

Rationality, Probability, and Pragmatics  
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# The pragmatics of cognitive biases: going beyond the bounds

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# Work on cognitive biases

- Kahneman, Tversky, and many others since
- General theme:
  - People are irrational in various ways in decision-making
  - This is because we rely on convenient heuristics
- General research method:
  - Elicit people's responses to a problem or problems
  - Demonstrate that these are individually irrational or collectively inconsistent
- Minimal example: Levin (1987)
  - Elicits a preference (between-participants design) for ground beef described as "75% lean" over that described as "25% fat"

# Quantity expressions in language

- e.g. expressions involving numbers
- Appropriate use often involves simplification
- Consequently, numbers alone can convey many meanings
  - exact (“punctual”) values *Mary has three children*
  - lower bounds *You need three wins to qualify*
  - upper bounds? *You can make three mistakes and still pass*
  - approximations *The shark was three metres long*
- In widespread use for important information
  - Medical, financial, scientific...
  - Used as a basis for important decisions (although if we’re that irrational....)

# Pragmatics in cognitive bias work

- Rather neglected (cf. Levinson 1995)
- “Rationality” typically characterised in terms of what is semantically given

# Example: base rate neglect

- Tversky and Kahneman (1974)

“An individual has been described by a neighbor as follows: “Steve is very shy and withdrawn, invariably helpful but with very little interest in people or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail.” Is Steve more likely to be a librarian or a farmer?”
- “Librarian” response argued to neglect base rate, or involve availability bias
- However, discourse expectations about relevance...
- Relies on the idea that you can give people information without the fact of your doing so being meaningful

# Similarly, for Levin (1987)

- Preference for “75% lean” over “25% fat” irrational only under the assumption that these are the same thing
  - Requires “fat” and “lean” to be complementaries
  - Requires 25% and 75% to take exact meanings
  - By appeal to semantics, both are plausible, but pragmatically the latter in particular is problematic
  - Reasonable to expect these numbers to vacillate between punctual and lower-bound meanings, in which case it’s rational to prefer “75% lean”

# Risky-choice framing

- Tversky and Kahneman (1981): selecting program to deal with an outbreak of disease “expected to kill 600 people”

**Program A:**

200 people will be saved

72 | 28

**Program B:**

1/3 probability that 600 will be saved; 2/3 probability none will be

**Program C:**

400 people will die

22 | 78

**Program D:**

1/3 probability that no-one will die; 2/3 probability that 600 will

# Again, assuming 'punctuality'

- If “200” and “400” attract lower-bound interpretations, then A is better than C
- “No people” is punctual and “600 people” might be if we assume that that’s the full set under discussion
  - Under this assumption,  $B = D$  (otherwise complicated)
  - $A > (B, D) > C$  in terms of expected number of lives saved
  - Participants’ choices seem to back this up



# Pragmatics breaking the tie?

- In terms of expected lives saved, there's no 'right answer' on the semantics alone
- Might this promote pragmatic enrichment?
- cf. conjunction fallacy (Tversky and Kahneman 1983)

*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.

# Testing this assumption

- Mandel (2013) – version of disease experiment with certain options modified by “at least” or “exactly”
  - Version with “at least” patterns with classic demonstrations of risky-choice framing
  - Version with “exactly” demonstrates much less inconsistency (although some, as suggested by Levinson 1995)
- However, still some issues
  - Not clear how the modified expressions are interpreted pragmatically (or even semantically)
  - Doesn't address how the fractions are interpreted
  - Only interested in punctual, LB and (to some extent) UB readings

# Other possibilities

- Approximations?
  - “has a 1/3 chance of saving 600 people” ~ “has about a 1/3 chance of saving about 600 people”
- Could be e.g. some % tolerance
  - But then can't paraphrase in the way performed in these experiments
  - “200 people will be saved” is not the same as “400 people will die”: sets of scenarios under which these are true/acceptable are not coextensive

# Other possibilities

- Pragmatic readings?
  - “has a  $1/3$  chance of saving 600 people” ~ “has a chance which is better expressed as  $1/3$  than any other possibility of saving a number of people better expressed as 600...”
  - But then still can't paraphrase in the way performed in these experiments
  - “200 people will be saved” is not necessarily the same as “400 people will die”: these are competing with different options in the numerical domain

# Outlook

- Would like to explore more carefully how people understand expressions of this type (and why)
- Motivation in part that appropriate professional communication shouldn't just take refuge in semantic correctness (as we currently understand it)
- Reasoning as a possible window into the finer points of interpretation