Bivariate Tables

EDP 613

Week 9

A Note About The Slides

Currently the equations may not show up properly in Firefox. Other browsers such as Chrome and Safari do appear to render them correctly.

Terms

bivariate - Doing something with two variables

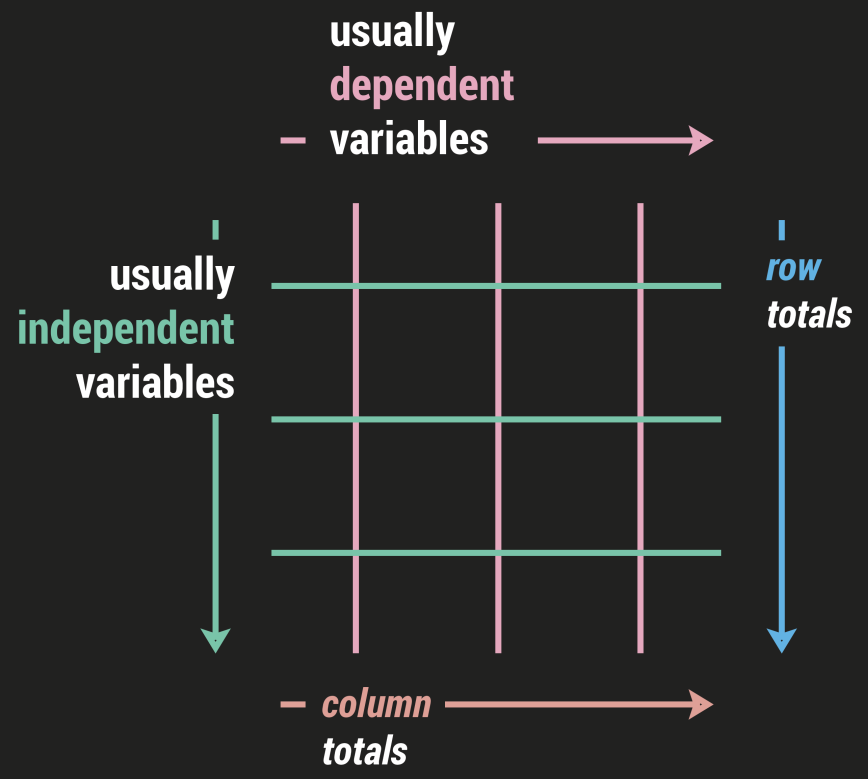
bivariate analysis

> - *Formally*: A statistical method to detect and describe the relationship between two nominal or ordinal variables (typically independent and dependent variables)
> - *Nutshell*: Finding out if and how two variables are related to each other

cross-tabulation

> - *Formally*: A tool for analyzing the relationship between two or more nominal or ordinal variables
> - *Nutshell*: A data table to compare the values between two variables
> - *Note*: A good approach when establishing "control" variables

Bivariate Tables



totals are also known as *marginals*

Creating a Cross-Tabulation Using Raw Data

- Column totals: Add across columns
- Row totals: Add across rows

Example of Cross-Tabulation Using Raw Data

Views on Candy Corn			
	Sentiment		
	Delicious	Disgusting	
Yes	4	7	11
No	6	9	15
	10	16	26

Creating a Cross-Tabulation Using Percents

Column percentages :

Use column totals as a denominator of the row values.

Row percentages :

Use column totals as a denominator of the row values.

Note: Percentages are typically given for the independent variable.

Example of Cross-Tabulation Using Percents

	Views on Candy Corn		
	Sentiment		
	Delicious	**Disgusting**	
Yes	40.00% (4)	43.75% (7)	42.30% (11)
No	60.00% (6)	56.25% (9)	57.69% (15)
N	(10)	(16)	(26)

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That is a **contingency table**

Specifically a **2 x 2 contingency table**

Why Do We Care?

Well we use them if we want to

- *partition* the dependent and independent variables
- detect if a relationship *exists* between the dependent and independent variables
- measure how *strong* a relationship may be (known as a *measure of association*)
- determine the *direction* of a relationship

This Way or That Way

The direction of a relationship can be

positive if the dependent and independent both go in the same direction up or down

negative if the dependent and independent go in opposite directions

Example of a Positive Relationship

Health Condition by SES			
	Sentiment		
	Low	**Middle**	**High**
Poor	39% (15)	12% (32)	9% (18)
Fair	36% (14)	45% (114)	28% (57)
Good	25% (10)	43% (109)	63% (127)
N	(39)	(254)	(202)

Source: General Social Survey: 1987-1992

Example of a Negative Relationship

Frequency of Trauma by SES			
	Sentiment		
	Low	**Middle**	**High**
Poor	31% (15)	41% (90)	48% (86)
Fair	22% (10)	42% (92)	20% (36)
Good	47% (23)	17% (38)	32% (58)
N	(48)	(220)	(180)

Source: General Social Survey: 1987-1992

Other Explanations

hours studying & grades

partying & assessments

sleep & performance

Color of your car & how well you do in EDP 613

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Elaborate

- A **control variable** is a special type of variable that doesn't change. We can use it to compare the possible effects of a treatment.
- **Elaboration** is a specific type of bivariate relationship where control variables are introduced.

