Recitation #2
Critical thinking
3 comments

- Religious survey

- Sexual behavior examples as teaching material
Critical thinking

- Observing and recording data is the central aspect of social science

- Sometimes, the data at hand is not ideal…

- The question we will start addressing today is what can we learn from different types of data.
Correlation & causation

• Every day we see in the news claims such as:
  • People are happier in better weather
  • Boys who mature later suffer from depression
  • Runners outlive other athletes
  • Kids who breast feed have a higher IQ
  • There is a negative correlation between # of hours watching TV and grades in school

• These are reliable statistical relationships, but are they causal?
  • For each write down the cause for the effect
Examples:

- Women who exercise regularly have less natural miscarriages.
  - Can you deduce that exercise help reduce risk of natural miscarriages? Why
- Famous conductors in the US live about 7 years longer than the average
- Students who come to all the classes do better
  - Why? What is the story?
Famous conductors in the US live about 7 years longer than the average.
Interpreting correlations

• Sometime we have a very strong causal model
  • Good weather causes happiness…
• Sometime strong models can be wrong
  • Running prevents heart attacks
    • Making people run can cause heart attacks...
  • The “hot hand”
So???

- The **only** way to draw valid conclusions is to have a control group!
  - In the Uri Geller case we should have tested how many clocks were observed to start working by someone else..

- In most cases, the only way to have a good control group is to conduct an experiment
**Self-selection!**

- Runners select themselves
- Famous conductors
- Berkeley….

<table>
<thead>
<tr>
<th>Dep.</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apply</td>
<td>Accepted</td>
</tr>
<tr>
<td>A</td>
<td>1,000</td>
<td>60%</td>
</tr>
<tr>
<td>B</td>
<td>1,000</td>
<td>30%</td>
</tr>
<tr>
<td>Both</td>
<td>2,000</td>
<td>900</td>
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</table>

= 45% = 33%
5 year cholesterol experiment

- $P(\text{death|no treatment}) = 21\%$
- $P(\text{death|treatment}) = 21\%$
- What about regularity?
  - $P(\text{death|regularity}) = 15\%$
  - $P(\text{death|non regularity}) = 24.6\%$
- But now we have self selection again
  - For regulars $P(D|T) = P(D|\text{no T}) \sim 15\%$
  - For non regulars $P(D|T) = P(D|\text{no T}) \sim 26\%$
Experiments

• Are not a perfect method
• They are also susceptible to some problems
• Placebo
  • The Hawthorne effect
• Self fulfilling prophecies
• Desire to cooperate
Placebo I

• In 1794 Gerbi discovered that by squeezing a certain worm between the thumb and the finger of the right hand, and placing the fingers on a painful tooth, the pain went away for a year.

• Hundreds of patients were tested and 68% reported no pain for a year!
Placebo II

- In a study on the effects of birth control, three groups were used
  - The pill with warning of side effects
  - Placebo without warning of side effects
  - Placebo with warning of side effects
- Group #2 reported 6% side effects
- Groups #1 & #3 reported 20% side effects
Placebo III

- Old French medical book suggest to use new medicines as fast, when its healing power is the strongest
  - Probably when the physician believes in it the most
Placebo IV

- Study on the ability of vitamin C to prevent the common cold
  - 2 Groups randomly assigned
  - But it turns out that by opening the capsules the subjects could see if they were in the control or placebo group (the hint was people who dropped out).
- When testing only SS who did not know which group they were in, the treatment was not effective.
- When testing only SS who did know which group they were in, the treatment was effective.
Placebo V

• The Hawthorne effect
  • In 1924 a study was done on effectiveness at work
  • The recommendation was to improve lighting condition
  • This helped for a while but not long term
  • Other changes had the same effect ….
Placebo -- summary

- Placebo strong effects
- Threatens the conclusions from many experiments
- Important to have a good control condition

- Placebo is real
  - Opioids
  - Sensitivity
  - Attention
Self fulfilling prophecies

- Teachers who are told that some kids are very smart, find that these kids get better grades
  -
- Researchers who believed that they have genetically inferior rats found them to have a lower performances
  -
- Smart Hans …
Desire to cooperate

• In many cases subjects want to help the experimenter.
  • If you tell subjects what is your hypothesis they will help you find it..

• This is why we prefer blind experiment
• Even better are double blind experiments
• Computer controlled experiments are another approach.
Summary

- People are bad measurement devices
- We observe and infer “rules” where there are none!
  - Correlations / causation
  - Self-selection
  - Placebo
  - Self fulfilling prophecies
- Statistics and research methods are here to protect us against ourselves