

Quantitative methods

Week #2

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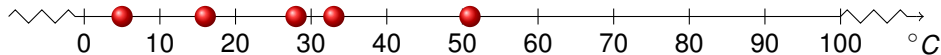


- 1 Types of error
 - Measurements
 - Gone Hunting
- 2 Elements of Research Design
 - Possible goals of research
 - Units of analysis
 - Ecological fallacy
 - Ecological fallacy
 - Variables and attributes
 - Types of variables and attributes
 - Relation between variables
 - Relationship between variables
- 3 Stages of Social Research

Measurements

Types of error

Measuring the temperature of a bowl of water kept at 60°C

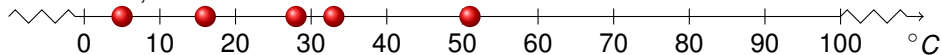


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Not reliable, not valid measurements:

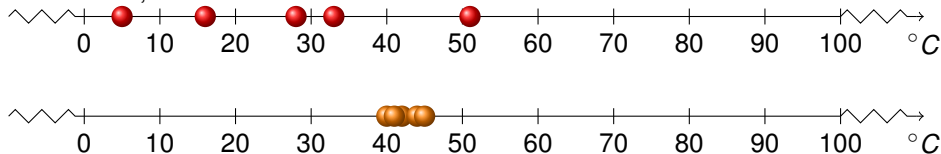


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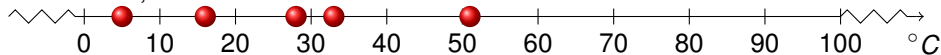


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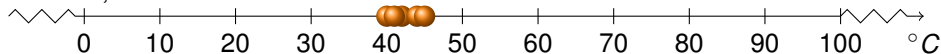
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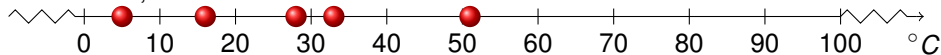


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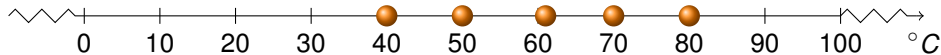
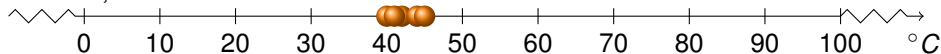
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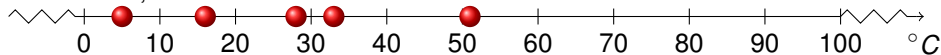


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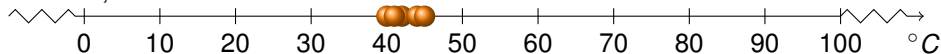
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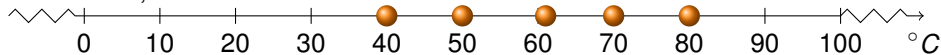
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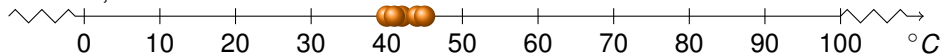
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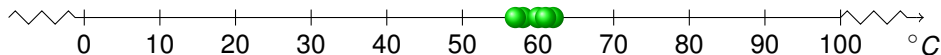
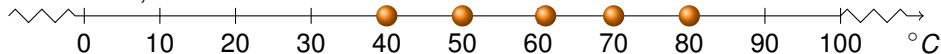
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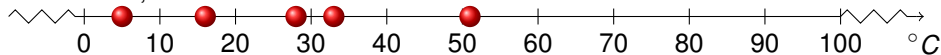


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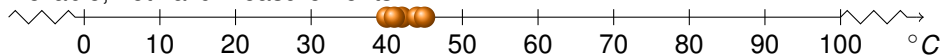
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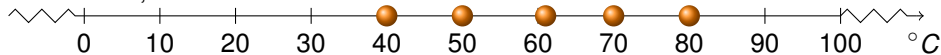
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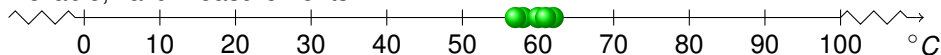
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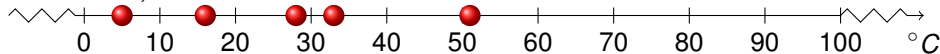


