Are We Rational?

Lecture 23

“To Err is Human”

Alexander Pope, *An Essay on Criticism* (1711)

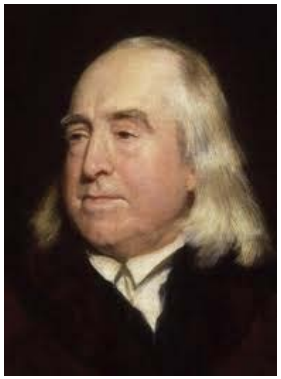
- Categorization
  - Proper Sets vs. Prototypes and Exemplars
- Judgment and Decision-Making
  - Algorithms vs. Heuristics
- Hypothesis-Testing
  - Disconfirmatory vs. Confirmatory Strategies
- Conditional Reasoning
  - Denying the Antecedent, Affirming the Consequent

Prescription vs. Description

Normative Model of Judgment and Reasoning

- Principles of Logic, Probability
- Self-Interest
- Optimality
- Utility (Efficiency)

Rational Choice



Rational Choice Defined

Bentham (1789)
von Neumann & Morgenstern (1947)

- Based on Current Assets
- Based on Possible Consequences
- Uncertain Consequences Evaluated by Probability Theory
- Adaptive within Constraints of Probabilities and Values Associated with Each Possible Consequence

Homo Economicus

The Concert and the Scalper

- Two People Attend a Concert
  - A Bought a Regular Ticket for $75
  - B Bought from a Scalper for $200
- Tickets are Nonrefundable
- Concert is Terrible

lehwego.com

Who is More Likely to Leave at Intermission?

The Lost-Ticket Scenario

Tversky & Kahneman (1981)

- Two People Decide to See a Play
- Tickets Cost $10
- As A Approaches the Ticket Booth, He Discovers that He Has Lost a $10 Bill
  - Will He Still Buy the Ticket?
- B Buys a Ticket, but Loses It Before He Enters the Theater
  - Will He Buy Another Ticket?

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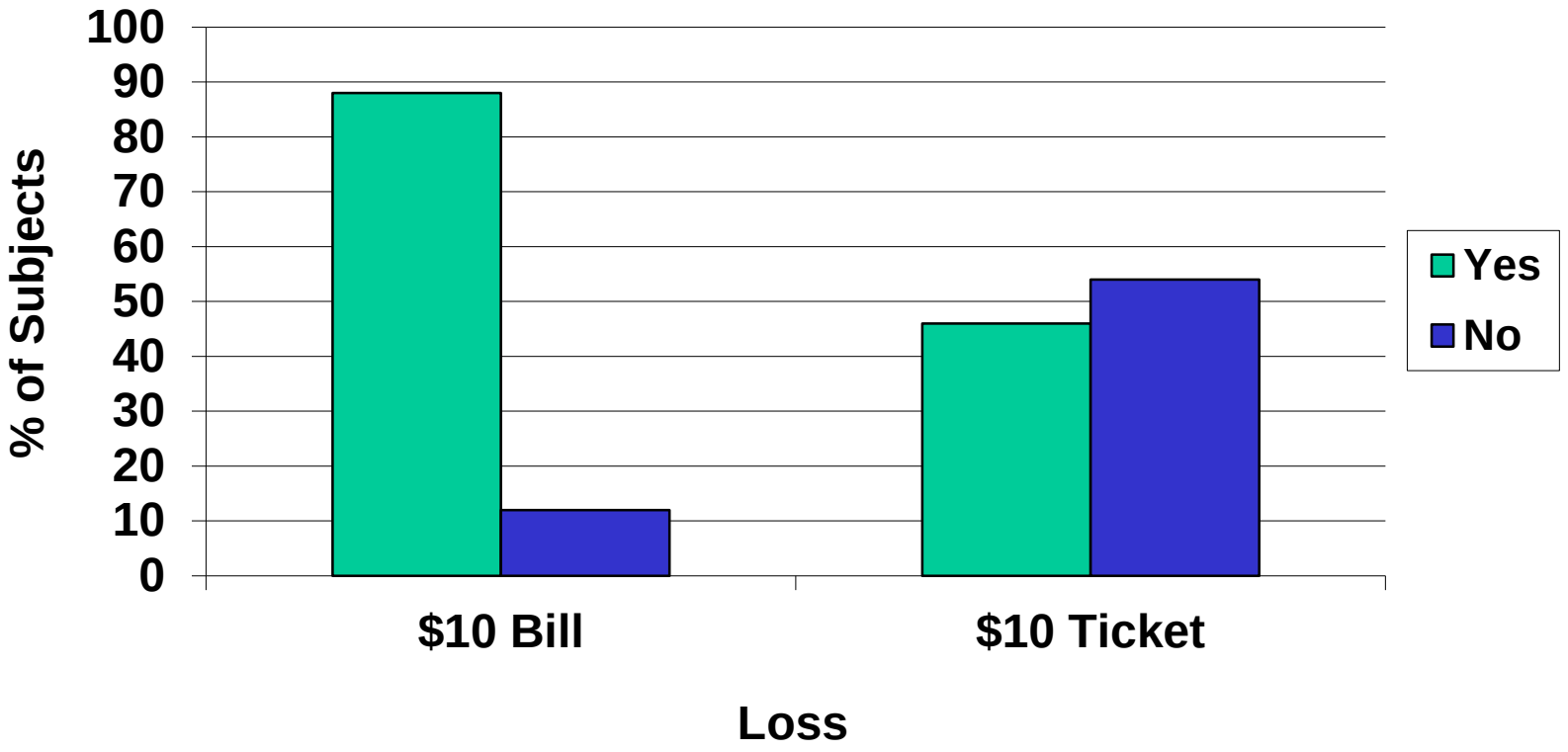
A Preference Reversal

