Societal Risks and the Law[1]

Statistics/CS/Poli Sci C79

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February 28, 2013

Risk and Reward

- We want to minimize our expected harm:

$$\text{harm} = \text{harm of an event} \times \text{probability of an event}$$

- What do we need to know if we are to decide if we should spent a certain amount of money to reduce the probability of an event?

Risk and Reward

In order to know if we should spend more money to reduce the probability of an event, we need to know:

- how much would this money reduce the probability of the event
- what else could the money be used for

Example: should we inspect more or less cows for BSE?

Systems 1 and 2

System 1:

System 1 is automatic and unconscious. Some other terms used for the system are the implicit system, the experiential system, the associative system, and the heuristic system. It contains the universal cognition that is shared between humans and animals and is thus considered evolutionarily old.

Systems 1 and 2

System 2:

System 2 is evolutionarily recent and specific to humans. It is also known as the explicit system, the rule-based system, the rational system, or the analytic system. It performs the more slow and sequential thinking. It is domain-general, performed in the central working memory system. Because of this, it has a limited capacity and is slower than System 1. It correlates with general intelligence.

Systems 1 and 2

Systems 1 and 2 are not just about math. And System 1 saves our lives.

Example: judging the distance of objects

Systems 1 and 2

We have historically privileged system 2 in our identity, particularly in the West since the 17th century.

Example. René Descartes (1596–1650): “I think, therefore, I am.” *Cogito ergo sum*

Systems 1 and 2

Problem: Descartes as bad psychology, and bad neuroscience. Our guts, limbic-driven surges, are important for making decisions, may be essential.

Patient Eliot has damage to the ventromedial prefrontal cortex because of removal of a meningioma. His intelligence is intact, and he appears quite normal except for his unusual calm in the face of his misfortune. However, he is completely incapable of making wise decisions. Without emotion, he could not make simple choices, such as which color socks to wear.

See:

- Antonio Damasio. *Descartes' Error: Emotion, Reason, and the Human Brain.*

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Biases and Heuristics

When we have difficult decisions to make, we often rely on a number of biases and heuristics. Three general categories:

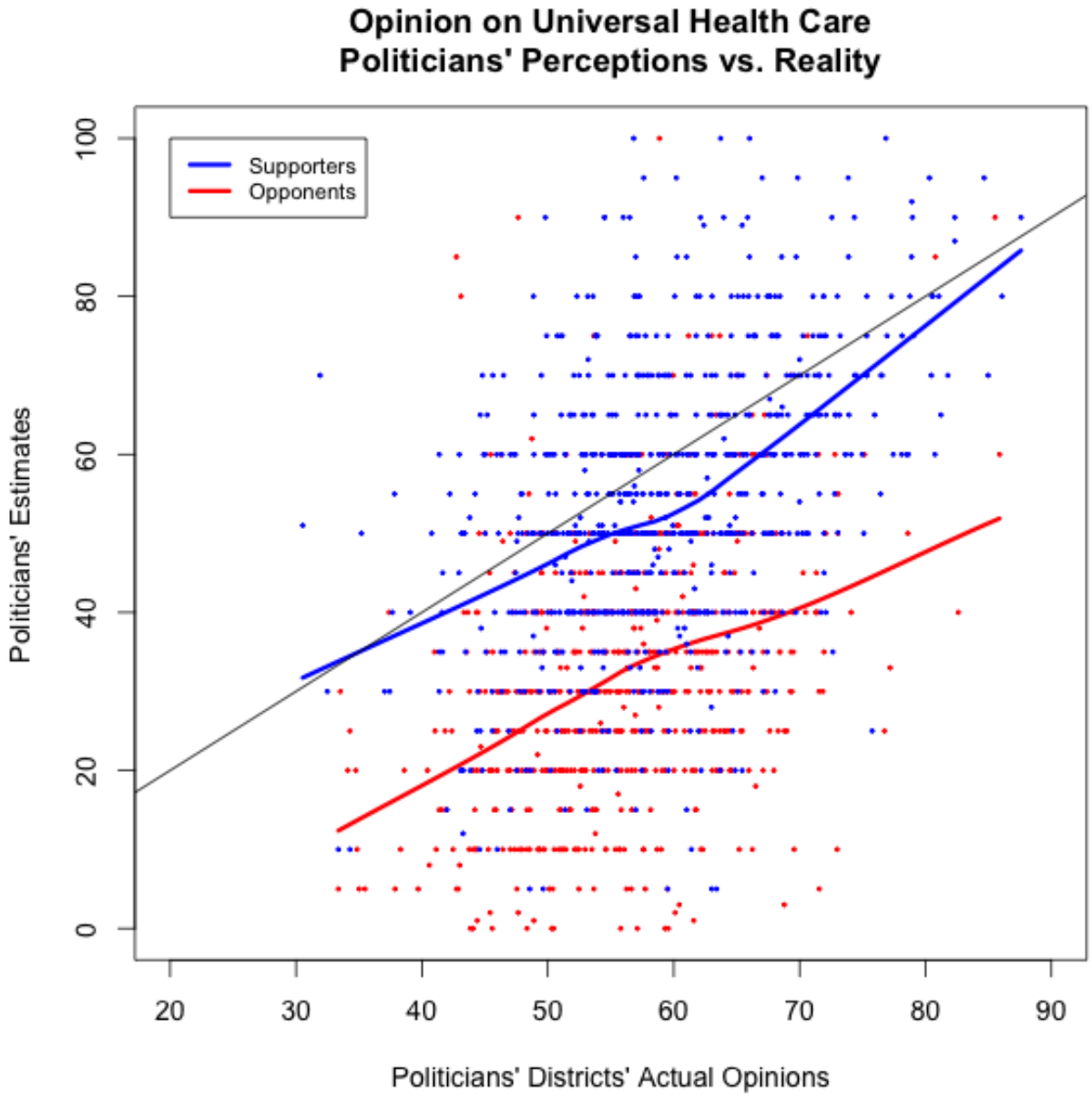
- Availability heuristic
- Adjustment and anchoring
- Representativeness