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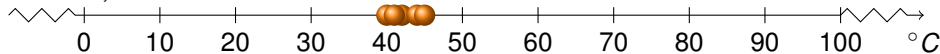
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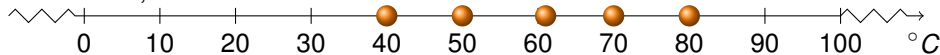
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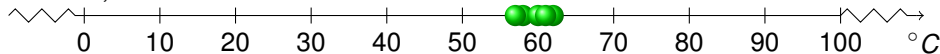
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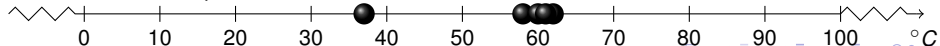
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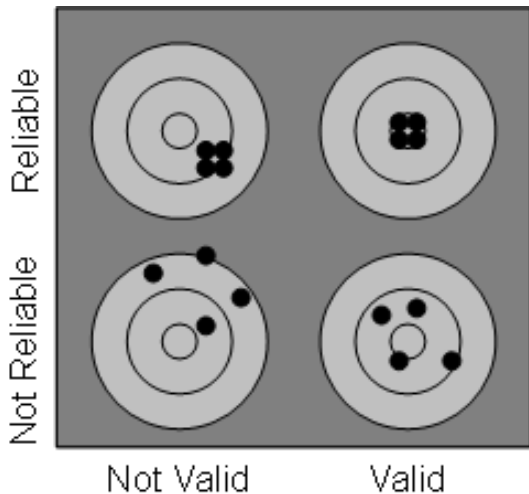


What about this sample?



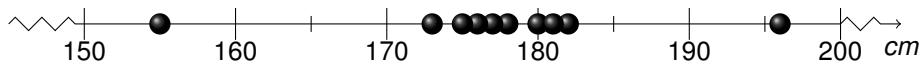
Gone Hunting

Types of error



Source: customerthink.com

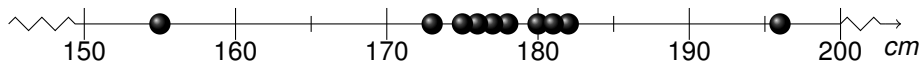
We measured the height of 10 students:



Social research

Types of error

We measured the height of 10 students:



Source: <http://www.wallpaperhere.com/>

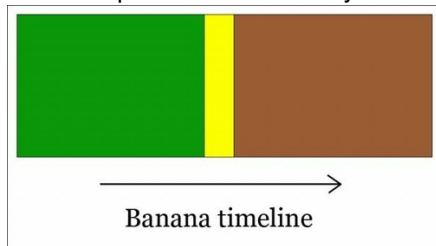
Which of the followings would make a good topic for research?

- How many homeless people lives in Budapest?
- What is the most popular way of suicide?
- What color is a banana?

Possible goals of research

Example of topics seeming meaningless

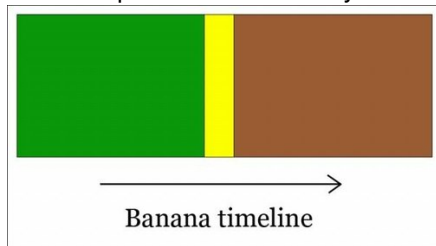
A simple time series analysis:



Possible goals of research

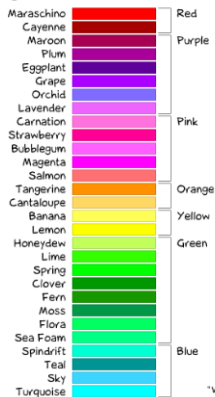
Example of topics seeming meaningless

A simple time series analysis:



Color names if
you're a girl...

Color names if
you're a guy...



Doghouse Diaries
"We take no as an answer."

Source: <http://blog.xkcd.com/2010/05/03/color-survey-results/>

Which of the followings would make a good topic for research?

- How many homeless people lives in Budapest?
- What is the most popular way of suicide?
- What color is a banana?
- How much does a pile of apples cost?
- What kind of relationship can be found between bodyweight and hair-color?
- Which is the best book in the world?

What could be the main factors of choosing a topic?

Definition: exploratory vs. descriptive vs. explanatory study

Units of analysis

Units, cases, objects

What entities are described and compared below?

- Are older people more afraid of crime than younger people?
- Does economic development lower the birth rate?
- Which Hungarian soccer team has the utmost fan club?
- The longer the emgagement period, the longer the marriage.
- What is the most prestigious occupation?

Do we always ask the units of analysis?

We found, that 2 million tourists arrived to Budapest in 2010. It was also known, that 2.5 million tourists visited the lake Balaton in the same year.

