Monday, September 24, 2018

- Warm-up
  - Create a scatterplot, find the r and equation for the following data:

Table 1. Sample of spousal ages of 10 White American Couples.

Husband	36	72	37	36	51	50	47	50	37	41
Wife	35	67	33	35	50	46	47	42	36	41

- Check homework
- Lurking & Confounding Variables

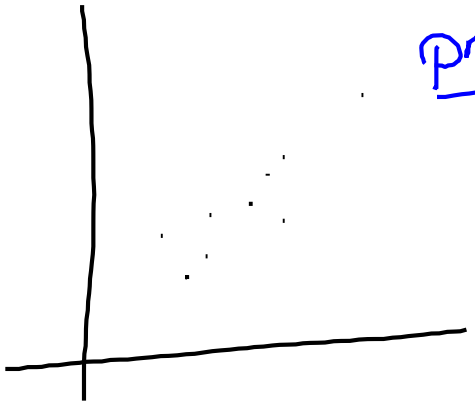
Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

Table 1. Sample of spousal ages of 10 White American Couples.

Husband	36	72	37	36	51	50	47	50	37	41
Wife	35	67	33	35	50	46	47	42	36	41

← x

← y



$r = 0.973$ strength direction

predicting

$y = 0.887x + 2.620$

wife = 0.887husband + 2.620

Table 1. Sample of spousal ages of 10 White American Couples.

Husband	36	72	37	36	51	50	47	50	37	41
Wife	35	67	33	35	50	46	47	42	36	41

$\hat{wife} = 2.62 + 0.887\,husband$

Interpret...

Correlation ≠ Causation

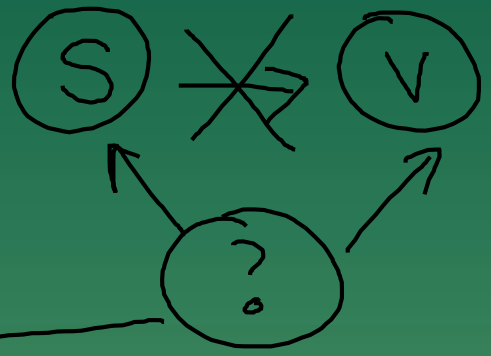
- Scatterplots and correlation coefficients **never** prove causation.
- A hidden variable that stands behind a relationship and determines it by simultaneously affecting the other two variables is called a **lurking variable**.

Content/Language Objective: I will be able to correctly discuss the meaning of association and correlation using a scatterplot and correlation coefficient both in writing and with my group/teacher/class.

Social Objective: I will participate respectfully so that my classmates and I can be part of the lesson.

ESSENTIAL QUESTION: What is the difference between association and correlation and how is it reflected in a coefficient or scatterplot?

KEY TERMS



- Extraneous variables
  - Lurking variable
    - A variable, usually unobserved (not measured), that influences the association between the variables of primary interest
  - Confounding variable
    - A variable that is associated with both response variables and is observed. This variable has an impact on both variables.

Content/Language Objective: I will be able to correctly discuss the meaning of association and correlation using a scatterplot and correlation coefficient both in writing and with my group/teacher/class.

Social Objective: I will participate respectfully so that my classmates and I can be part of the lesson.