Availability

Answer a question based on an instance or occurrence one can quickly bring to mind: the imaginable, the dramatic, the recent

- Retrievability of instances (salience):
  - plane crashes versus car accidents; guns versus swimming pools; military deaths in wars versus accidents
- Effectiveness of a search set:
  - is r more likely the first or third letter in English words?
  - Are the abstract words (though, love) more common in written English than concrete works (door, desk)?
- Illusory correlation: a narrative usually wins

Availability



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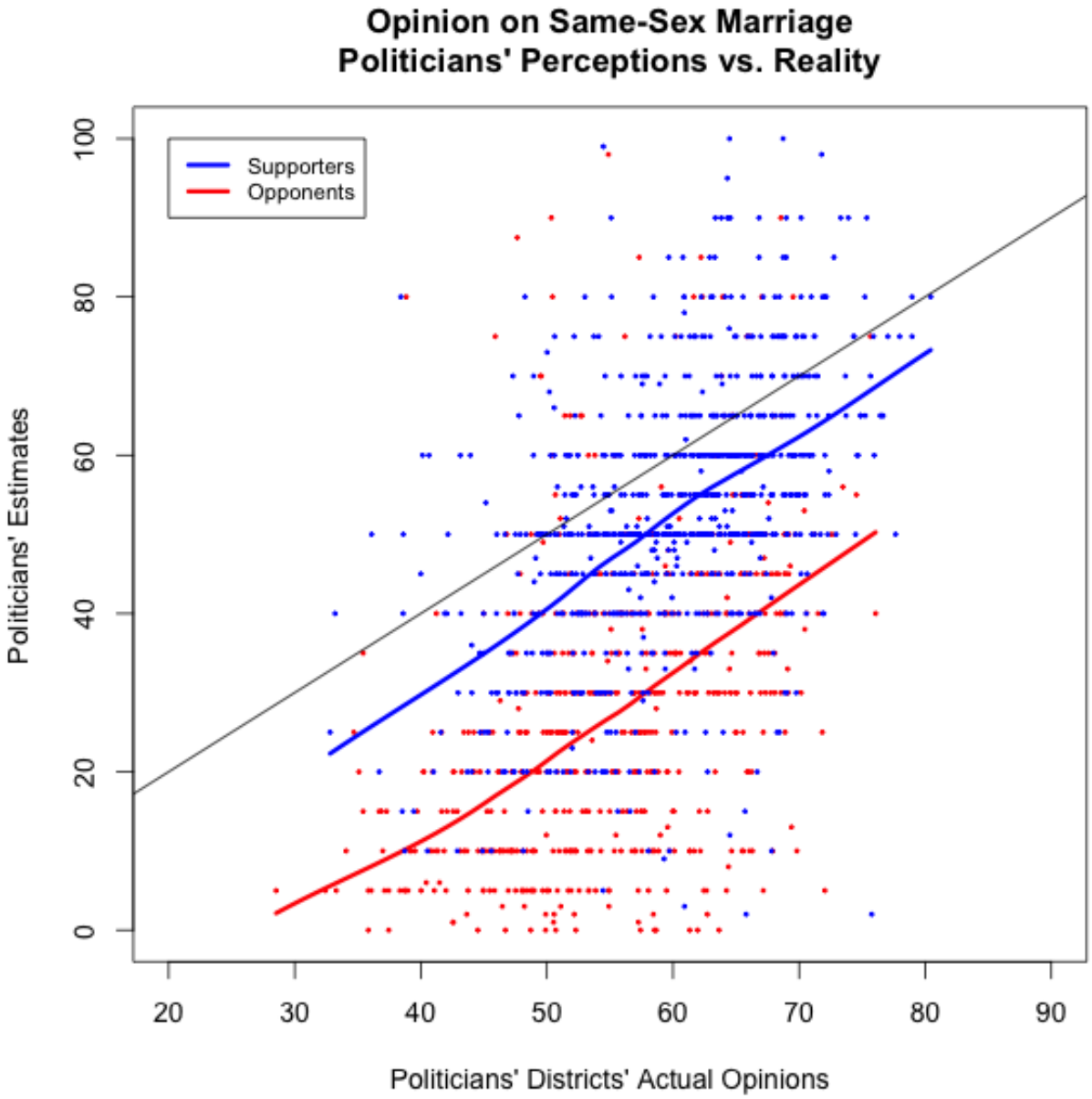

