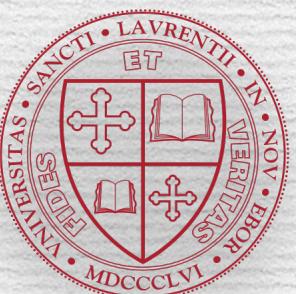
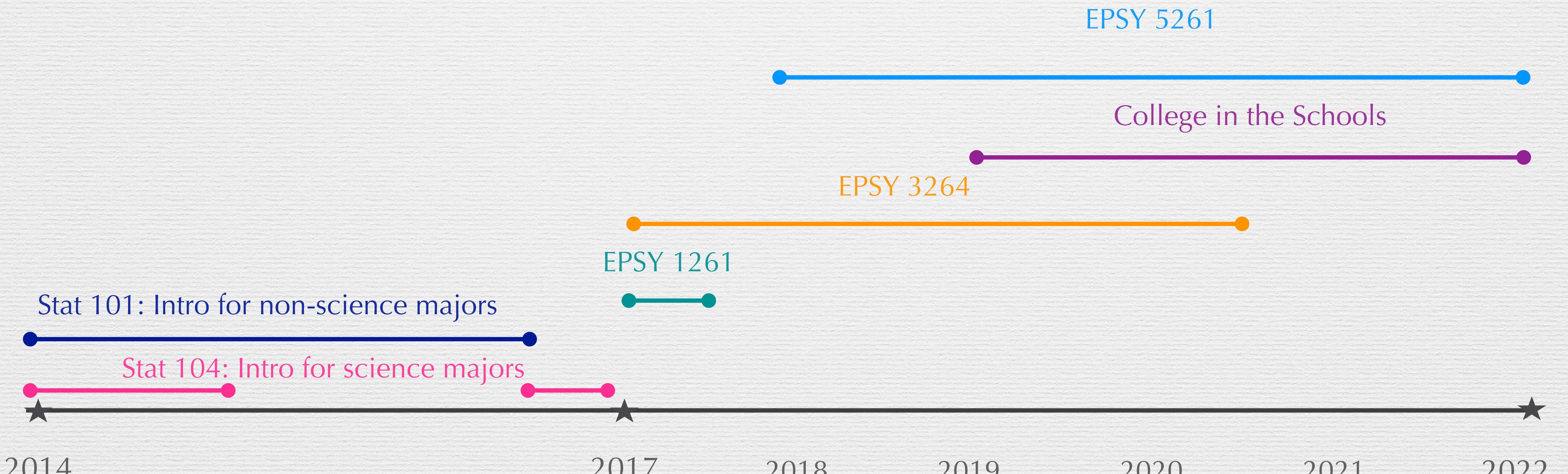


Teaching Presentation

Chelsey Legacy
PhD Candidate
Quantitative Methods in Education

Background



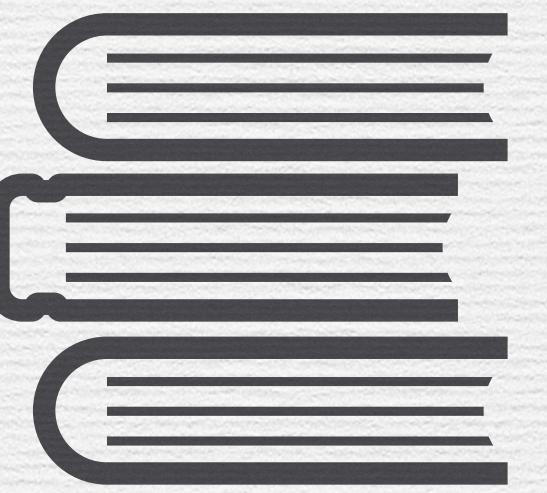
Career Goals

- Teaching
 - Design courses based on current research & needs of student audience
- Research
 - Stay current on statistics education
 - Conduct research on projects that align with my interests
- Service
 - Advising/Mentoring



EPSY 5261

- Content
- Technology
- Assessments



Content

Where we are:

Describing Data (25%)

Confidence Intervals - Bootstrap (20%)

Hypothesis Tests - Randomization (20%)

Confidence Intervals - Traditional(10%)

Hypothesis Test - Traditional(10%)

Regression (10%)

Chi-sq (5%)

Where we could go:

Data (20%)

Visualization/MVT (20%)

Confidence Intervals - Bootstrap (20%)

Hypothesis Tests - Randomization (20%)

Regression (20%)

Add more “*Data Science*”



Technology

Where we are:

R Studio w/ *Mosaic* Package

Randomize It Shiny App

Where we could go:

Streamline and Simplify



learnR Tutorials

Assessment

Where we are:

Exams (45%)

Group Discussion (20%)

Labs (20%)

Quizzes (15%)

Where we could go:

Article Review Activity* (20%)

Group Discussion (20%)

Labs (45%)

Quizzes (15%)

