

Stat 104 – Lecture 5

Association

- Variables
 - Response – an outcome variable whose values exhibit variability.
 - Explanatory – a variable that we use to try to explain the variability in the response.

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Association

- There is an association between two variables if values of one variable are more likely to occur with certain values of a second variable.

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Picturing Association

- Two Categorical (Qualitative).
 - Cross-tabs table, mosaic plot.
- Two Numerical (Quantitative).
 - Scatter diagram.

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Categorical Data

- Who?
 - Students in a statistics class at Penn State University.
- What?
 - “With whom is it easiest to make friends?” Opposite sex, same sex, no difference.
 - Gender. Male, female.

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Cross-tabs Table

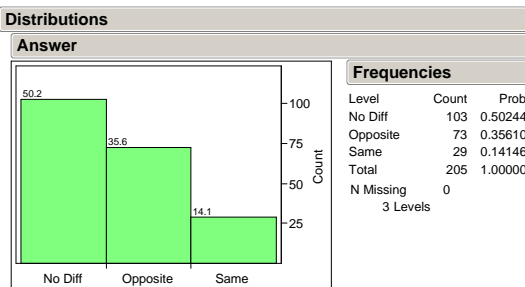
With whom is it easiest to make friends?

	Same Sex	Opposite Sex	No Diff	Total
Female	16	58	63	137
Male	13	15	40	68
Total	29	73	103	205

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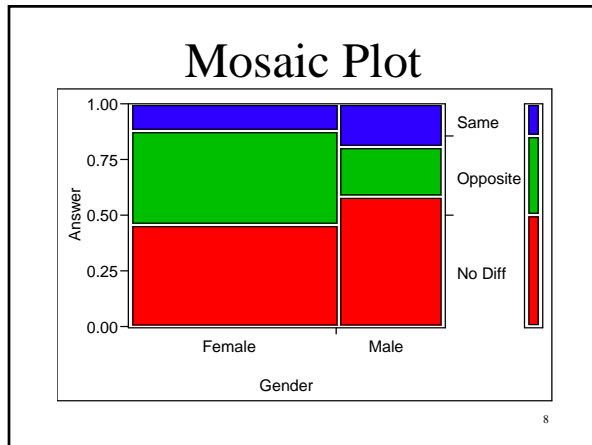
Bar Graph

With whom is it easiest to make friends?



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Percentages				
With whom is it easiest to make friends?				
Count Row %	Same Sex	Opposite Sex	No Diff	Total
Female	16 11.7%	58 42.3%	63 46.0%	137 100%
Male	13 19.1%	15 22.1%	40 58.8%	68 100%
Total	29	73	103	205



Interpretation

- More than 50% of males say no difference while less than 50% of females say no difference.
- Females are about twice as likely as males to say opposite.
- Males are about twice as likely as females to say the same.

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Scatter Plot

- Statistics is about ... variation.
- Recognize, quantify and try to explain variation.
- Variation in two quantitative variables is displayed in a scatter plot.

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Scatter Plot

- Numerical variable on the vertical axis, y , is the response variable.
- Numerical variable on the horizontal axis, x , is the explanatory variable.

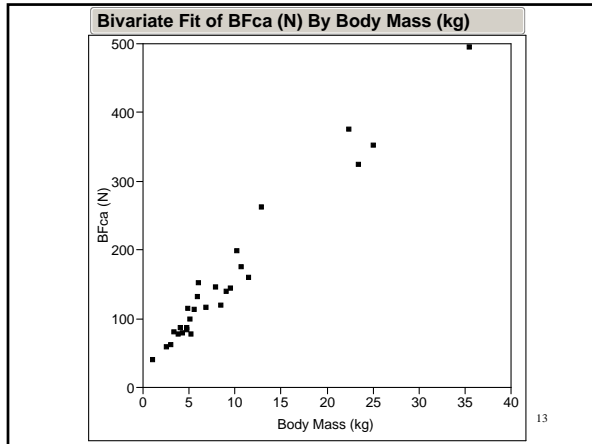
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Scatter Plot

- Example: Body mass (kg) and Bite force (N) for *Canidae*.
 - y , Response: Bite force (N)
 - x , Explanatory: Body mass (kg)
 - Cases: 28 species of *Canidae*.

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Positive Association

- Positive Association
 - Above average values of Bite force are associated with above average values of Body mass.
 - Below average values of Bite force are associated with below average values of Body mass.

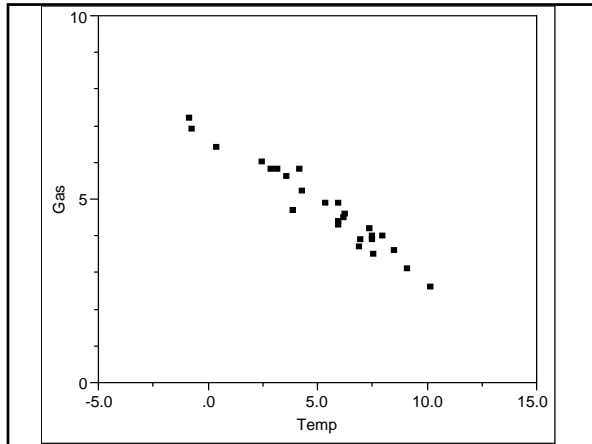
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Scatter Plot

- Example: Outside temperature and amount of natural gas used.
 - Response: Natural gas used (1000 ft³).
 - Explanatory: Outside temperature (° C).
 - Cases: 26 days.

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Negative Association

- Above average values of gas are associated with below average temperatures.
- Below average values of gas are associated with above average temperatures.

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Association

- Positive
 - As x goes up, y tends to go up.
- Negative
 - As x goes up, y tends to go down.

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