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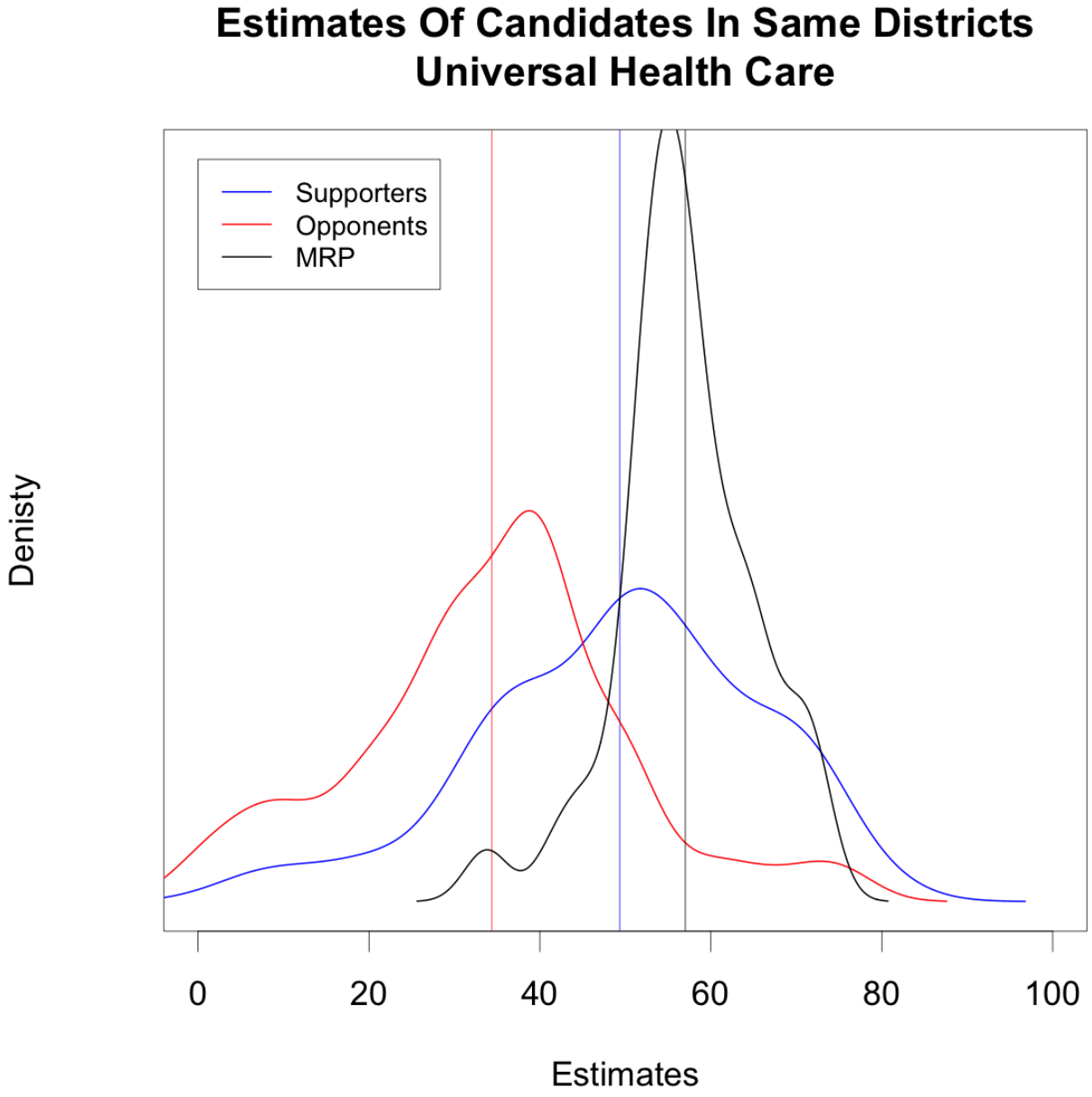

