

A photograph of a fruit market stall. In the foreground, there are large piles of oranges and red apples. The background is blurred, showing more fruit and market structures.

# POLS 095: Methods in Politics

**Measurement: Comparing Apples and Oranges**

# Variables



What is a variable?



Must it be quantitative?

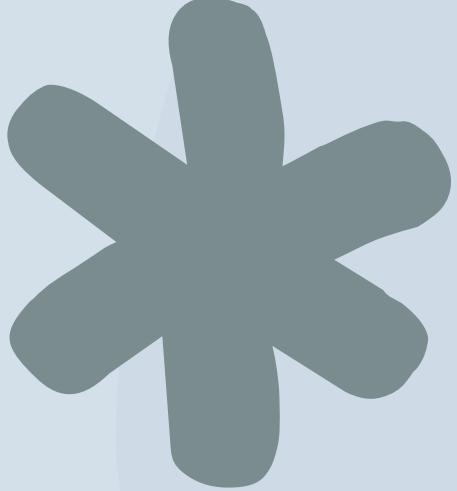


What distinguishes a  
*variable* from a *constant*?



Can you identify any variables or constants capturing the characteristics of these kittens?





## Variables

- What does the adage “comparing apples and oranges” mean?
- Variables: characteristics whose values vary systematically across observations
  - Variables differ in how precisely they measure an empirical characteristic
- What are some variables we could use to characterize fruit?