More Authentic Type Assessments



Standard Deviation

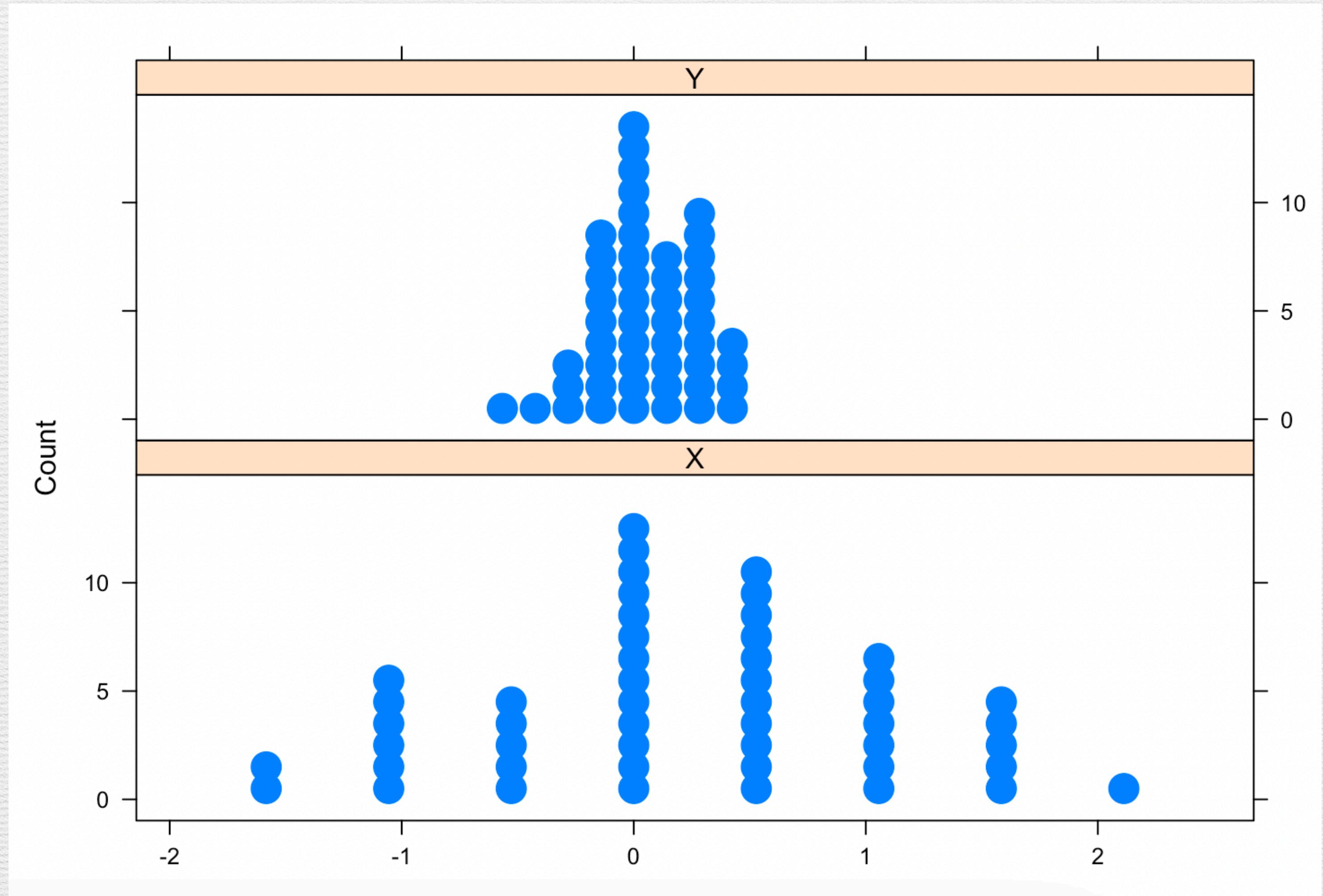
Quick Review

- Shape
 - Symmetric/skewed
 - Number of modes
- Measures of center
 - Mean/median/mode
- Some discussion of variability
 - Range/IQR from boxplots

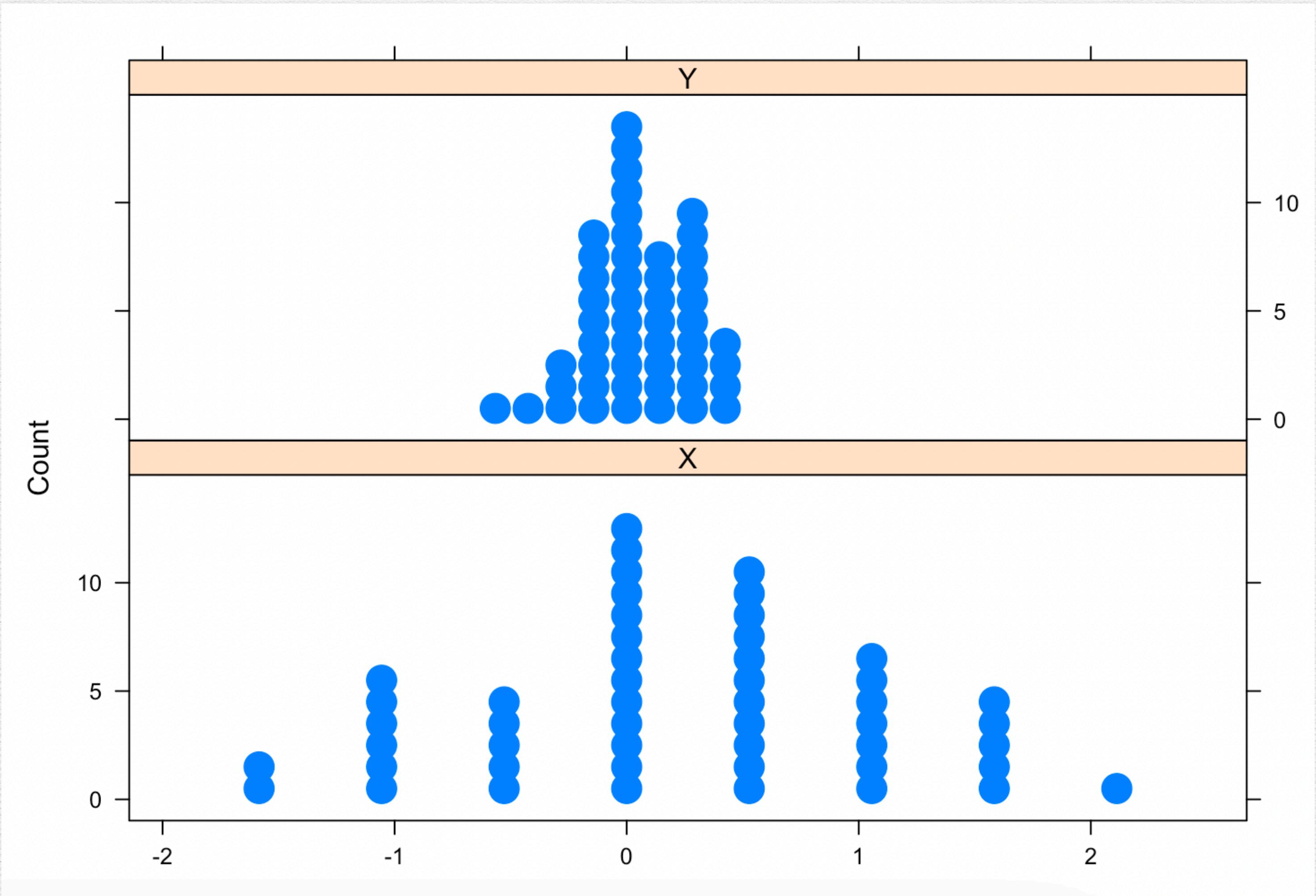
Describing data

- Gain insight into population or sample by visualizing data
- Key things to look for and describe
 - Center
 - Variability
 - Shape