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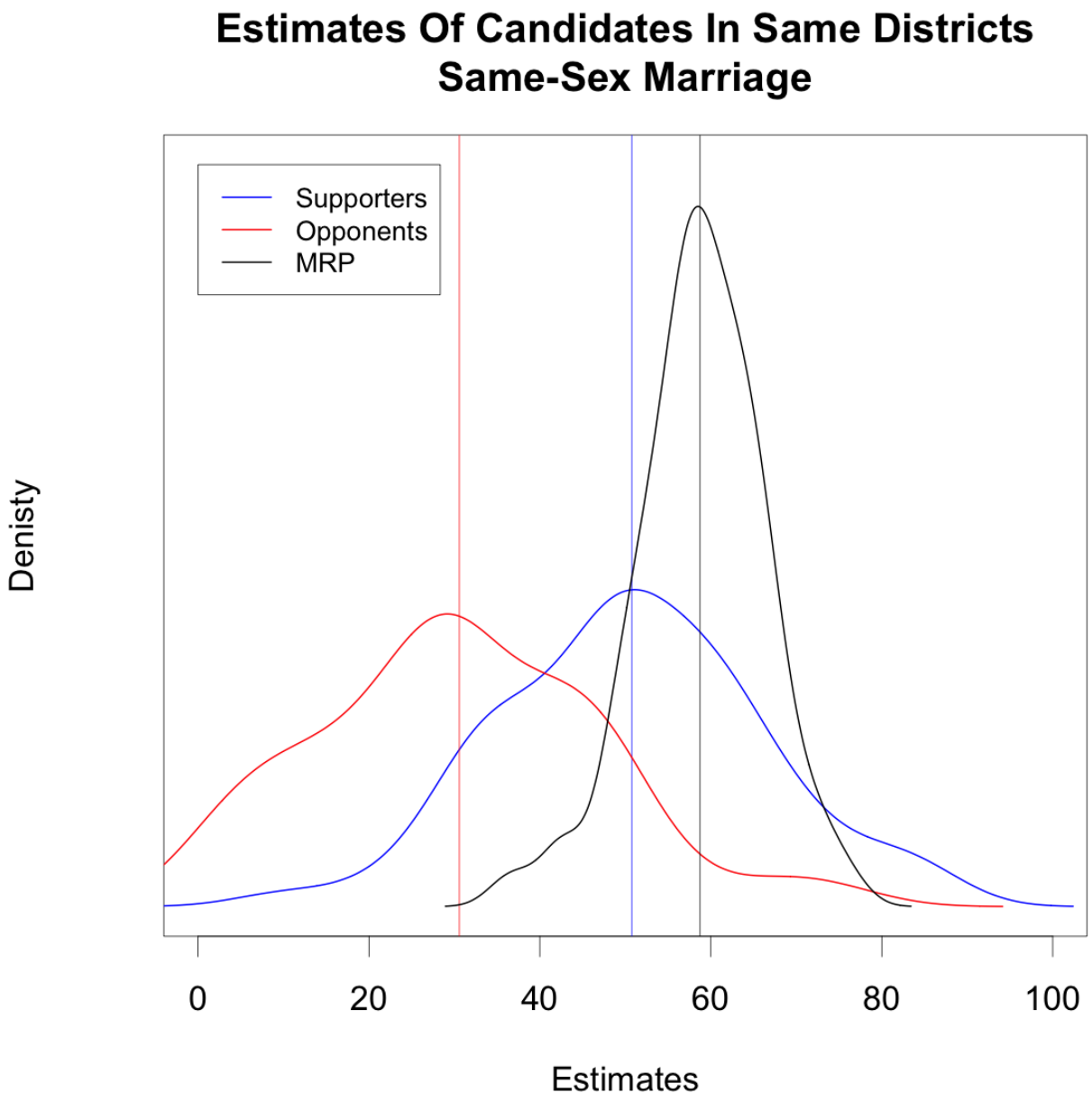