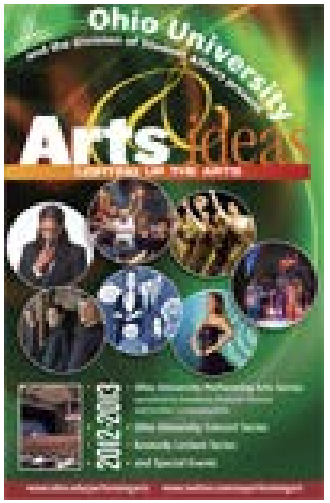
Tversky & Kahneman (1981)



No-Shows at the Theatre

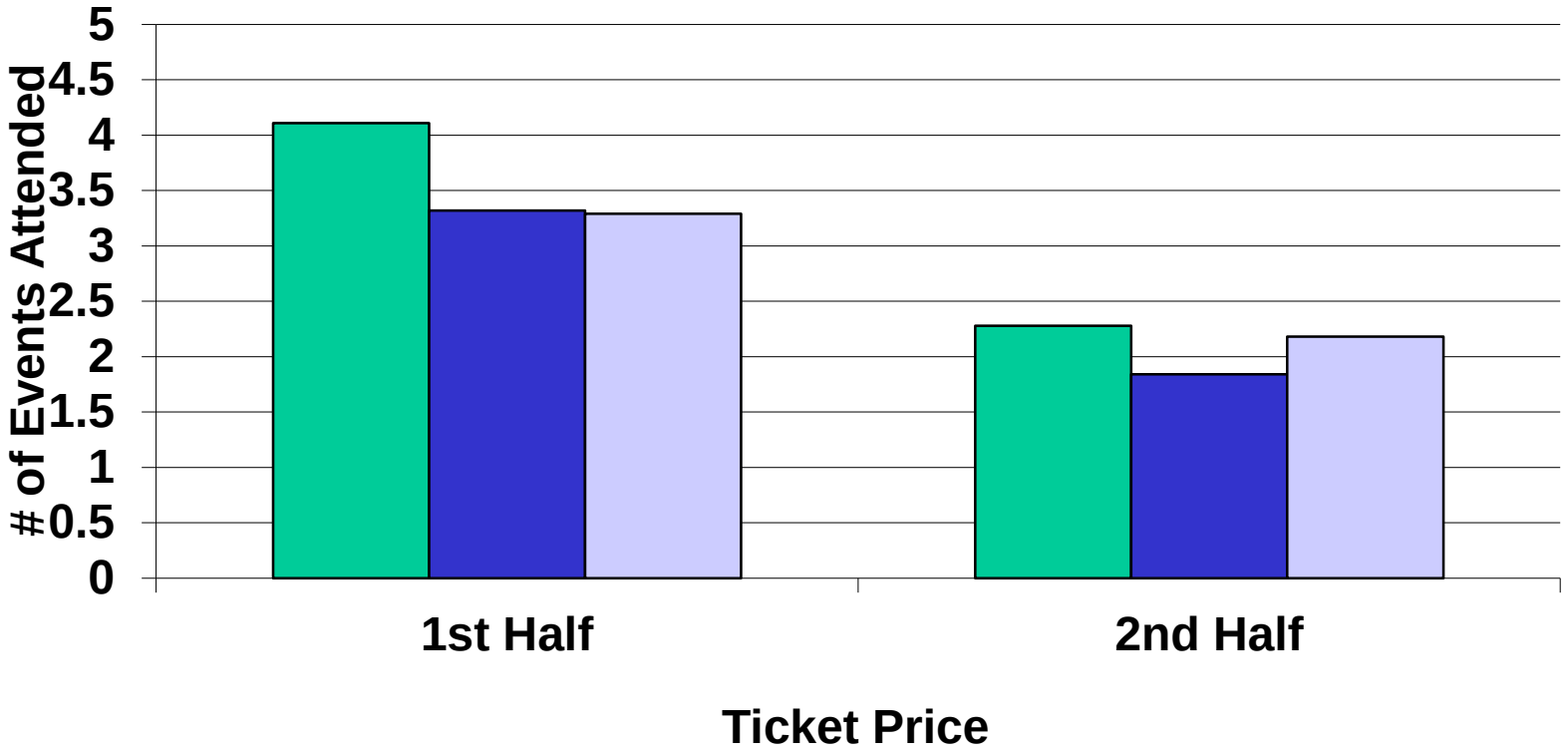
Arkes & Blumer (1985)

- Subscriptions to Ohio University Theater
  - Regular Price: $15
  - Discount: $13
  - Deep Discount: $8
- Random Assignment
  - First 60 Purchasers
- Attendance at Performances
  - > 6 Months After Purchase



Attendance at Performances

Arkes & Blumer (1985)



The Problem with Sunk Costs

- Sunk Costs Have Already Been Incurred
  - Cannot be Recovered
- Rational Choices Based on *Current Assets*
  - *Should Ignore Sunk Costs*
- Sunk Costs are Part of the Contextual Frame for Decision-Making

Sunk Costs in Public Policy

"To terminate a project in which $1.1 billion has been invested represents an unconscionable mishandling of taxpayers' dollars."

Jeremiah Denton (R-Alabama), 1981

"Completing Tennessee-Tombigbee is not a waste of taxpayer dollars Terminating the project at this late stage of development would, however, represent a serious waste of funds already invested"

James Sasser (D-Tennessee), 1981

sam.usace.army.mil

Common Violations of Rational Choice

Hastie & Dawes (2001)

- Choosing out of Habit
- Choosing on the Basis of Conformity
- Choosing on the Basis of Authorities

Conditions of Uncertainty

- Ill-Defined Problem
- Algorithm Unknown
- Insufficient Information
- Insufficient Opportunity
  - Time
  - Motivation

Framing in the Disease Problem

Tversky & Kahneman (1981)

- Imagine that You are a Public Health Official Facing the Impending Outbreak of a Deadly Disease
- Based on Past Experience, the Disease is Expected to Kill 600 People
- Two Alternative Programs Available…

semissourian.com

The Disease Problem (1)

