

# Stat 101 – Lecture 10

## Scatter plots and Association

- Statistics is about ... variation.
- Recognize, quantify and try to explain variation.
  - Variation in contents of cola cans can be explained, in part, by the type of cola in the cans.

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## Scatter plots and Association

- Response variable,  $y$ 
  - The variable of primary interest.
- Explanatory variable,  $x$ 
  - A variable used to try to explain variation in the response.

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## Scatter plots and Association

- When both the response and the explanatory variables are quantitative, display them both in a scatter plot.
- Look for a general pattern of association.

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# Stat 101 – Lecture 10

## Scatter plots and Association

- Example: Tar (mg) and nicotine (mg) in cigarettes.
  - $y$ , Response: Nicotine (mg).
  - $x$ , Explanatory: Tar (mg).
  - Cases: 25 brands of cigarettes.

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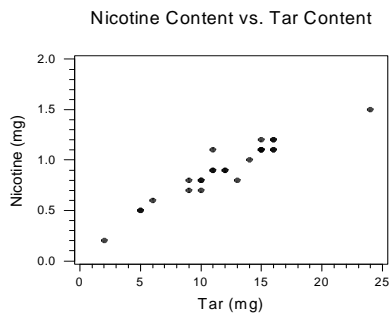
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## Scatter plot



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## Positive Association

- Positive Association
  - Above average values of Nicotine are associated with above average values of Tar.
  - Below average values of Nicotine are associated with below average values of Tar.

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## Negative Association

- Example: Outside temperature and amount of natural gas used.
  - Response: Natural gas used (1000 ft<sup>3</sup>).
  - Explanatory: Outside temperature (° C).
  - Cases: 26 days.

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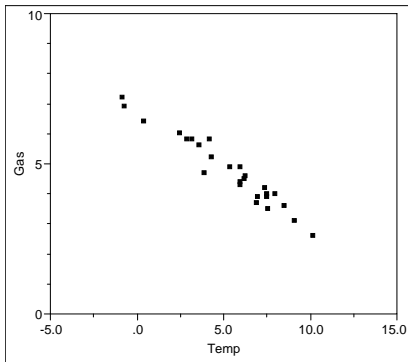
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## Negative Association



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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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# Stat 101 – Lecture 10

## Correlation

- Linear Association
  - How closely do the points on the scatter plot represent a straight line?
  - The correlation coefficient gives the direction of the linear association and quantifies the strength of the linear association between two quantitative variables.

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## Correlation

- Standardize y

$$z_y = \frac{y - \bar{y}}{s_y}$$

- Standardize x

$$z_x = \frac{x - \bar{x}}{s_x}$$

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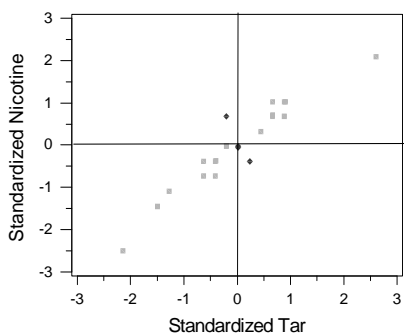
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Nicotine Content vs. Tar Content



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