Availability

In U.S. politics the big availability heuristic is partisanship: the party you are a member of:

- Examples:
  - partisanship and the economy; spending money
  - Sequestration, $1.2 trillion in cuts, March 1, 2013
- What about independents?

Adjustment and Anchoring

The starting point matters, even if it is irrelevant

- Insufficient adjustment:
  - number of countries in the UN
  - starting offers in negotiations

Adjustment and Anchoring

Condition 1:

$$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

Adjustment and Anchoring

Condition 2:

$$8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

Adjustment and Anchoring

Insufficient adjustment:

- Condition 1: $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$
  - Mean answer: 512
- Condition 2: $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
  - Mean answer: 2,250
- True answer: 40,320

Adjustment and Anchoring

Pick one of the following three bets:

1. simple event: drawing a red marble from a bag containing 50% red marbles and 50% white marbles
2. conjunctive events: drawing a red marble seven times in succession, with replacement, from a bag containing 90% red marbles and 10% white marbles
3. disjunctive events: drawing a red marble at least once in seven success tries, with replacement, from a bag containing 10% red marbles and 90% white marbles

Adjustment and Anchoring

People picked in the order of 2, 1, and 3:

1. simple events: drawing a red marble from a bag containing 50% red marbles and 50% white marbles. Win Prob=.5
2. conjunctive event: drawing a red marble seven times in succession, with replacement, from a bag containing 90% red marbles and 10% white marbles. Win Prob=.48
3. disjunctive events: drawing a red marble at least once in seven success tries, with replacement, from a bag containing 10% red marbles and 90% white marbles Win Prob=.52

Adjustment and Anchoring

Biases in the evaluation of conjunctive and disjunctive events

- Probability of conjunctive events overestimated
- Probability of disjunctive events underestimated

Adjustment and Anchoring

We've seen this conjunctive bias before.

Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Which is more probable?

1. Linda is a bank teller
2. Linda is a bank teller and is active in the feminist movement.

65% of participants selected 2

Adjustment and Anchoring

Anchoring in the assessment of subjective probabilities

- Variance of estimated probability distributions is smaller than actual probability distributions
- Common to both naive and expert respondents

This leads to us expecting strange behavior in others: we like consistent patterns even if they should cause us to worry. See Madoff (also related to representativeness; stability bias)

Representativeness

What is the probability that object A belongs to class B? What is the probability that event A originates from process B?