# Are apples and oranges comparable?



Unit of analysis: piece of fruit



Observation: each piece of fruit

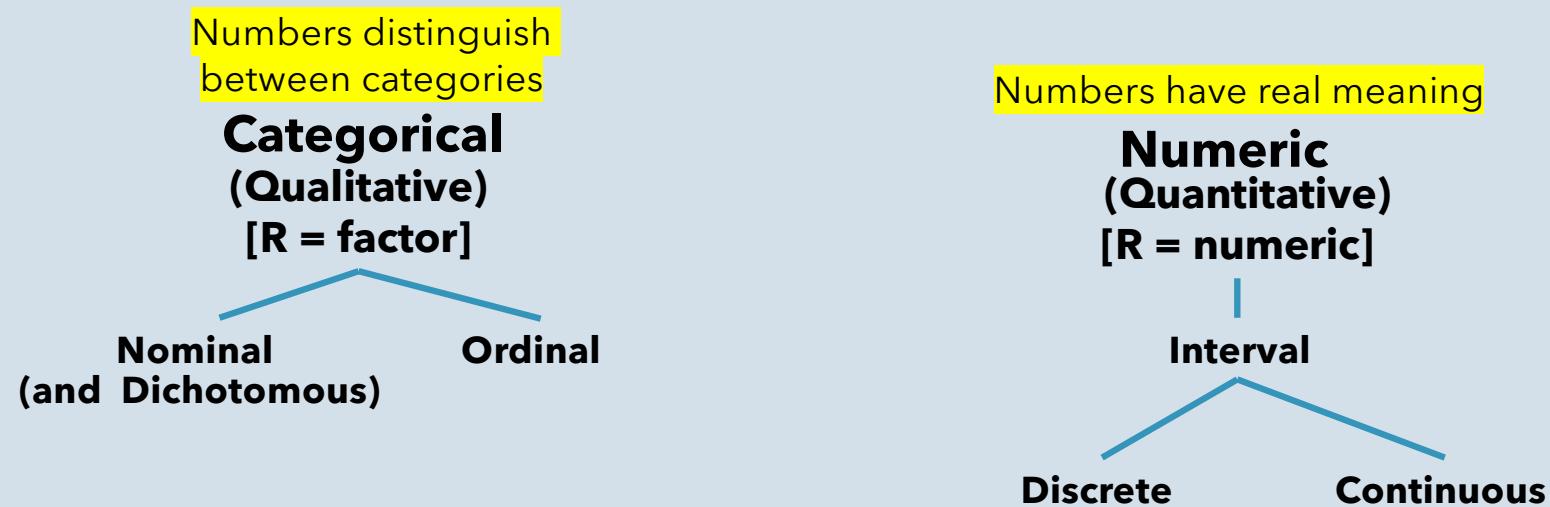


Measurement



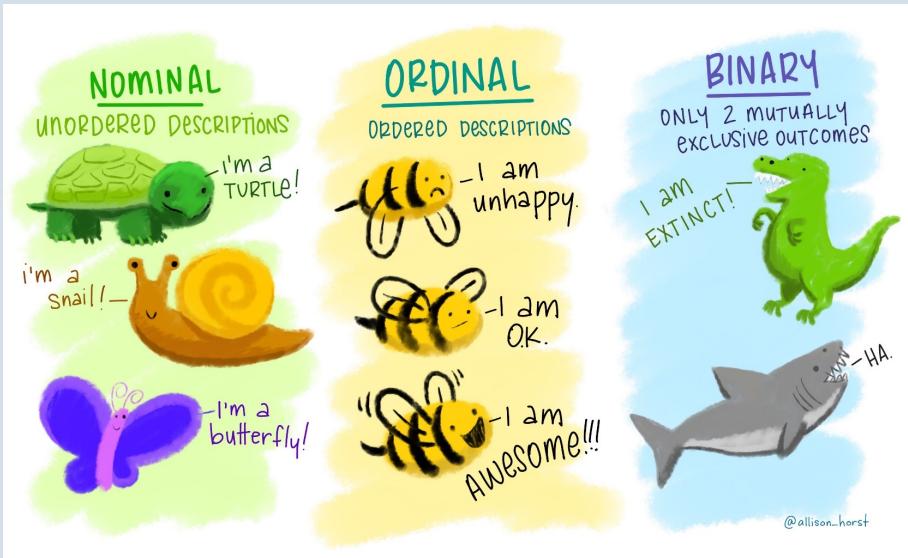
Data

# Levels of measurement

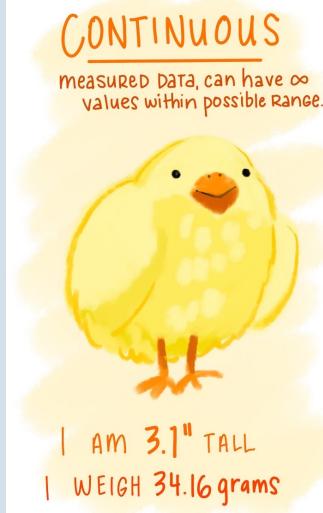


# Levels of measurement: nominal, ordinal, and continuous

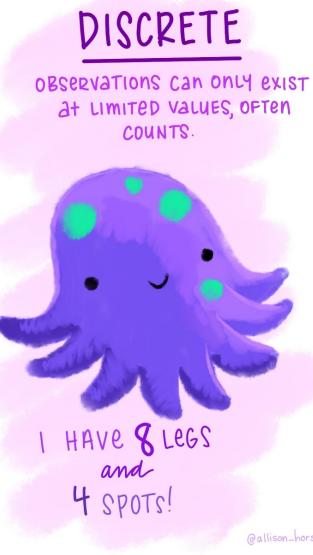
## Factor



## Numeric



## Interval



Differences between measurements, true zero exists

## Ratio Data

Differences between measurements but no true zero

## Interval Data

Ordered Categories (rankings, order, or scaling)

## Ordinal Data

Categories (no ordering or direction)

## Nominal Data

Quantitative Data

Qualitative Data

# Levels of Measurement

Nominal	Ordinal	Interval	Ratio
"Eye color"	"Level of satisfaction"	"Temperature"	"Height"
Named	Named	Named	Named
	Natural order	Natural order	Natural order
	Equal interval between variables	Equal interval between variables	Has a "true zero" value, thus ratio between values can be calculated

### *TYPES OF VARIABLES*

<b>Characteristic</b>	Nominal	Ordinal	Interval	Ratio
Implied ordering?	No	Yes	Yes	Yes
Implied distance between successive numbers?	No	No	Yes	Yes
Intervals between successive ranks equal?	No	No	Yes	Yes
Zero point?	None	Arbitrary	Arbitrary	Absolute
Application examples	Gender Social Class	Batteries Shoes	Temperature IQ	Age Weight

OK to compute....	Nominal	Ordinal	Interval	Ratio
frequency distribution	Yes	Yes	Yes	Yes
median and percentiles	No	Yes	Yes	Yes
add or subtract	No	No	Yes	Yes
mean, standard deviation, standard error of the mean	No	No	Yes	Yes
ratio, or coefficient of variation	No	No	No	Yes

## Causality and variance

- All of the fruit has some value on the variable “color”
- Can color explain why some fruit are sweeter?