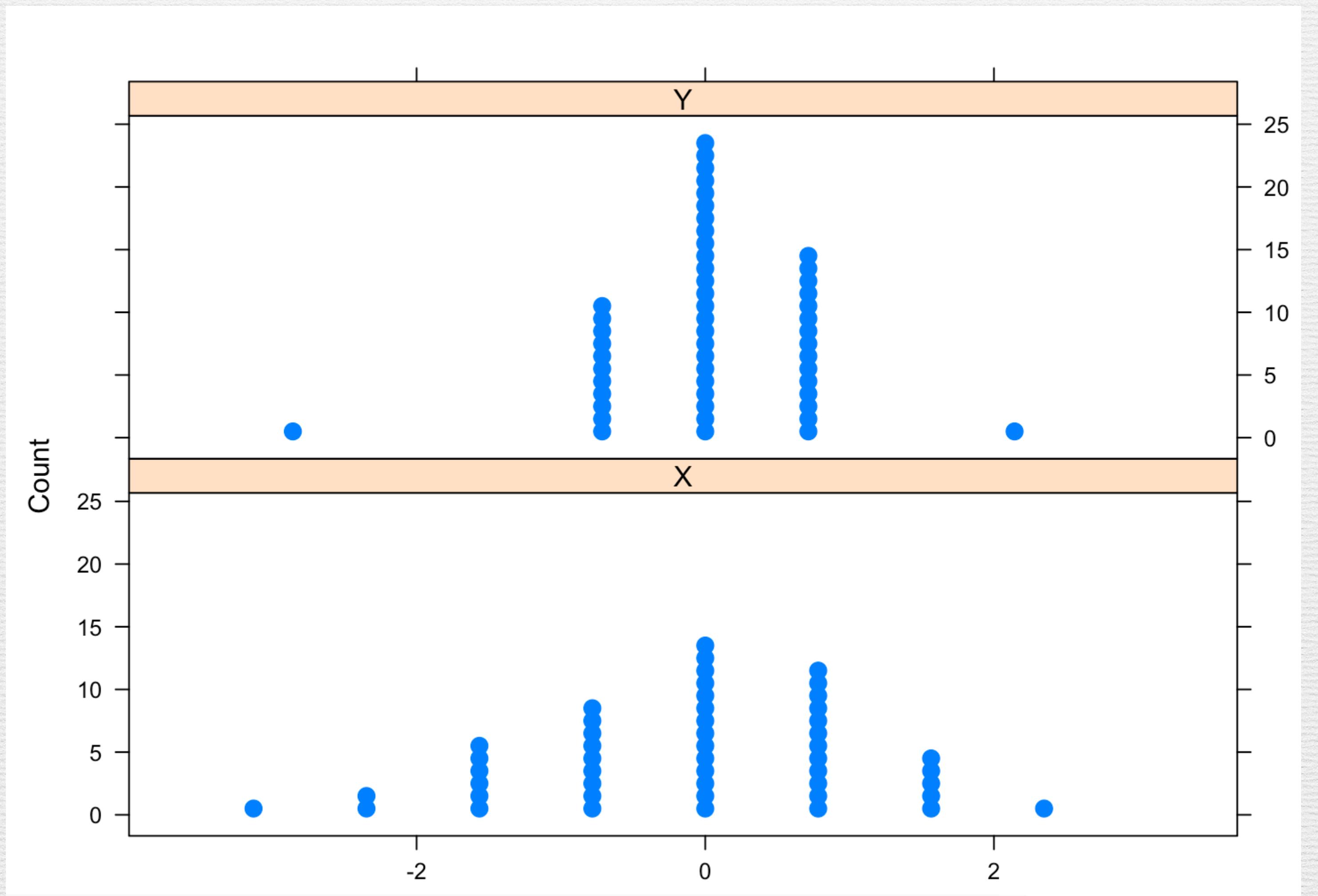
What's the same?



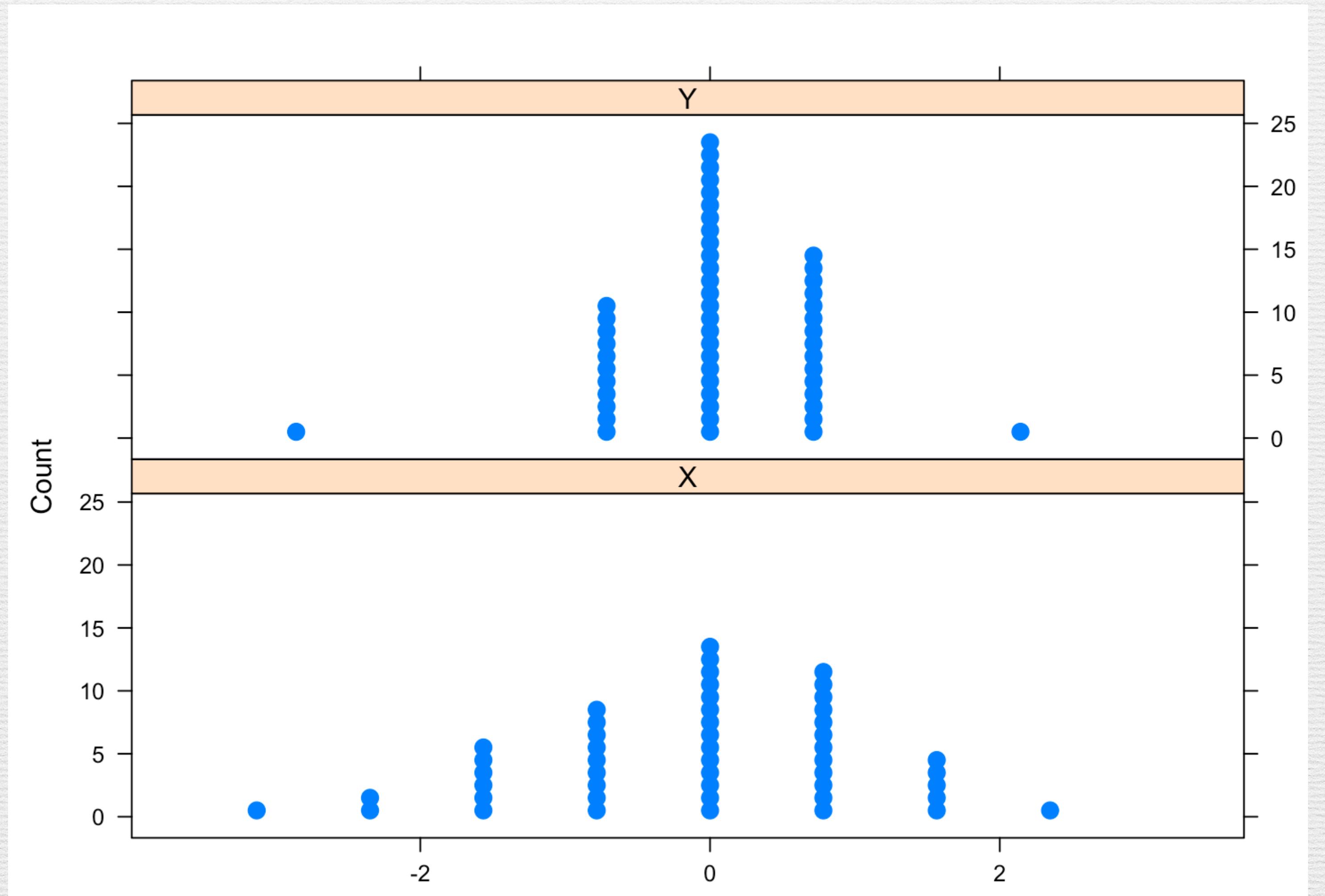
What is different?