- Insensitivity to prior probability (or base rates)
- Insensitivity to sample size
- Law of small number (which doesn't exist!)
- Illusion of validity/stability
- Regression to the mean

Representativeness

- Imagine a group of 70 lawyers and 30 engineers
- “Dick is a 30 year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well-liked by his colleagues.”
- Is Dick a lawyer or an engineer?

Representativeness

Insensitivity to prior probability (or base rates). Respondents judged Dick to be equally likely to ben engineer regardless of prior distribution of lawyers and engineers.

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Representativeness

A town has two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50% of all babies are boys.

For a period of 1 year, each hospital recording the days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days?

- The larger hospital
- The smaller hospital
- About the same (within 5% of each other)

Representativeness

Insensitivity to sample size. Respondents picked the following:

- The larger hospital: 21%
- The smaller hospital: 21%
- About the same: 53%

Representativeness

Illusion of validity/stability

- Predicting average grades
- Stock market returns: Madoff, consistent returns
- Foreign policy experts

Representativeness

Regression to the mean: if a variable is extreme on its first measurement, it will tend to be closer to the average on a second measurement

- Why flight instructors conclude that criticism is more effective than praise
- Mutual funds
- Parents and the income/IQ/height of children
- Reversion to mediocrity

Representativeness

Which of the following two sequences is more likely to occur with a fair coin?

1. HTHTTH
2. HHHTTT

Representativeness

People think that “the law of large numbers applies to small numbers as well.” So, they pick 1 over 2.

1. HTHTTH
2. HHHTTT

Recognition Heuristic

- Who will win in the soccer match: Manchester United vs. Shrewsbury Town?
- Which has a greater population: San Diego or San Antonio?

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Recognition Heuristic

Turkish participants as accurate as British in the first case; German participants more accurate than American in the second one

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Attempt at Unification

Some of these can be unified under Attribute Substitution

- The target attribute is relatively inaccessible
- An associated attribute is highly accessible
- The substitution is not detected and corrected by System 2 (head)

Subjective and Objective

Attribute substitution especially occurs when something subjective is asked, but something objective is in mind and easier to recall:

1. How tall are you?
2. How much pain are you in on a scale between 0 and 10?

Heuristic Can Help

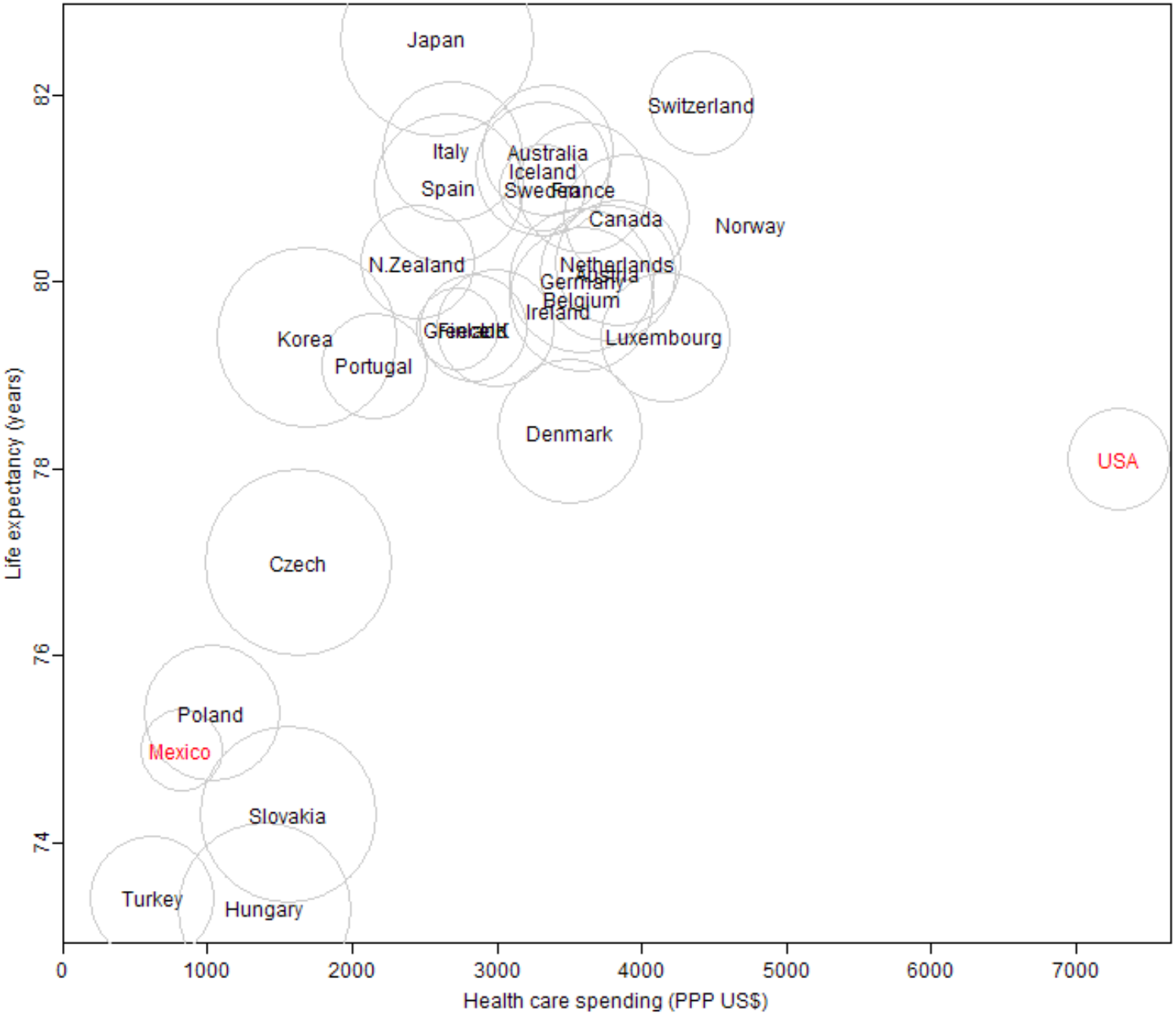
- Heuristics are strategies using readily accessible, though loosely applicable, information to control problem solving
- Attribute substitution is a psychological process thought to underlie a number of cognitive biases and perceptual illusions. It occurs when an individual has to make a judgment (of a target attribute) that is computationally complex, and instead substitutes a more easily calculated heuristic attribute.
- Heuristics can help. They make our lives easier in low information environments. Take an example of a bill before Congress.
- But heuristics can also hurt

Insurance Example

When subjects are offered insurance against their own death in a terrorist attack while abroad, they are prepared to pay more for it than they would for insurance that covers death of any kind while abroad, even though the latter clearly includes the former.

The attribute of fear is being substituted for a calculation of the total risks of travel. Fear of terrorism is stronger than a general fear of dying on a foreign trip.