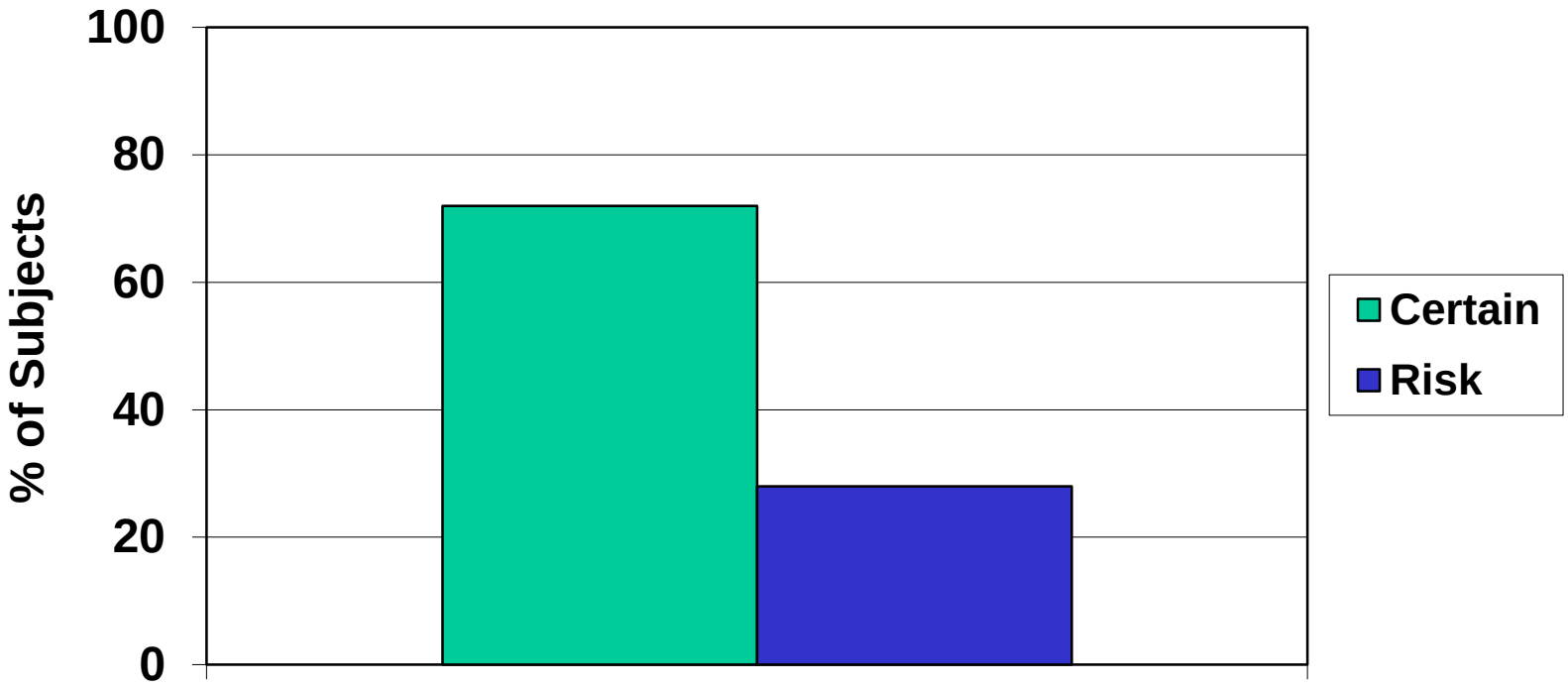
Tversky & Kahneman (1981)

- Certainty: If **A** is Adopted
  - 200 People Will Be Saved
- Risky Prospects: If **B** is Adopted
  - 1/3 Probability that All Will Be Saved
  - 2/3 Probability that None Will Be Saved

Which Program Do You Choose?

Choices in the Disease Problem (1)

Tversky & Kahneman (1981)



Evaluating the Choices with Rational Choice Theory

- Expected Value of a Choice
  - Outcome x Probability
- Program A: Certain that 200 Will Be Saved
  - Value = 1 x 200 = 200
- Program B: Chance that All Will Be Saved
  - Value = 1/3 x 600 = 200

Viewed Rationally, the Outcomes are Identical

Explaining the Effect (1)

- People are Risk-Averse
  - Prefer “Sure Thing” to Any Risk
- But People are Not Necessarily Risk-Averse
  - Will Accept Risks Under Certain Circumstances

Risky Prospects (2)