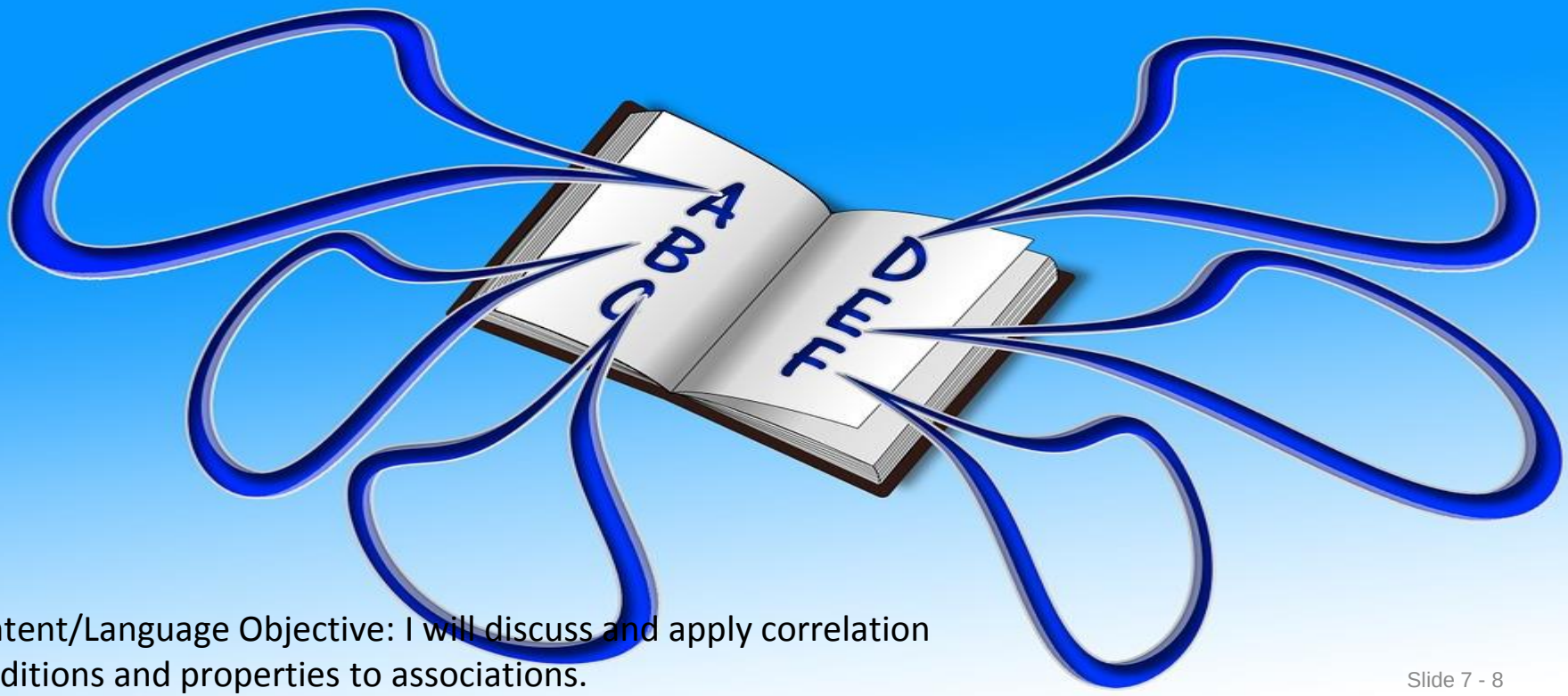
ESSENTIAL QUESTION: What is the difference between association and correlation and how is it reflected in a coefficient or scatterplot?

A Little Freakonomics

A little More Freakonomics

Example

- **A sample of students from grades 1, 6, and 12 of Lake Wobegon school district showed a correlation of 0.81 between students' height and vocabulary score. Is there a causal relationship between height and vocabulary?**