Could we state that ...

- the inhabitants of Budapest are not as friendly as people living at the lake Balaton?
- Budapest has less spectacle than the lake Balaton?
- the lake is a bigger tourist goal?
- tourists think that lake Balaton is a lot nicer place than Budapest?
- the beach of Balaton is lot more crowded than the streets of Budapest?

What can be said based on the above data?

Ecological fallacy

A classical example

Emile Durkheim (1897): *Le Suicide*

- Suicide rates are higher in men than women.
- Suicide rates are higher for those who are single than those who are married.
- Suicide rates are higher for people without children than people with children.
- Suicide rates are higher among Protestants than Catholics and Jews.
- Suicide rates are higher among soldiers than civilians.



Ecological fallacy

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Definition

The ecological fallacy occurs when you make conclusions about individuals based only on analyses of group data.



Variables and attributes

A concrete example

How old are you?

- >18
- 19-24
- 25-30
- 31-40
- 41-100
- 100<

What is variable and what is attribute in the above example?

Variables and attributes

Test your knowledge!

Research topics:

- Are older people more afraid of crime than younger people?
- Does economic development lower the birth rate?
- Which Hungarian soccer team has the utmost fan club?
- The longer the engagement period, the longer the marriage.
- What is the most prestigious occupation?

What is variable and what is attribute in the above example?

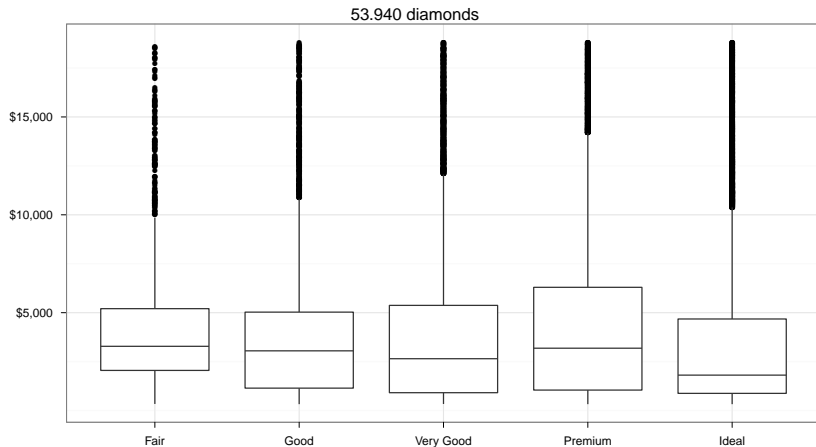
Types of variables

- explanatory variables
 - dependent variables
 - qualitative variables
 - quantitative variables
 - independent variables
 - qualitative variables
 - quantitative variables
- extraneous variables
 - control variables
 - other variables

Let's make up some examples based on the above list!

Relation between variables

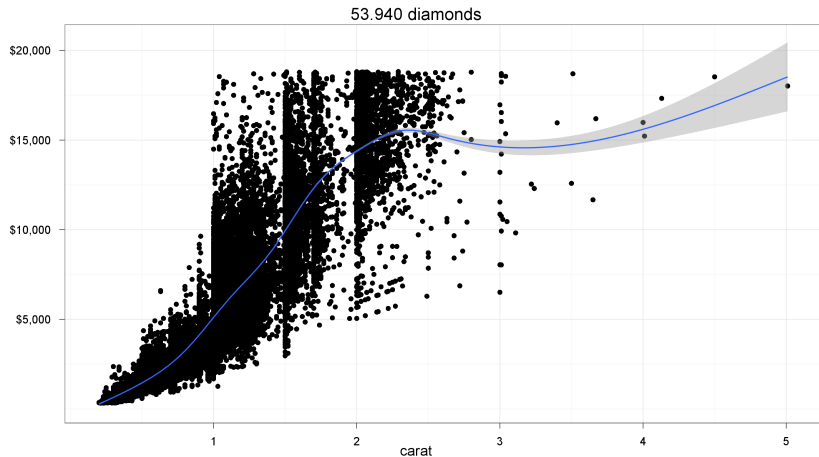
A visual example



```
ggplot(diamonds, aes(cut, price)) + geom_boxplot() + xlab("") + ylab("") +  
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```

Relation between variables

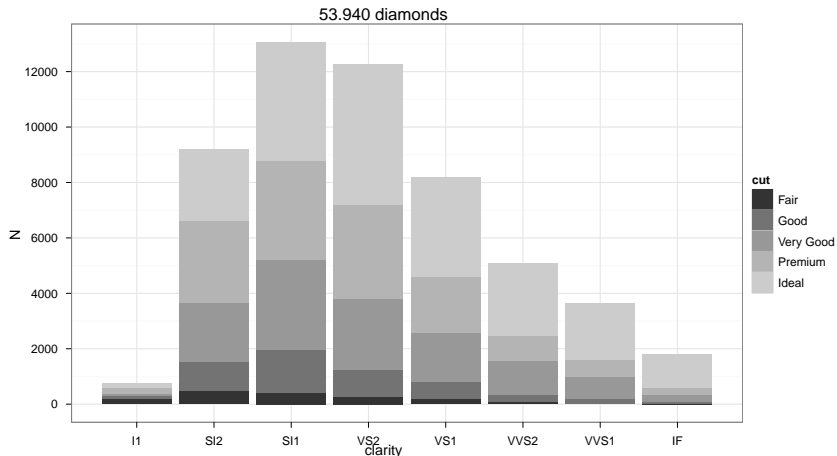
A visual example



