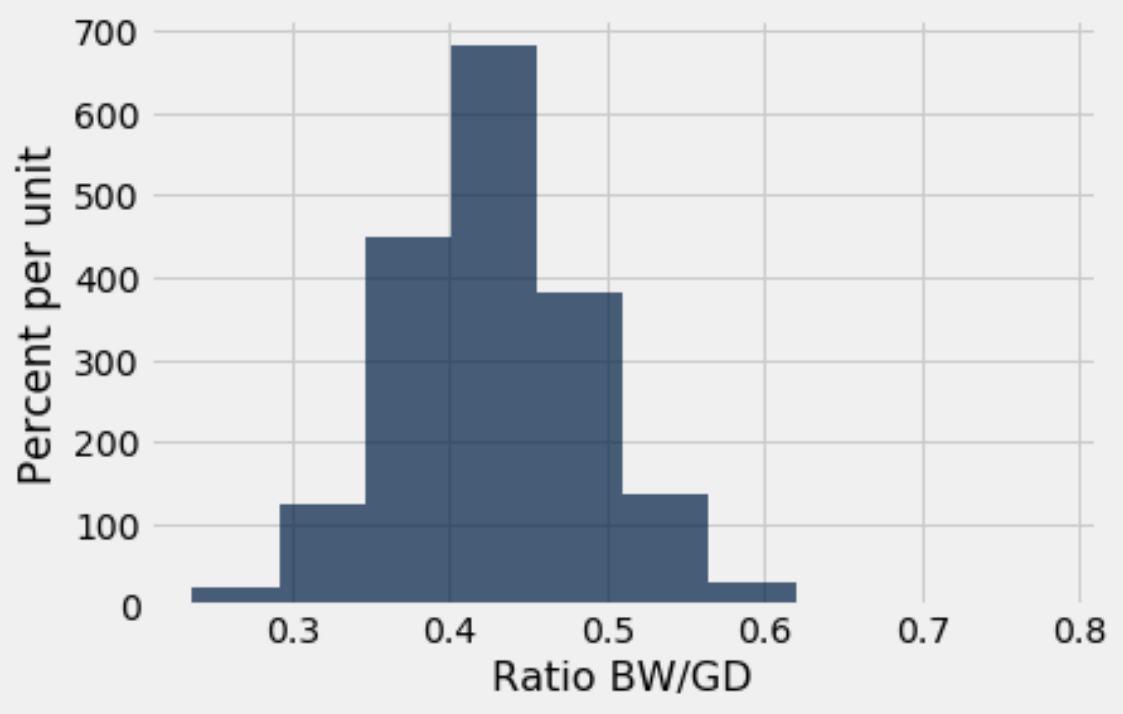
108          | 282              | 0.382979
136          | 286              | 0.475524
138          | 244              | 0.565574
132          | 245              | 0.538776
120          | 289              | 0.415225
143          | 299              | 0.478261
140          | 351              | 0.39886
... (1164 rows omitted)
```

```
In [7]: babies.hist('Ratio BW/GD')
```




```
In [8]: babies.sort('Ratio BW/GD', descending = True)
```

```
Out[8]: Birth Weight | Gestational Days | Ratio BW/GD
        116          | 148              | 0.783784
        174          | 281              | 0.619217
        174          | 284              | 0.612676
        110          | 181              | 0.607735
        174          | 288              | 0.604167
        176          | 293              | 0.600683
        158          | 267              | 0.59176
        173          | 293              | 0.590444
        160          | 271              | 0.590406
        132          | 225              | 0.586667
        ... (1164 rows omitted)
```

```
In [9]: percentile(50, babies.column('Ratio BW/GD'))

Out[9]: 0.42907801418439717

In [10]: # Bootstrap the sample median

         medians = make_array()