Describing the distribution of a variable

1. Central tendency or typical value
2. Dispersion (spread)



# Describing the distribution of a variable

- Other ways to describe distribution

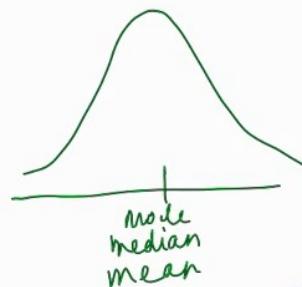


# Describing the distribution of a variable

- Other ways to describe distribution
- Skew (negative or positive)

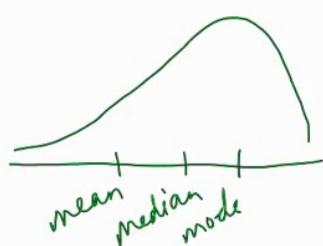
The relative location of the mode, median, and mean in a unimodal distribution:

Symmetric



For a symmetric distribution, the mean, median, and mode are all approximately the same.

Left-skewed



For a left-skewed distribution, the mode is larger than the median which is larger than the mean.

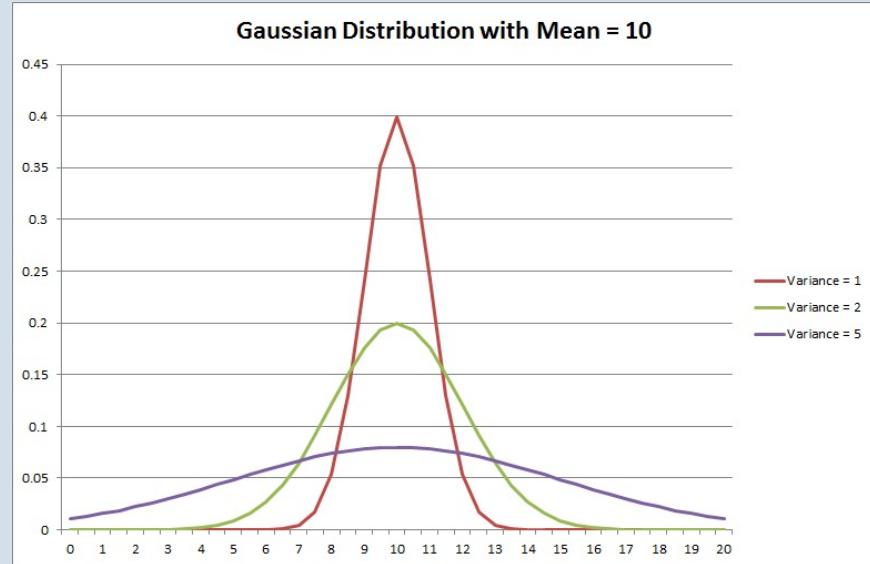
Right-skewed



For a right-skewed distribution, the mode is less than the median, which is less than the mean.

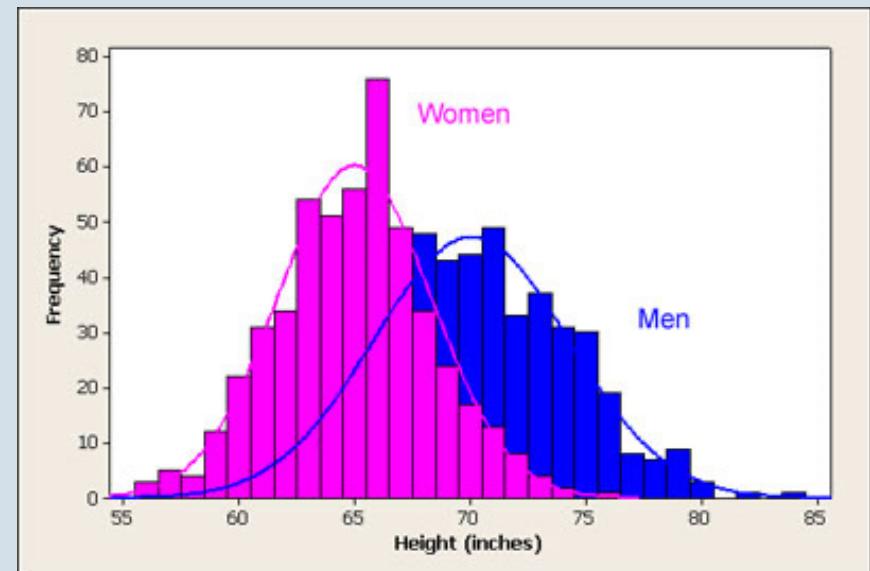
# Describing the distribution of a variable

- Frequency and relative frequency tables
- Bar charts and histograms
- Quantiles (e.g., quartiles, percentiles)
- How stretched the distribution is
- What sorts of description are possible for nominal, ordinal, and continuous levels?



