Bivariate Tables

EDP 613

Week 11

A Note About The Slides

Currently the equations do not show up properly in Firefox. Other browsers such as Chrome and Safari do work.

What is Bivariate?

It just means doing things with two variables.

- **bivariate analysis** - A statistical method to detect and describe the relationship between two nominal or ordinal variables (typically independent and dependent variables).

- **cross-tabulation** - A tool for analyzing the relationship between two or more nominal or ordinal variables. This is a good approach when we want to establish *control* variables.

Constructing a Bivariate Table

There are three things to consider:

- **columns** - Typically the dependent variables.

- **rows** - Typically the independent variables.

- **marginals** - The totals of the row and columns.

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. (not a typo!)

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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)

Side Note: Contingency Tables

- The examples are known as **contingency tables**

- Specifically they are **2 x 2 contingency tables**.

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 Possible Scenarios

- Hours studying and grades

- Partying and assessments

- Sleep and performance

- Color of your car and how well you do in EDP 613

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 include

- Spurious relationships
- Intervening relationships
- Conditional Relationships

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

- Possible Intervening variable between the others: Hours studying

Example

- Independent variable: Sale of ice cream

- Dependent variable: Number of outdoor crimes

- Possible Cause Prior to the Control variable: Outdoor temperature

Testing for a spurious relationship

- **Spurious relationships** - Both the independent variable and the dependent variable are

    - not causally linked
    - influenced by some third variable
    - 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 include

- Spurious relationships
- Intervening relationships
- Conditional Relationships

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.

- 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

- Possible Conditional Variables: SES

Goals of Elaboration

1. Elaboration allows us to test for spurious relationships

2. Elaboration clarifies the causal sequence of bivariate relationships by introducing variables hypothesized to intervene between the independent and depependent variables

3. Elaboration specifies the different conditions under which the original bivariate relationship might hold.

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