Testing for an intervening relationship

- **Intervening variable** - A control variable that follows an independent variable but precedes the dependent variable in a causal sequence
- **Intervening relationships** - The control variable intervenes between the independent and dependent variables

Example: Examining two variables before considering a third one

- independent variable: Attending weekday parties
- dependent variable: Grades
- intervening variable (maybe): Hours studying

Example

- independent variable: Sale of ice cream
- dependent variable: Number of outdoor crimes
- intervening variable (maybe): Outdoor temperature

Testing for a spurious relationship

- **Spurious relationships** - Both the independent variable and the dependent variable are NOT
    1. not causally linked
    2. influenced by some third variable
    3. explained by a control variable
- **Nonspurious relationships** - Both the independent variable and the dependent variable
    - cannot by explained by a control variable

Example

- independent variable: Number of firefighters at the scene of a crime
- dependent variable: Property damage
- Possible cause prior to the control variable: Size of the fire

Elaborate

- A **control variable** is a special type of variable that doesn't change. We can use it to compare the possible effects of a treatment.
- **Elaboration** is a specific type of bivariate relationship where control variables are introduced.

Testing

Elaboration tests

- are useless on relationships that have been determined like
  - *causal* : At least one variable is found to directly effect another
- include relationships that are
  - *spurious* : Both an independent and dependent variable are influenced by some third party variable. If the third variable is unknown, it may appear that there is a causal link when there actually isn't one.
  - *intervening* : A control variable that comes after an independent variable but is before the dependent variable in a causal chain
  - *conditional* : An independent variable's effect on the dependent variable depends something within a control variable

Testing for a control relationship

control relationship - An independent variable's effect on the dependent variable depends on, or is conditioned by, a category of a control variable

Note: The relationship between the independent and dependent variables will change according to the different conditions (or categories) of the control variable

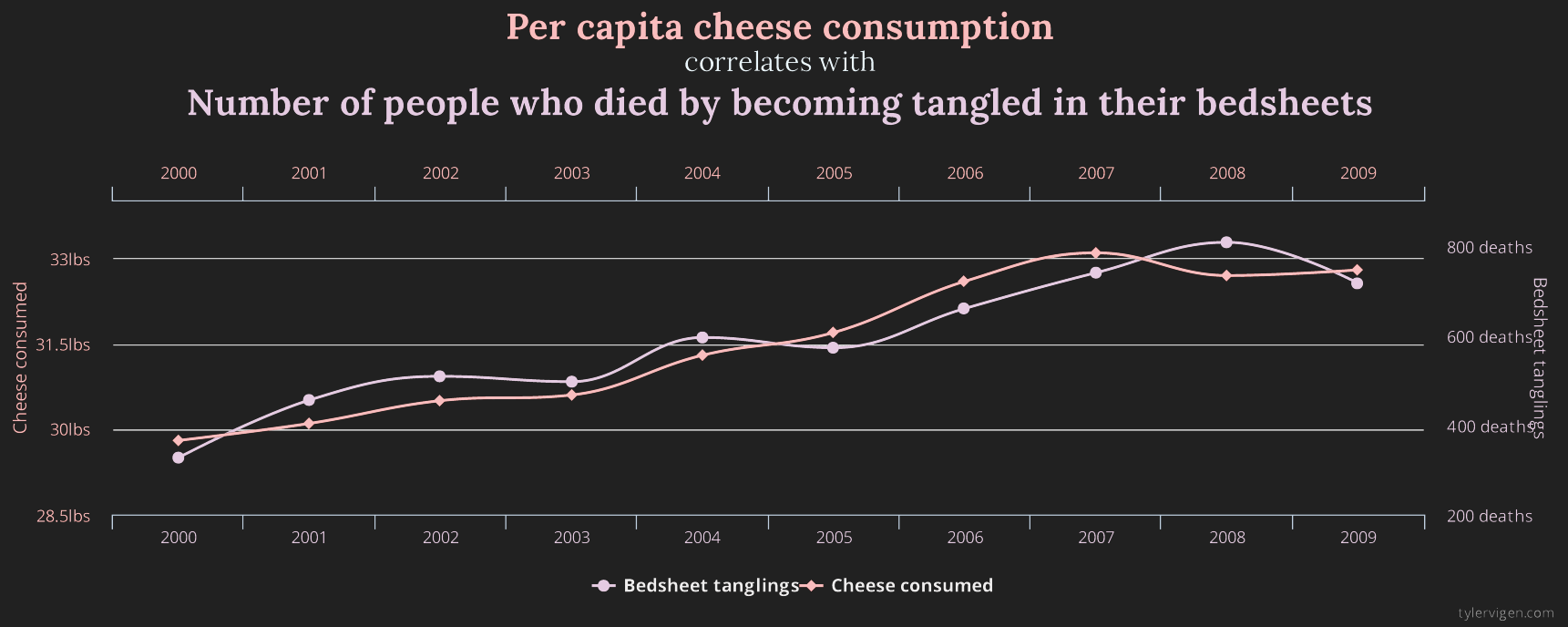
Example: Examining two variables before considering a control

- independent variable: Number of toys owned
- dependent variable: Hours spent playing with toys
- conditional variable (maybe): SES

Goals of Elaboration

1. *to* test for spurious relationships
2. *to* clear up the causal sequence of bivariate relationships by finding possible intervening variables
3. *to* specify the different conditions under which the original bivariate relationship might hold

That's it. Take a break before our R session!



See more ridiculous correlations at spurious correlations