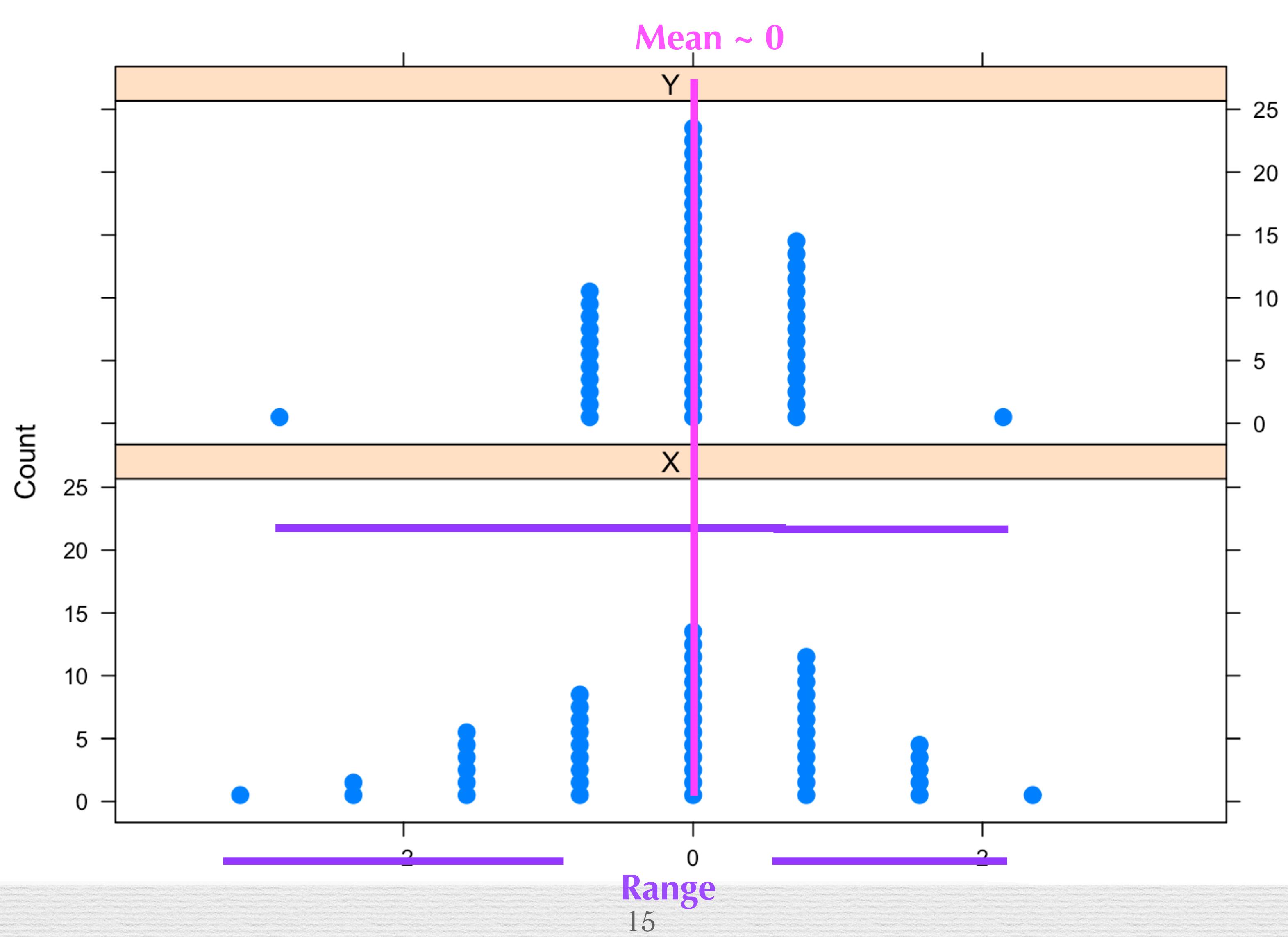
What is the same?



What is different?



A closer look.....



Quantifying Variability

- How far, typically, are observations from the “center” of the distribution?

Quantifying Variability

- How far, typically, are observations from the *mean* of the distribution?

Standard Deviation

- How far, **on average**, are observations from the **mean**?

Standard Deviation

- How far, on average, are observations from the mean?

Distance

$$\text{Average} = \frac{\sum distance_i}{n}$$

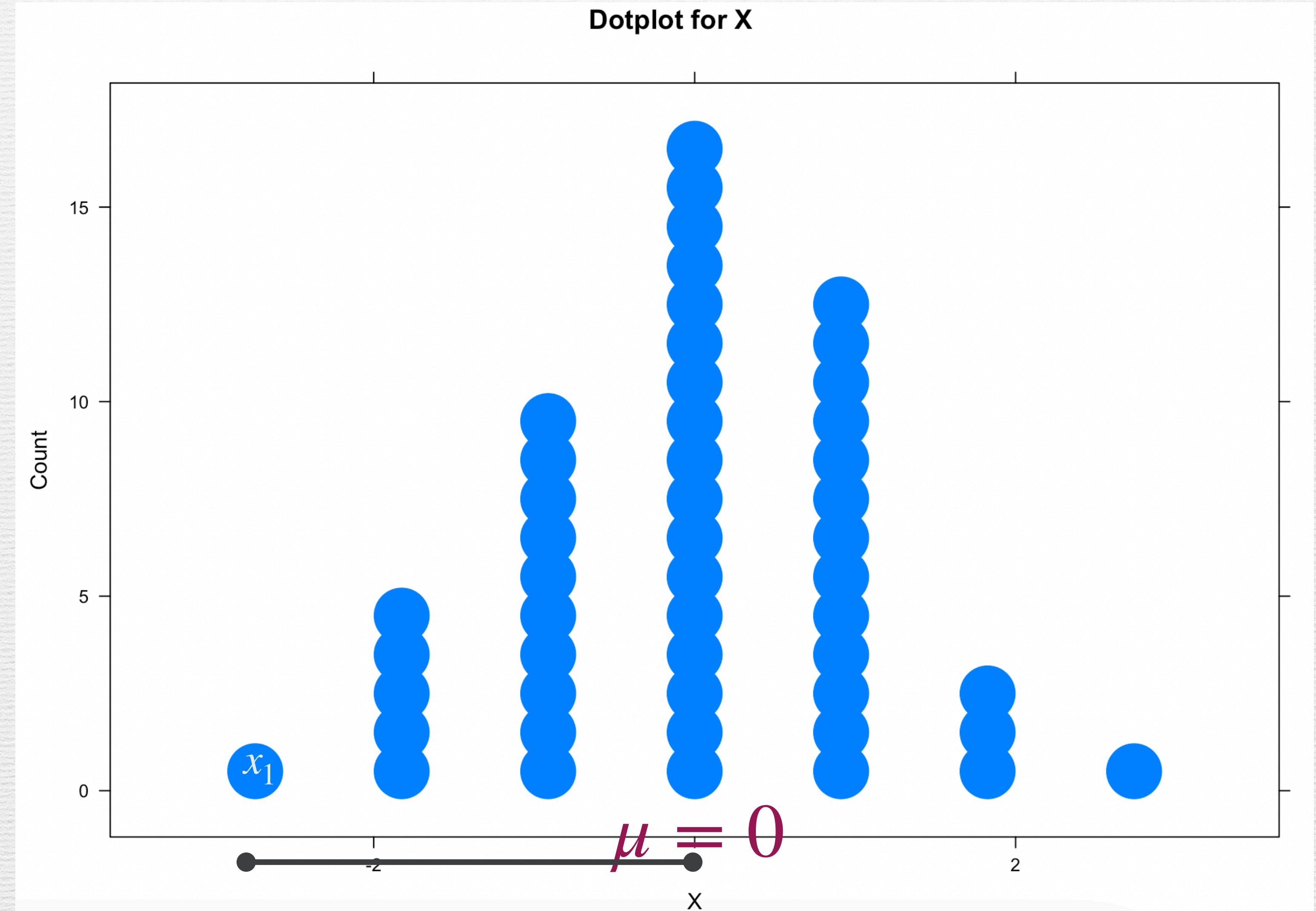
μ

Standard Deviation

Calculate distance from mean
for each observation :