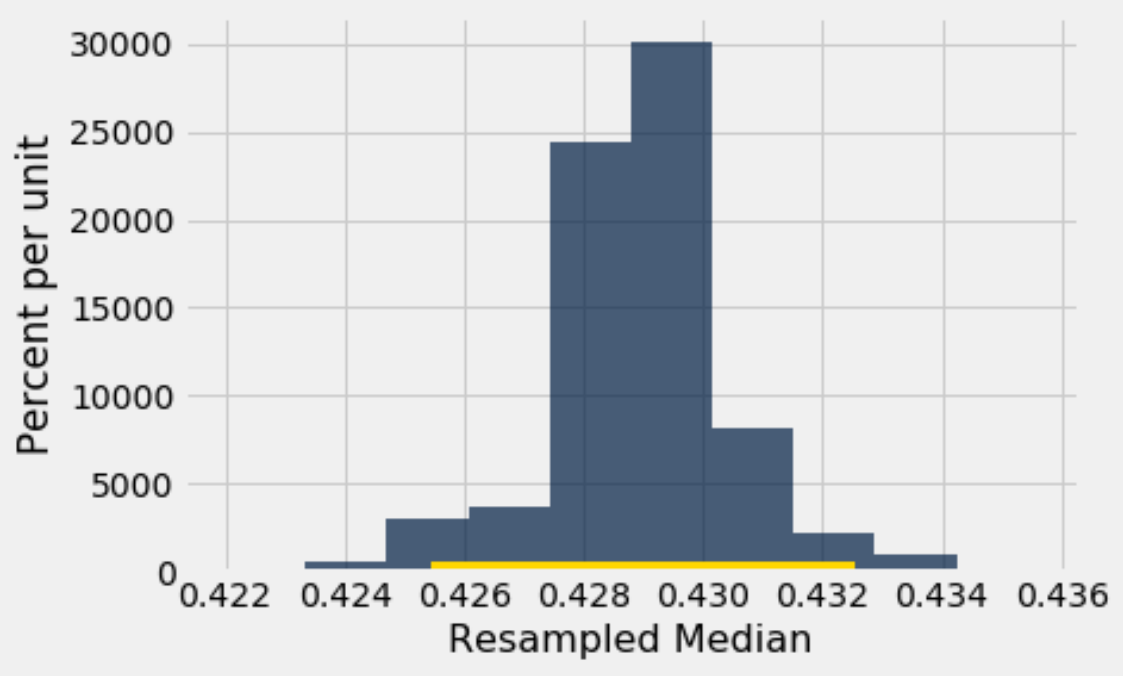
         for i in np.arange(5000):
             resample = babies.sample()
             resampled_median = percentile(50, resample.column('Ratio BW/GD'))
             medians = np.append(medians, resampled_median)

In [11]: interval_95 = make_array(percentile(2.5, medians), percentile(97.5, medians))
         interval_95

Out[11]: array([ 0.42545455,  0.43252595])

In [12]: Table().with_column('Resampled Median', medians).hist()
         plots.plot(interval_95, [0, 0], color='gold', lw=8)
         print('Approx 95% Confidence Interval for Median Ratio in Population:')
         print(np.round(interval_95, 3))

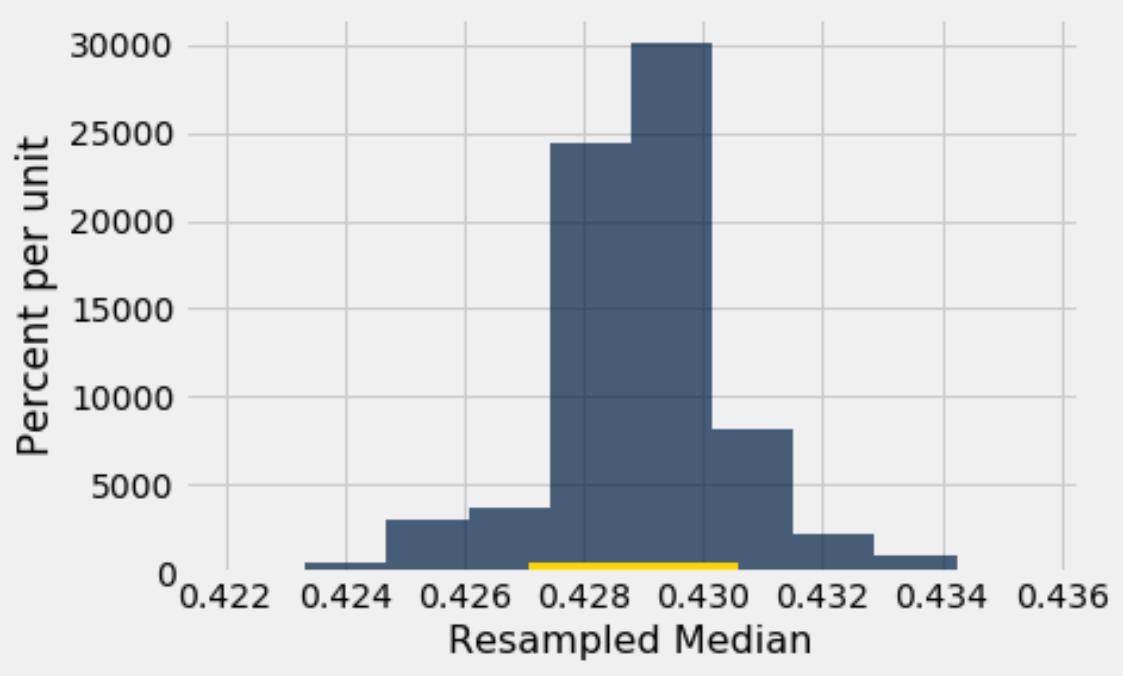
Approx 95% Confidence Interval for Median Ratio in Population:
[ 0.425  0.433]
```



