Class 3

Heuristics and Biases

Reading: Bazerman & Moore chapter 3
Main Topics

- Errors Associated with the **Availability** Heuristic
- Errors Associated with the **Representativeness** Heuristic
- Errors Associated with the **Confirmation** Heuristic

Availability Heuristics Errors

- Bias 1: Ease of Recall
- Bias 2: Retrievability
Bias 1. Ease of Recall

Problem one: ranking causes of death

<table>
<thead>
<tr>
<th>Cause</th>
<th>Annual Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>435,000</td>
</tr>
<tr>
<td>Fast Food</td>
<td>400,000</td>
</tr>
<tr>
<td>Traffic</td>
<td>45,000</td>
</tr>
<tr>
<td>Guns</td>
<td>29,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>17,000</td>
</tr>
</tbody>
</table>

Availability

Bias 2. Retrievability

Problem Two:
Estimate the percentage of words in the English language that begin with the letter “a” 6%

Problem Three:
Estimate the percentage of words in the English language that have the letter “a” as their third letter 9%
**Representativeness Heuristic Errors**

**Bias 3:** Insensitivity to Base Rates  
**Bias 4:** Insensitivity to Sample Size  
**Bias 5:** Misconceptions of Chance  
**Bias 6:** Ignoring Regression to the Mean  
**Bias 7:** The Conjunction Fallacy

**Bias 3. Insensitivity to Base Rates**

**Problem Four A:** Prosecutor’s fallacy

*Man caught on camera robbing ATM. In film he is 6’7”, has red hair and beard. Next day, police arrest man matching that description.*

At trial, a forensic statistician testifies that only 1/1000 individuals match the description. Prosecutor informs jury that chances are 999 to 1 that the man is guilty. Correct?
Bias 3. Insensitivity to Base Rates

Problem Four B: Medical Diagnosis

One in 100 babies is born with X disease. Mary takes a screening test, which gives a positive result for 90% of babies with X, and a positive result for 10% of babies without X.

Mary’s baby tests positive, and the doctors say there is a 90% chance the baby has X disease. Correct?
Problem Four B cont’d: Medical Diagnosis

Classifying population of 1000 who take test

<table>
<thead>
<tr>
<th>Test results</th>
<th>Disease present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (n = 10)</td>
</tr>
<tr>
<td>Positive</td>
<td>9</td>
</tr>
<tr>
<td>Negative</td>
<td>1</td>
</tr>
</tbody>
</table>

Problem Five: Birth Rates

Big Hospital has 100 babies born each day. Small Hospital has 10 births each day.

Yesterday, 70% of the babies born at one of the hospitals were girls. Which hospital (probably)?
Problem Six A: Fourth child
You have three daughters, and are pregnant with your fourth child. What are the chances that the new baby will be a girl?

Problem Six B: Plans to have four children
Your childless friend plans to have four children, and asks what the chances are they will all be girls. What do you tell her?
Bias 6. Regression to the Mean

Problem Seven: Sports performance
Ted Williams of the hit .406 in 1941 (anything above .300 is excellent). What was his average in 1942?

Bias 7. Conjunction Fallacy

Problem Eight A: The Linda case
Linda is 31, single, outspoken, very smart. In college she majored in philosophy and was deeply concerned about discrimination and social justice, and participated in antinuclear demonstrations.
Bias 7. Conjunction Fallacy

Problem Eight A (cont’d): Choose the most likely possible description of Linda’s occupation:

(a) truck driver;
(b) bank teller;
(c) journalist;
(d) bank teller who is an active feminist.

Confirmation Heuristics

Bias 8: The Confirmation Trap
Bias 9: Anchoring
Bias 10: Conjunctive- and Disjunctive-Events Bias
Bias 11: Hindsight Bias
Bias 12: Overconfidence
Bias 8. The Confirmation Trap

Problem Eight: Wason’s Cards

Hypothesis: “If a card has a vowel on one side, then it has an even number on the other side.”

Which cards must you turn over to test the hypothesis?

A S 4 9

Bias 8. Anchoring

Problem Nine: The Taj Mahal

Take the last three digits of your phone number. Put the number 1 at the beginning of the string, so you have four digits. Think of those four digits as a year.

Was the Taj Mahal built before or after that year? ______

What year was the Taj Mahal built, by your best estimate? ______
Problem Ten A: Marbles
A bag contains 1000 red marbles and 1000 white marbles.
Which is more likely, to draw a red marble 7 times in succession, or to draw at least one white marble in seven tries?

Problem Ten B: Reactors
A nuclear reactor core has five key components. Each has a 10% chance of failing, independently of the others, after an earthquake. If one fails, disaster follows.
What is the chance of disaster after an earthquake?
Bias 10. Conjunctive and Distinctive Events

Problem Ten C: Flights

You have to fly to Quebec tomorrow. There are five nearly-full flights, and for each you have a 10% chance of getting a ticket. With what chance will you get a ticket?