$$x_1 - \mu$$

$$-2.5 - 0 = -2.5$$

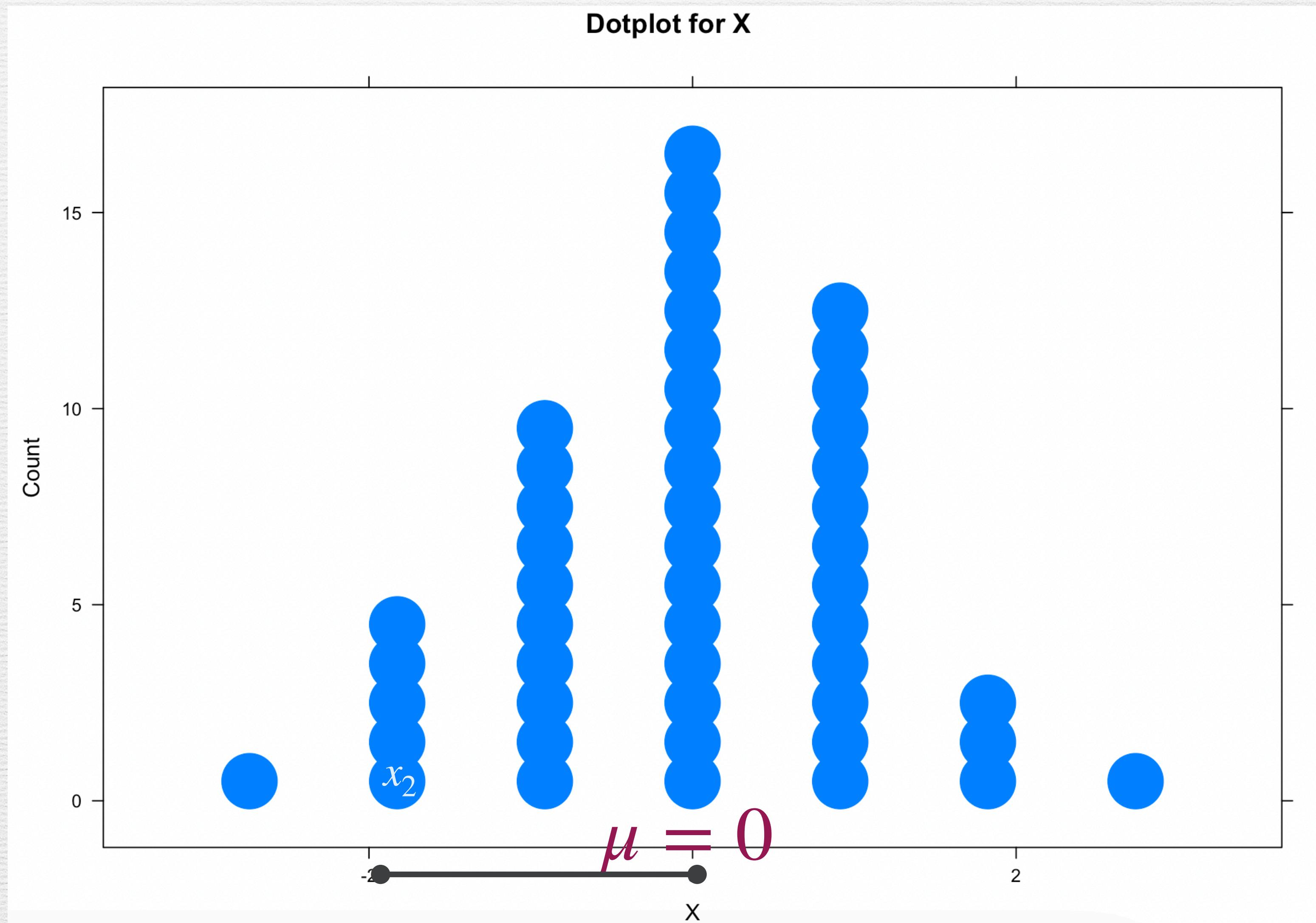


Standard Deviation

Calculate distance from mean
for each observation :

$$x_2 - \mu$$

$$-2 - 0 = -2$$



Standard Deviation

Calculate distance from mean
for each observation :

$$x_1 - 0$$

$$x_2 - 0$$

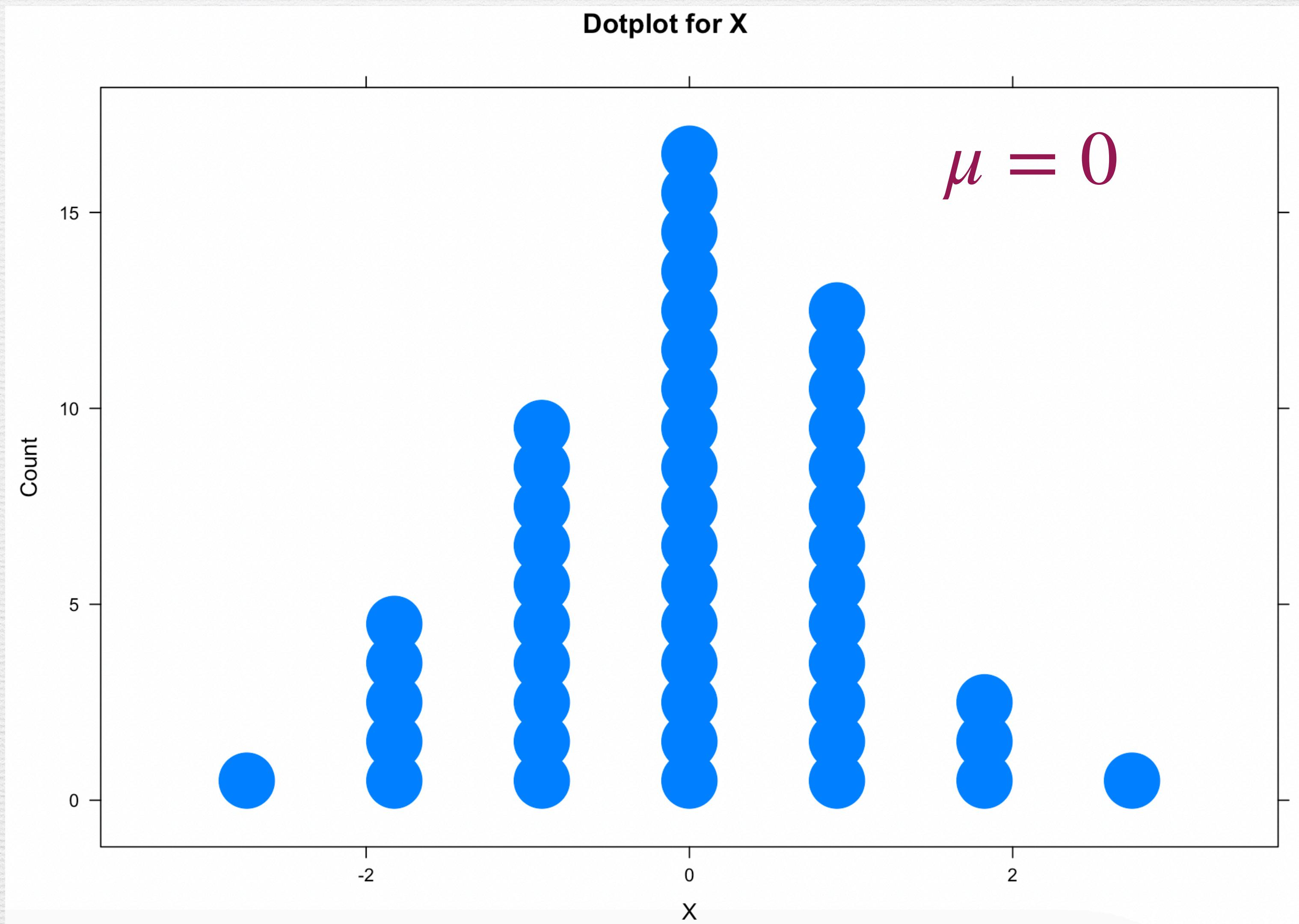
$$x_3 - 0$$

.