```
In [13]: interval_80 = make_array(percentile(10, medians), percentile(90, medians))

In [14]: Table().with_column('Resampled Median', medians).hist()
         plots.plot(interval_80, [0, 0], color='gold', lw=8)
         print('Approx 80% Confidence Interval for Median Ratio in Population:')
         print(np.round(interval_80, 3))

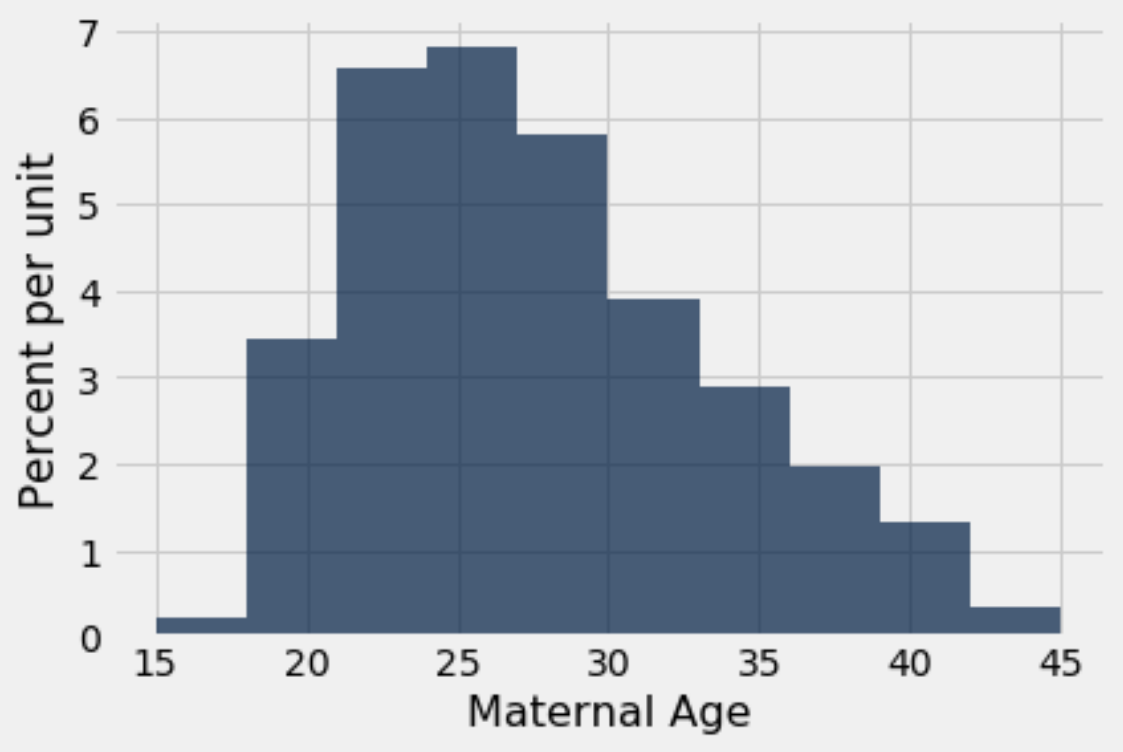
Approx 80% Confidence Interval for Median Ratio in Population:
[ 0.427  0.431]
```