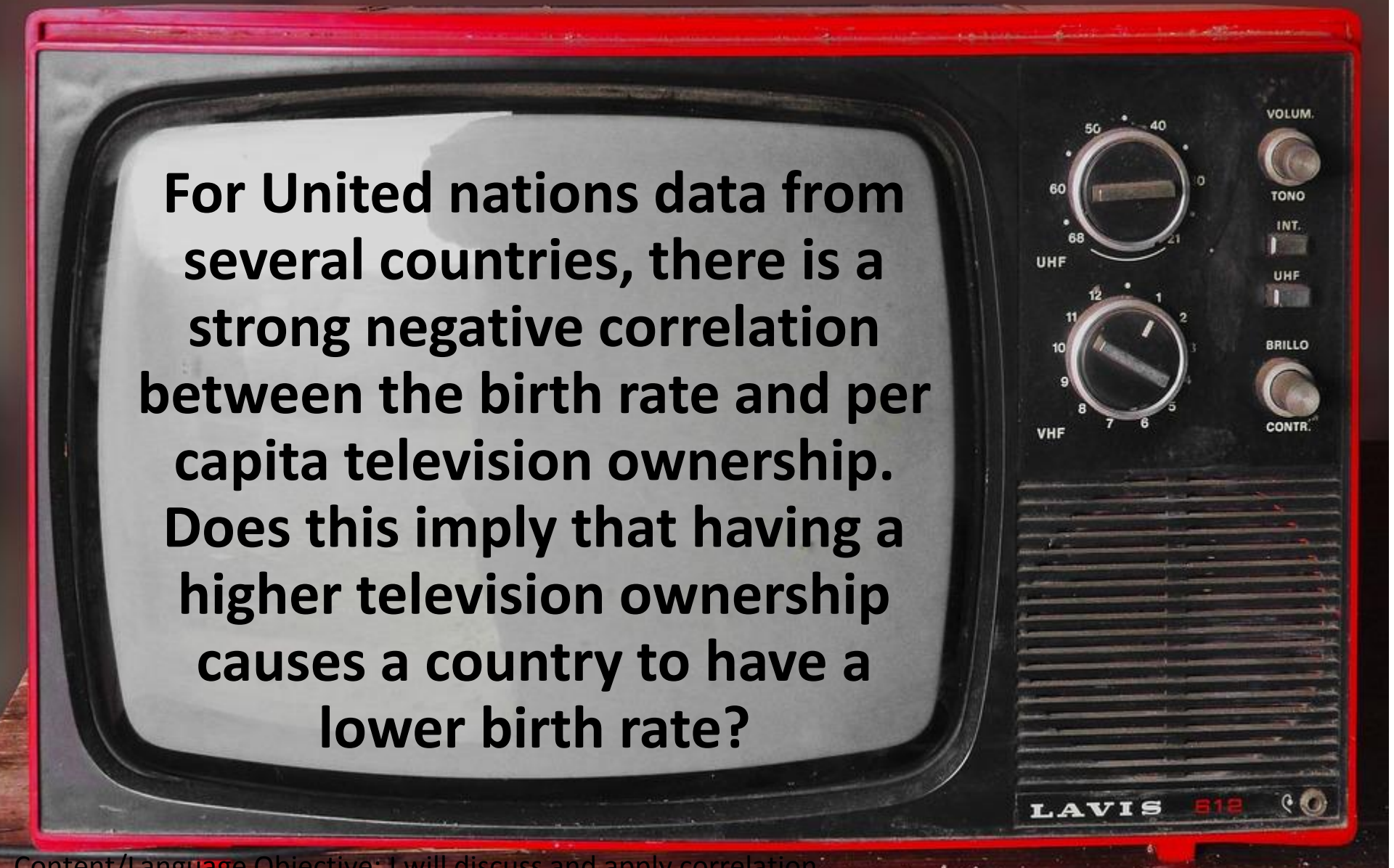
Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

More Examples

- If the correlation between the number of firefighters at a fire and the damage the fire causes is positive (say 0.85), does this mean that more firefighters at a fire causes more damage?

Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

Another Example



For United nations data from several countries, there is a strong negative correlation between the birth rate and per capita television ownership. Does this imply that having a higher television ownership causes a country to have a lower birth rate?

Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

More examples

Researchers found that women who don't work during pregnancy tend to have healthier babies. The conclude that going to work while pregnant can have a harmful impact on the health of the child.

Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

More examples

Researchers found that adults going out to eat after 9:00 PM tend to wake up the next morning with headaches more often. They conclude that restaurants lower theirs standards as the night get later and as a result the consumers don't feel well the next morning.

Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

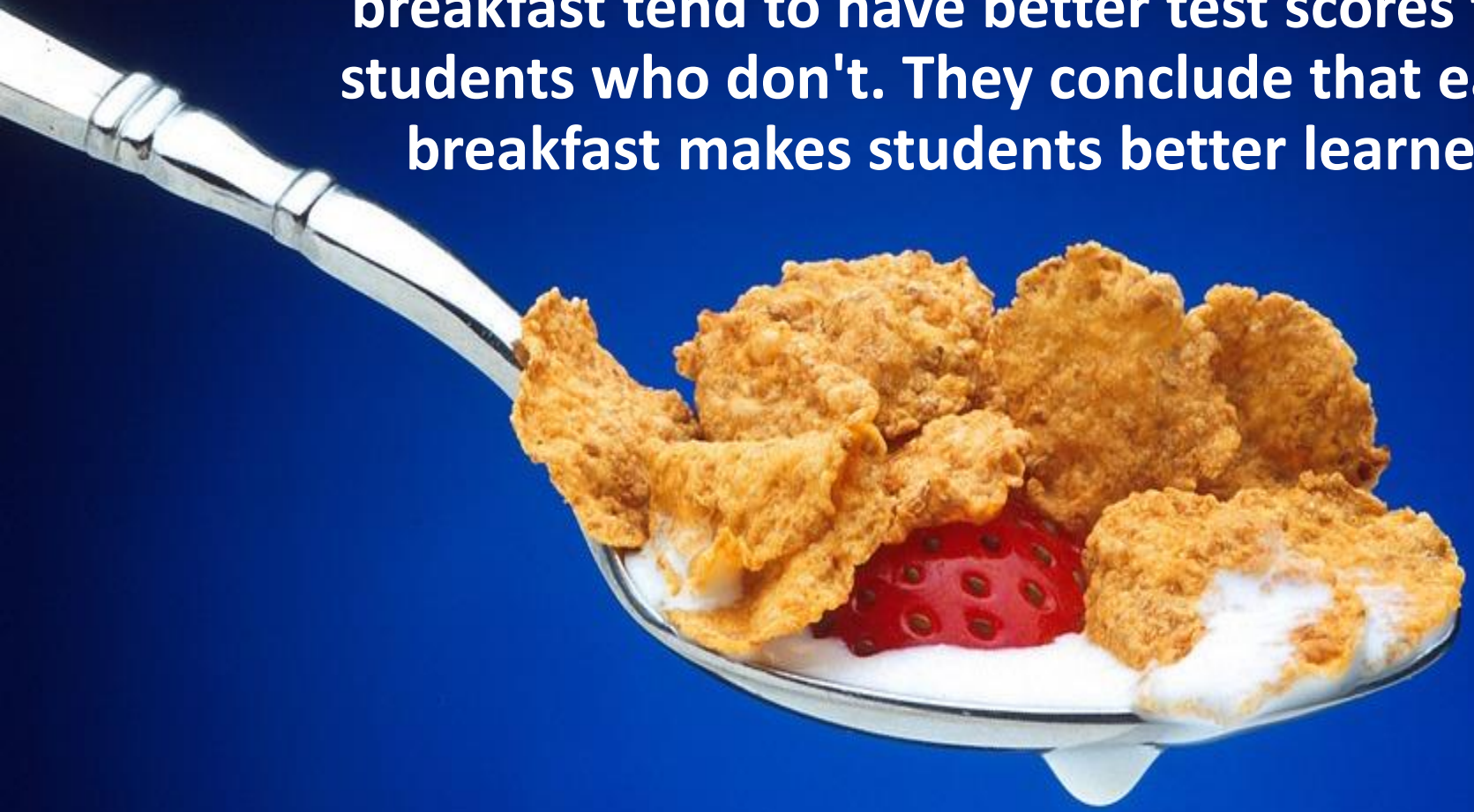
More examples

Researchers looked at countries around the world and found a positive correlation between CO_2 emissions and life expectancy. They concluded that carbon dioxide emissions are good for your health.

Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

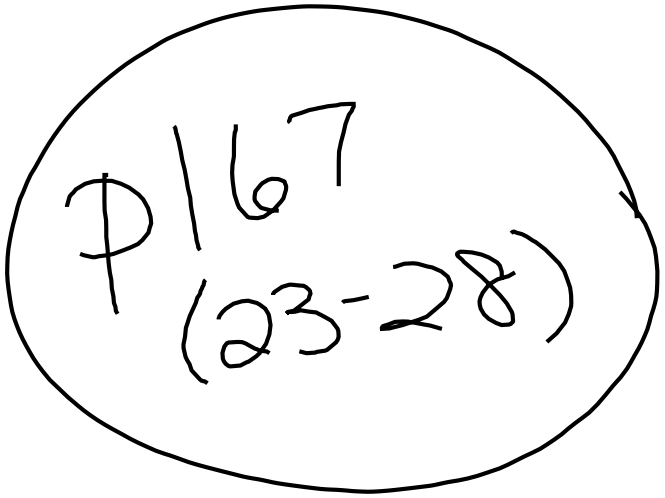
More examples

Researchers found that students who eat breakfast tend to have better test scores than students who don't. They conclude that eating breakfast makes students better learners.



Content/Language Objective: I will discuss and apply correlation conditions and properties to associations.
Social Objective: I will participate in class discussions.

A more controversial one...



Homework