.

.

$$x_n - 0$$



Standard Deviation

Standard Deviation for Population

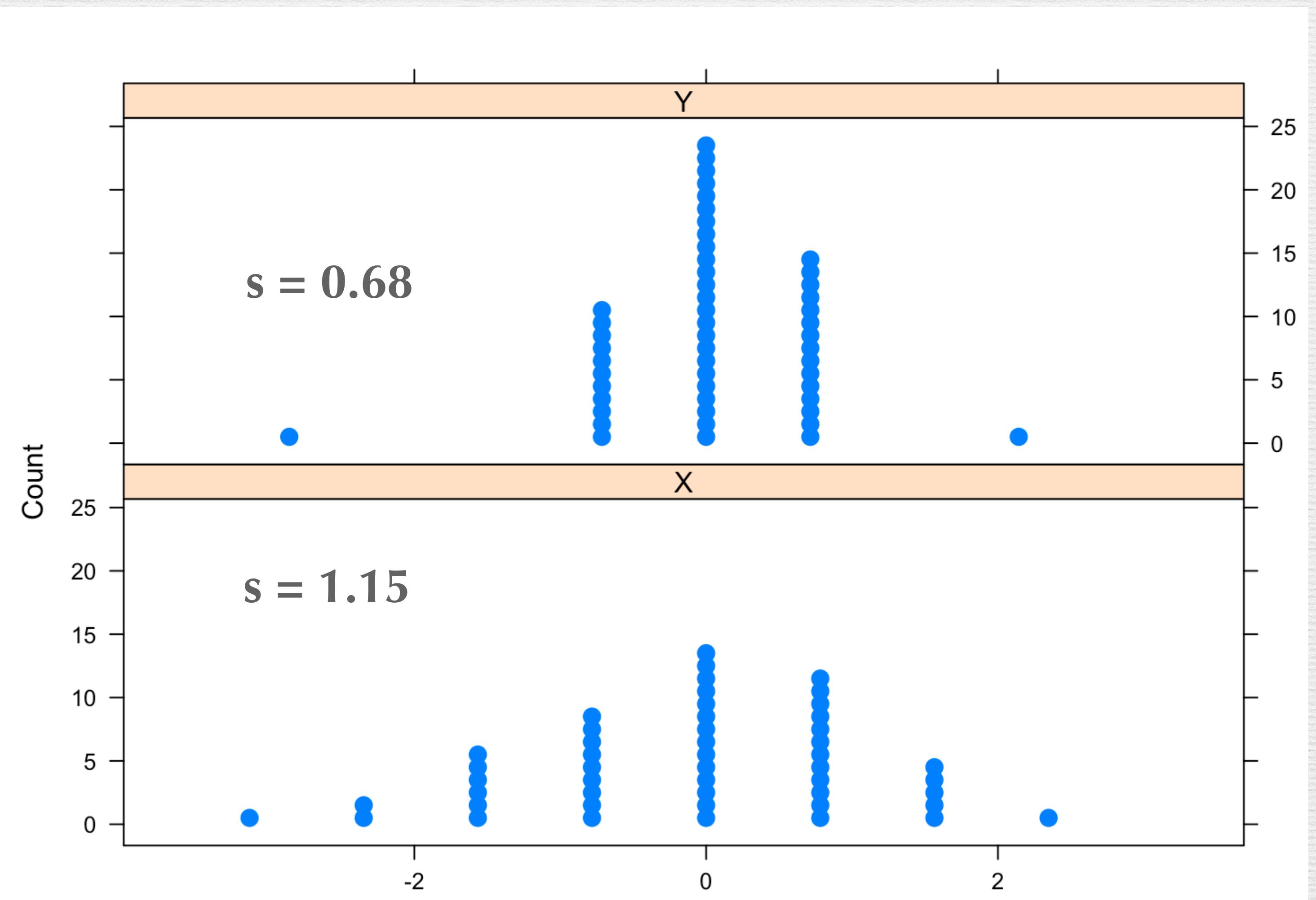
$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$

Standard Deviation for a Sample

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}}$$

`favstats()` function in **mosaic**

Recall:

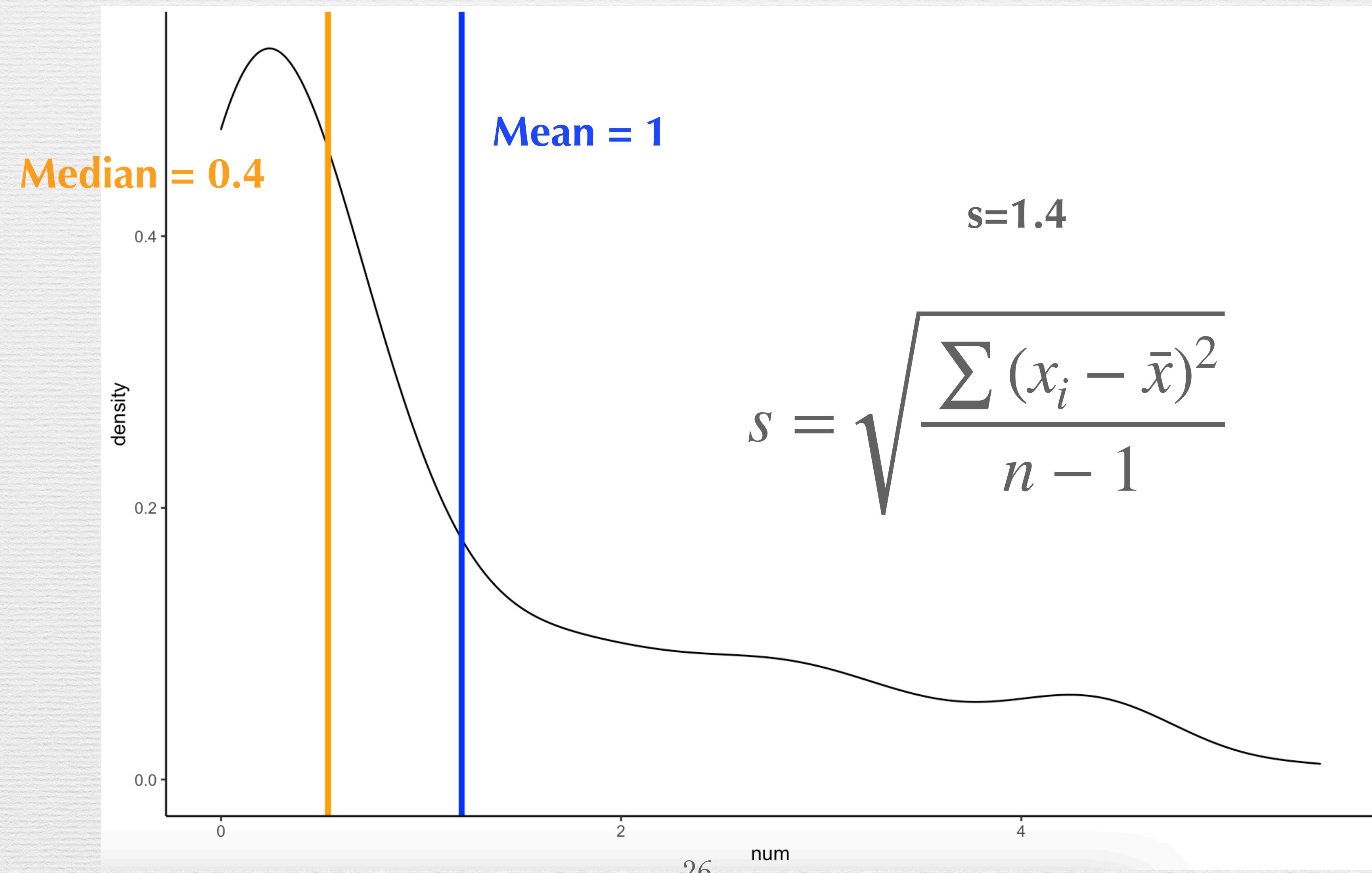




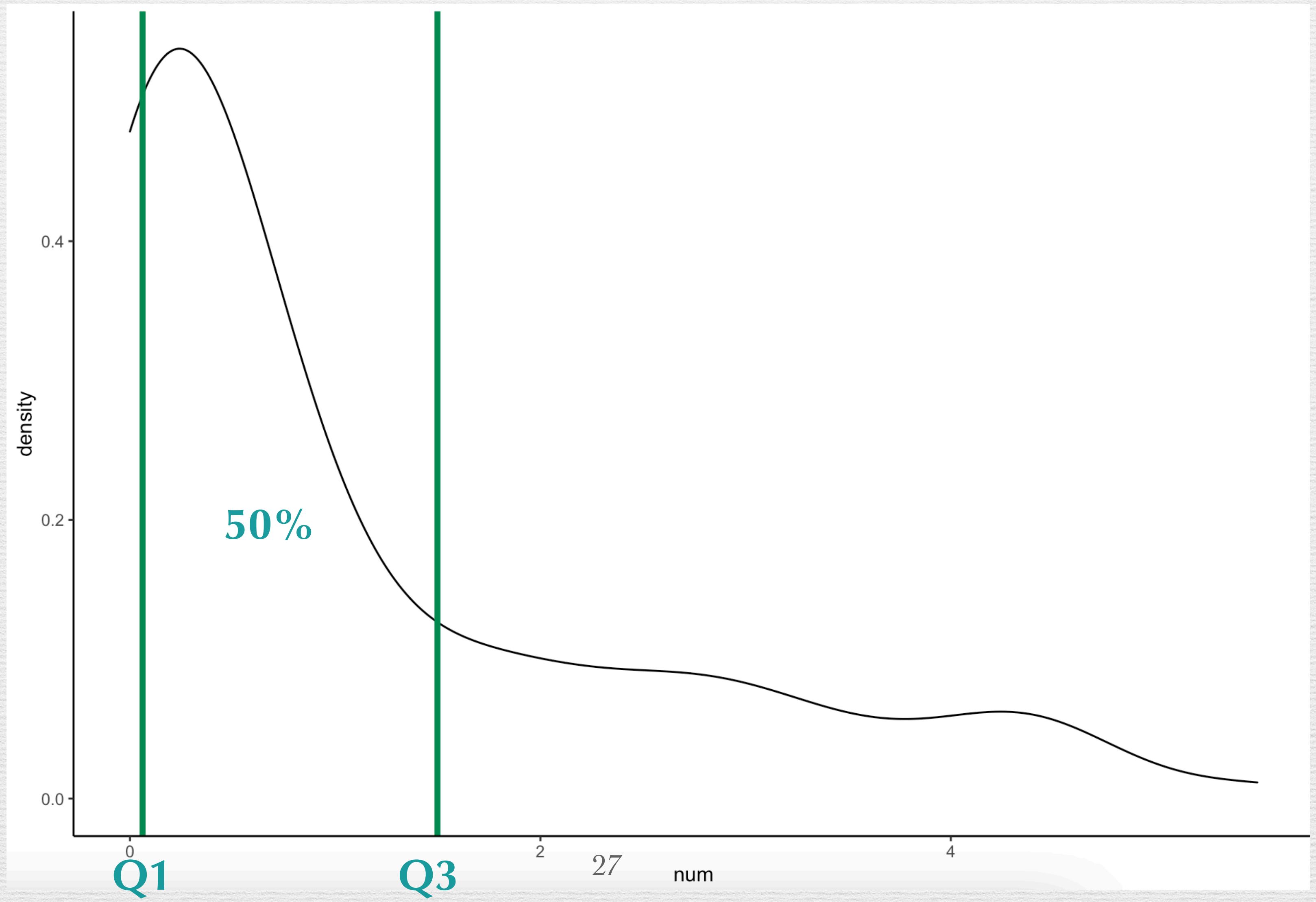
Activity

<https://jamboard.google.com/d/1ds7Cslavrmr4-dYW9AC5Y3fF1bcER8TX2PwcFxesuwo/viewer?f=5>