Spending and Life Expectancy



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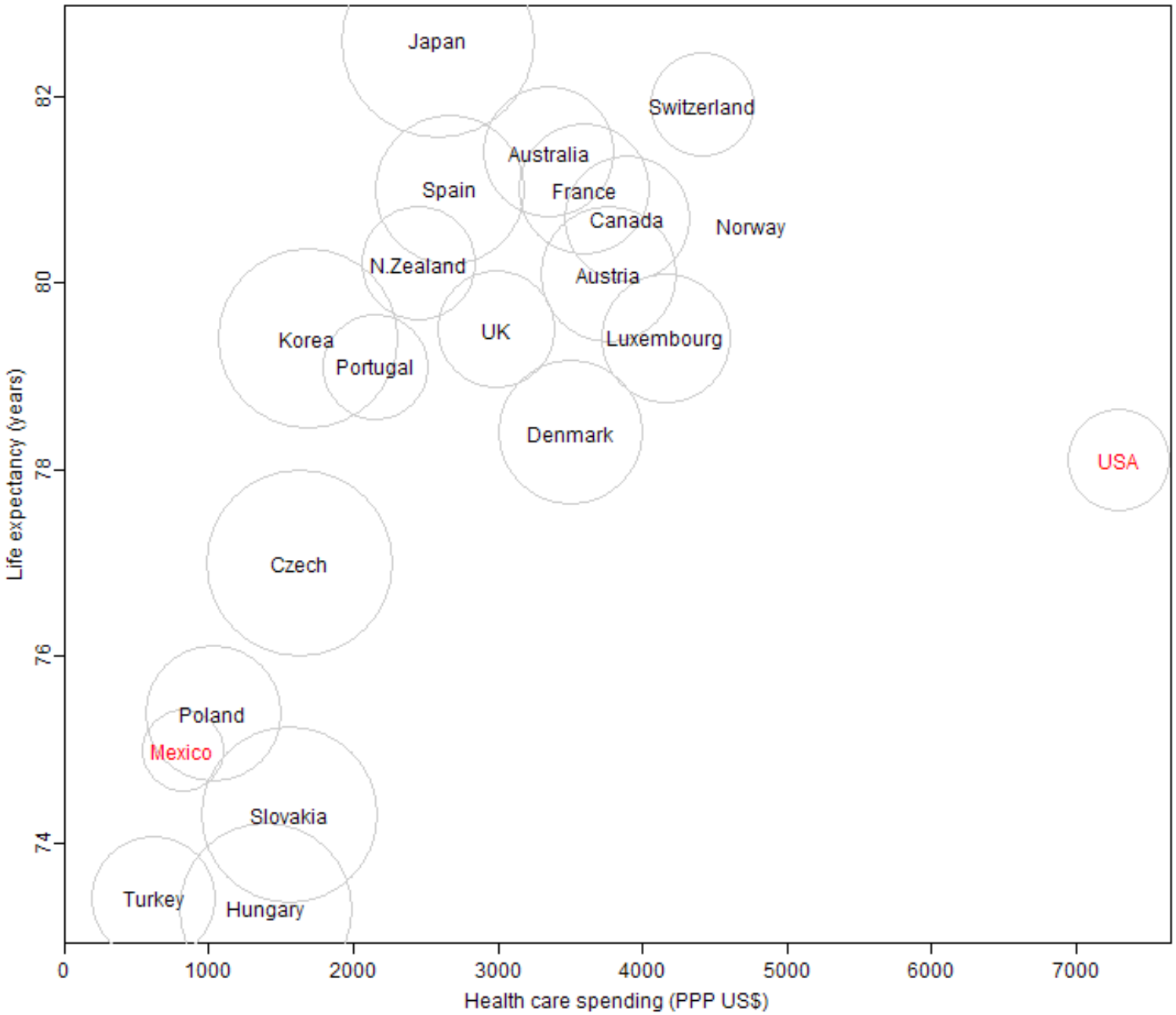

Information and the Iraq War

- In January of 2003, the Princeton Survey Research Associates polled more than 1,200 Americans and asked: "To the best of your knowledge, how many of the September 11 hijackers were Iraqi citizens?"
- Only 17% new the correct answer (none)
- 44% believed most of the hijackers were Iraqi
- 6% believed 1 was an Iraqi
- 33% didn't answer
- 2/3 of respondents said they had a good grasp of the issue surrounding the Iraqi crisis

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Information and the Iraq War II

- More than 60% of public supported support an eventual war if it were the only way to topple Iraqi leader Saddam Hussein or end the threat of Iraqi weapons of mass destruction.
- Informed public was considerably less hawkish about war—much less than 50%
- Support for the war in Britain was about 13% the British were much better informed than Americans.
- What is the implication of this? Is this causal?
- Some more data: [Survey Results]

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Sequestration

- $1.2 trillion in cuts over 10 years, March 1
- About $85.4 billion in cuts in 2013
- $42.7 billion in defense cuts (a 9.4% cut)
- $28.7 billion in domestic discretionary cuts (a 8.2% cut)
- $9.9 billion in Medicare cuts (a 2% cut)
- $4 billion in other mandatory cuts (a 7.6% cut to nondefense programs, and a 10% cut to mandatory defense programs)
- More info: [link]