```
ggplot(diamonds, aes(carat, price)) + geom_point() + geom_smooth() + ylab("") +  
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```

Relation between variables

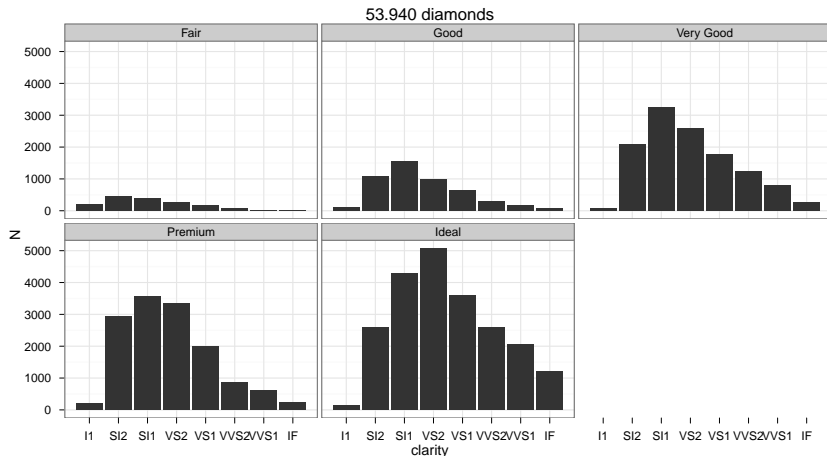
A visual example



```
ggplot(diamonds, aes(clarity, fill=cut)) + geom_bar() + ylab("N") +  
theme_bw() + opts(title="53.940 diamonds")
```

Relation between variables

A visual example



```
ggplot(diamonds, aes(clarity)) + geom_bar() + ylab("N") + facet_wrap(~ cut) +  
theme_bw() + opts(title="53.940 diamonds")
```

Levels of Measurement

Qualitative and quantitative variables in depth

Qualitative variables:

- Nominal: exhaustive labels with no intersect (mutual exclusivity) not in a specific order
- Ordinal: an (possible) ordered variable with exhaustive labels not intersecting

	Nominal	Ordinal	Interval	Ratio
Classification	X	X	X	X
Rank order		X	X	X
Equal intervals			X	X
Nonarbitrary zero				X

Quantitative variables:

- Interval: equal distances between the ordered labels (numbers)
- Ratio: a scale with a zero point

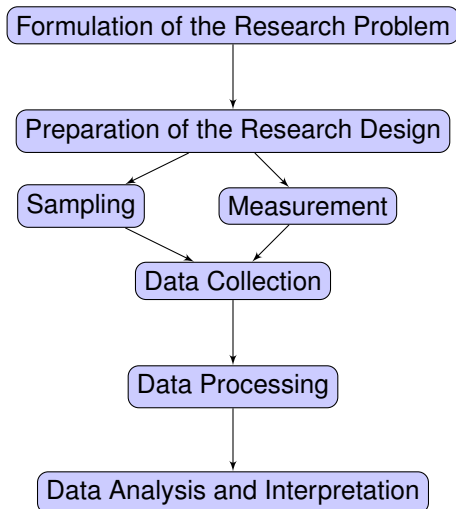
Possible relationship between variables:

- association,
- correlation,
- spurious relationship,
- influence,
- direction of influence,
- **causality.**

What is hypothesis?

Stages of Social Research

A flowchart



It was a pleasure!

Daróczy Gergely

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