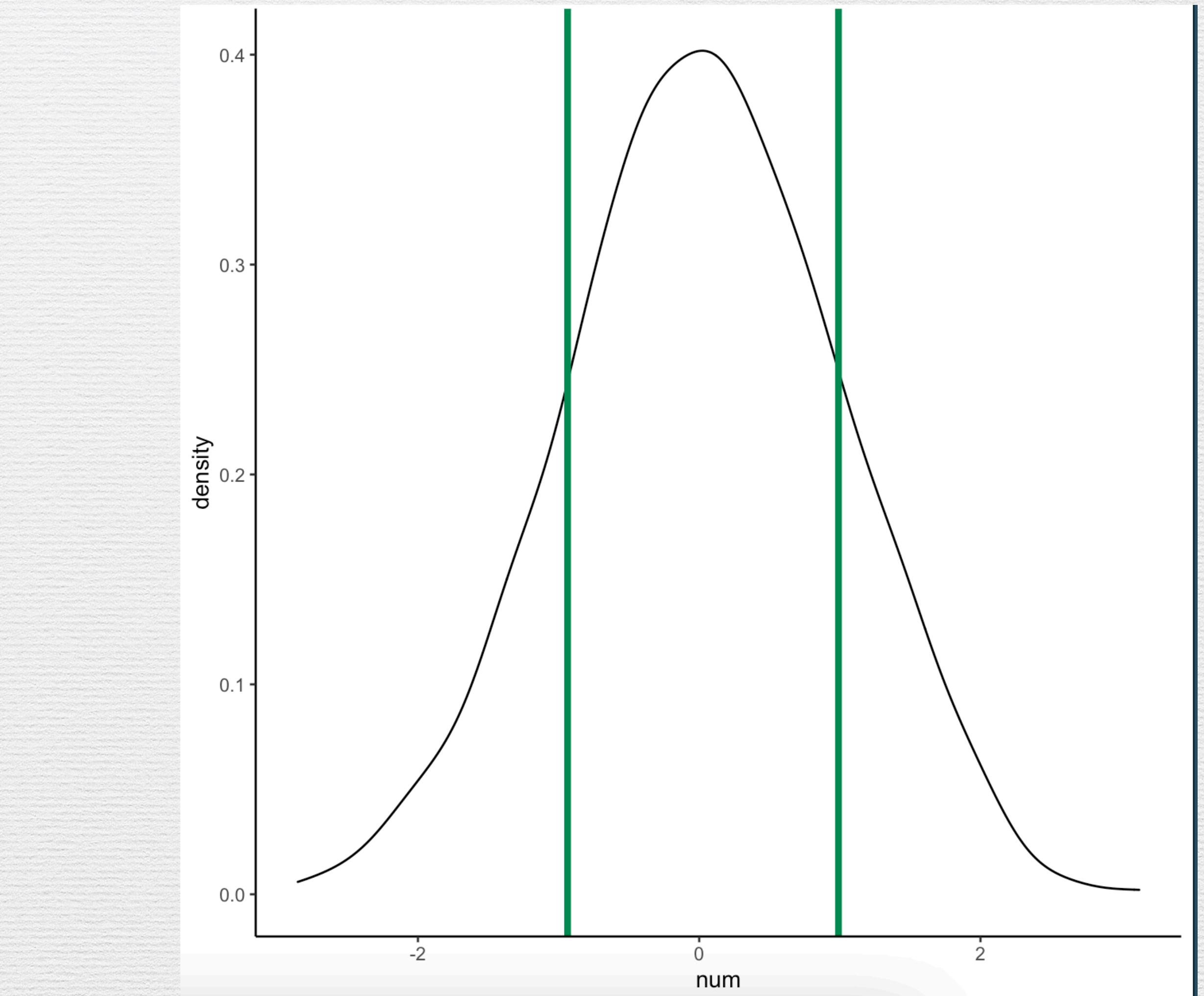
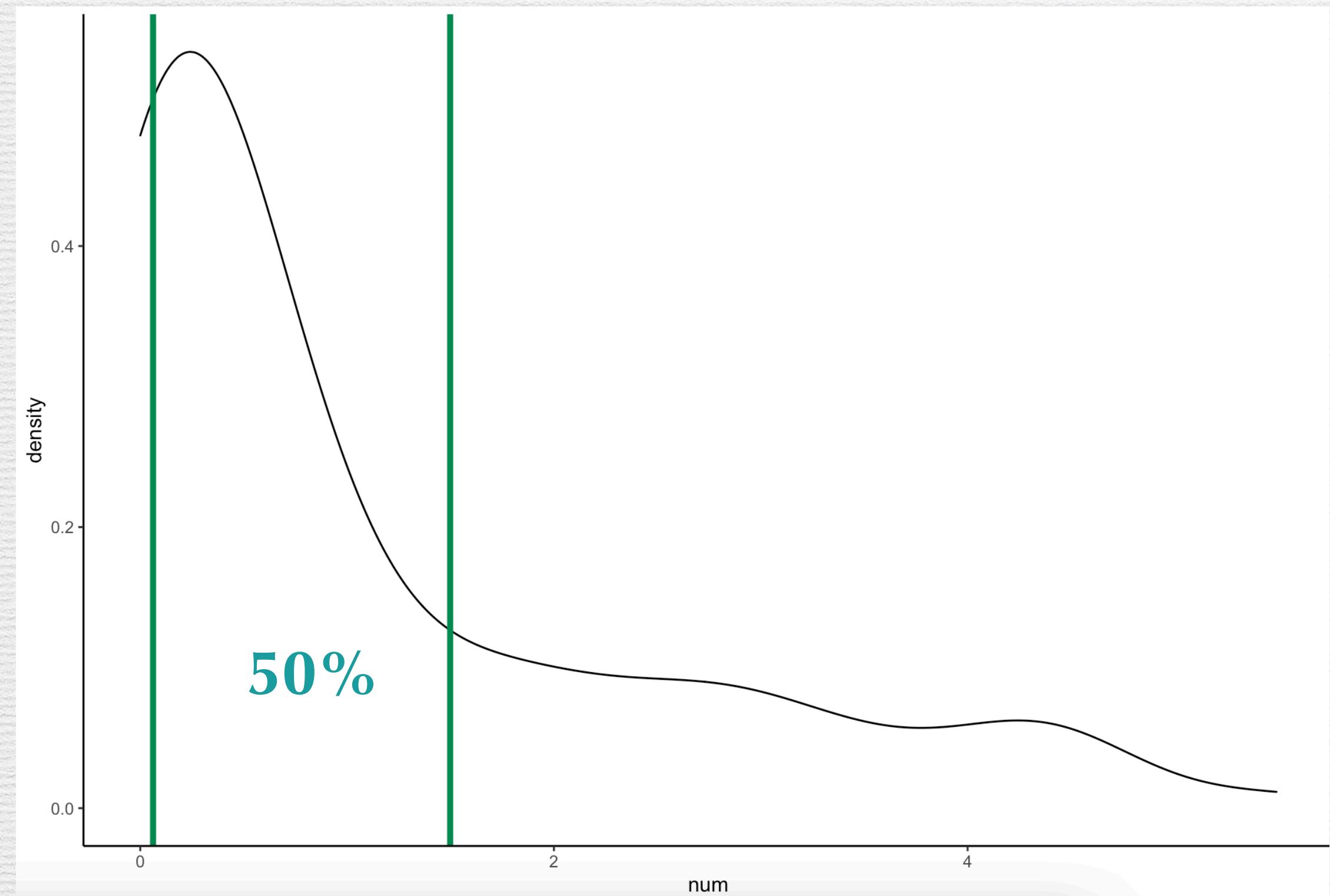
Skewed Distributions



Skewed Distributions



Describing Data Tip



Key Ideas

- Standard Deviation: a measure of variability telling us, on average, how far cases are from the mean
- Most useful for symmetric distributions



Thank you!

Questions?

References

- Slide 5: Content
 - [Data Story Bytes](#)
 - [GAISE](#)
 - [Curricular Guidelines for Undergraduate Programs](#)
 - [National Academies: Data Science for Undergraduates](#)
 - Nicholas J. Horton (2015) Challenges and Opportunities for Statistics and Statistical Education: Looking Back, Looking Forward, *The American Statistician*, 69:2, 138-145, DOI: 10.1080/00031305.2015.1032435
- Slide 6: Technology
 - [learnR](#)
 - [A paper about teaching code thoughtfully](#)
- Slide 7: Assessment
 - [Laura's Article Summary Activity](#)
- Slide 24: Activity
 - [Weather data](#)