```
In [17]: np.average(births.column('Maternal Age'))

Out[17]: 27.228279386712096

In [16]: births.hist('Maternal Age')
```



0.2 CIs for Testing

Null Hypothesis: Average age of mothers is exactly equal to 27
Alternative Hypothesis: Average age of mothers is not equal to 27

```
In [18]: # Bootstrap the sample mean

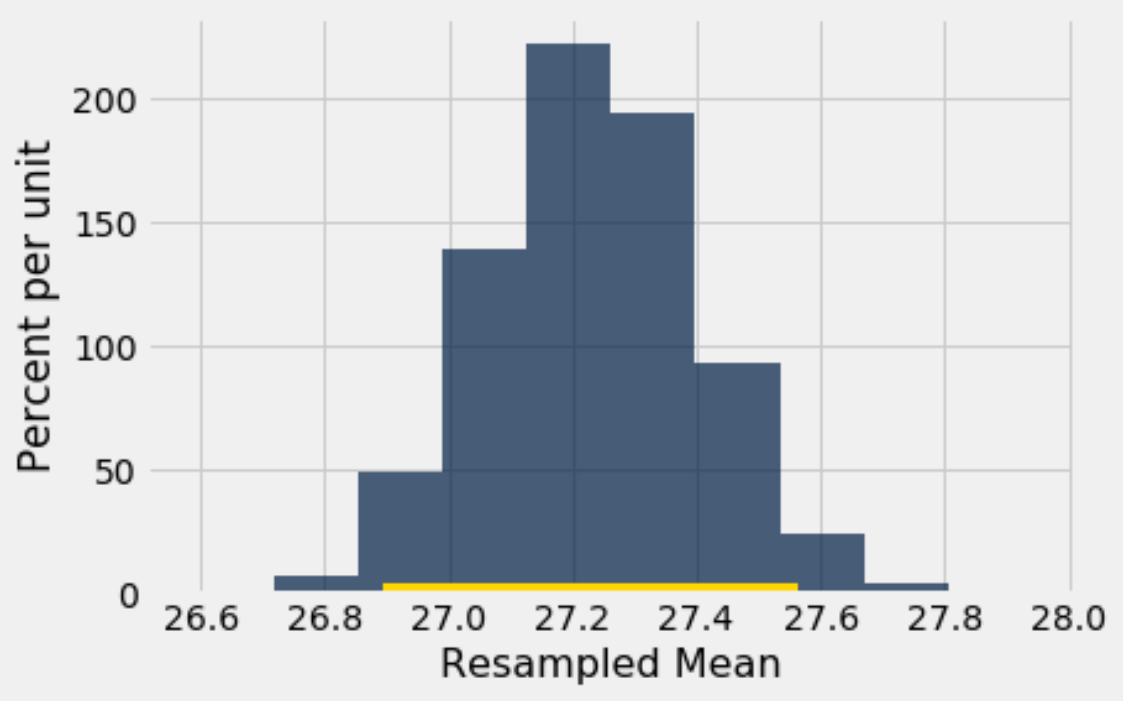
         means = make_array()

         for i in np.arange(5000):
             resample = births.sample()
             resampled_mean = np.average(resample.column('Maternal Age'))
             means = np.append(means, resampled_mean)
```

```
In [19]: interval_95 = make_array(percentile(2.5, means), percentile(97.5, means))

         Table().with_column('Resampled Mean', means).hist()
         plots.plot(interval_95, [0, 0], color='gold', lw=8)
         print('Approx 95% Confidence Interval for Mean Maternal Age in Population:')
         print(np.round(interval_95, 3))
```

```
Approx 95% Confidence Interval for Mean Maternal Age in Population:
[ 26.894  27.563]
```


Percent per unit
200
150
100
50
0
26.6
26.8
27.0
27.2
27.4
27.6
27.8
28.0
Resampled Mean