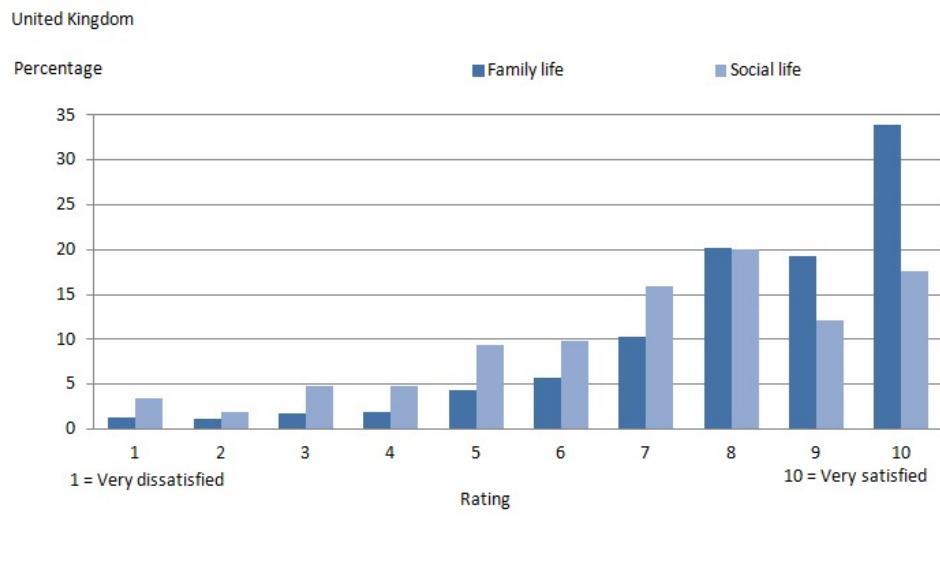
# Mean

- For interval level data that has a symmetric distribution
  - Can also be used for dichotomous data where the mean will yield the % for each category (ex. % red apples vs. % not red apples)

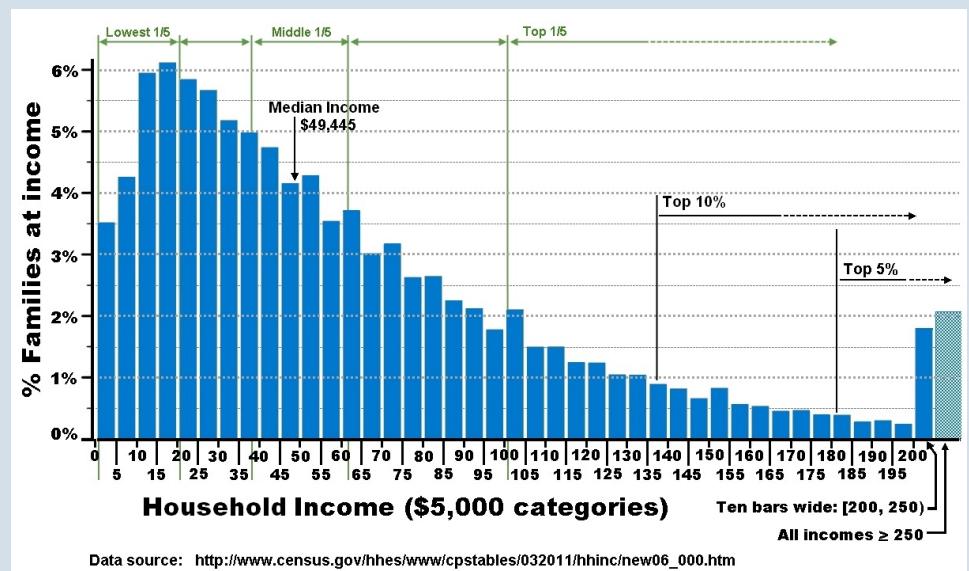


# Median

- For:
  - Ordinal level data  
(Satisfaction with life)



Interval level data that has a skewed distribution  
(Income)



# Mode

- For categorical level data
- “What is the typical car brand on the road?”