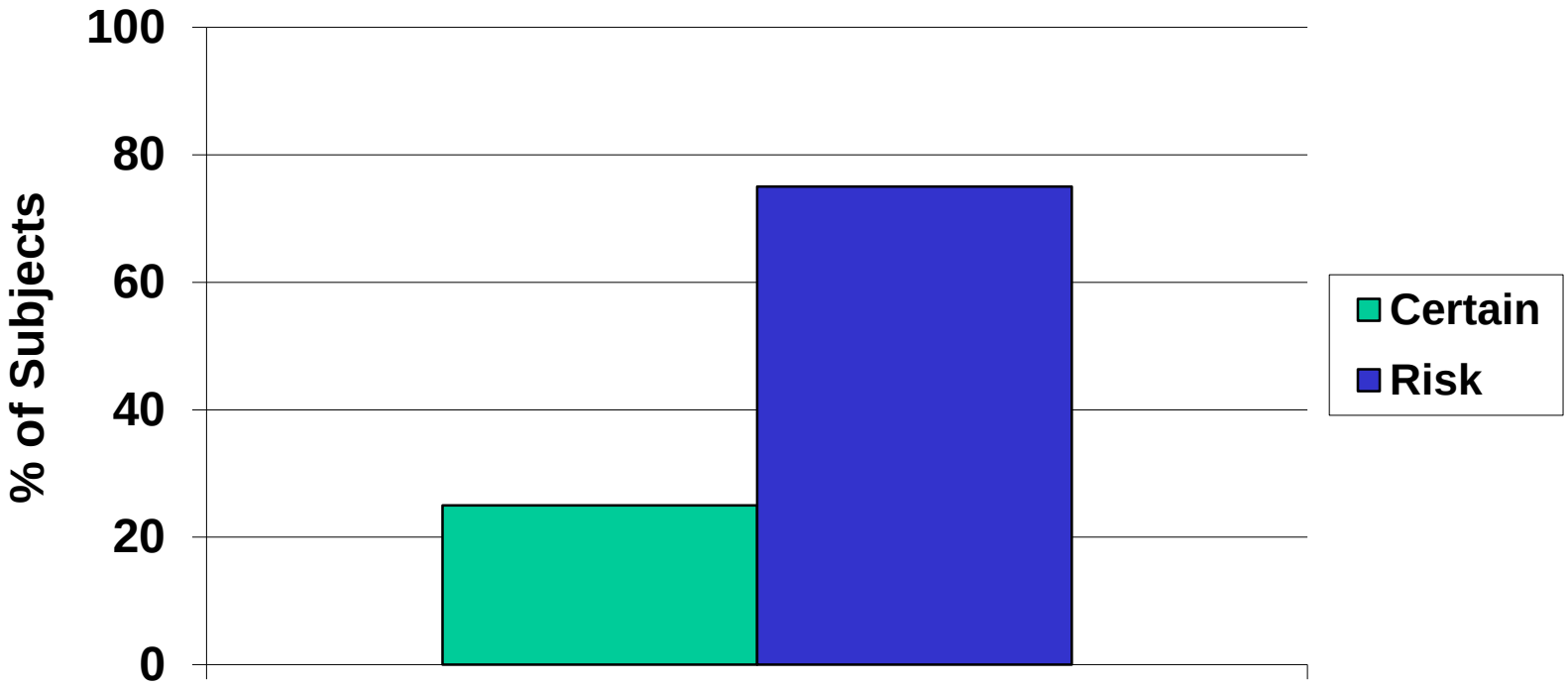
Tversky & Kahneman (1981)

- Certainty: If **C** is Adopted
  - 400 People Will Die
- Risky Prospects: If **D** is Adopted
  - 1/3 Probability that None Will Die
  - 2/3 Probability that All Will Die

Which Program Do You Choose?

Choices in the Disease Problem (2)

Tversky Kahneman (1981)



Evaluating the Choices with Rational Choice Theory

- Expected Value of a Choice
  - Outcome x Probability
- Program C: Certain that 400 Will Die
  - Value = 1 x 400 = 400
- Program D: Chance that All Will Die
  - Value = 2/3 x 600 = 400

Viewed Rationally, the Outcomes are Identical

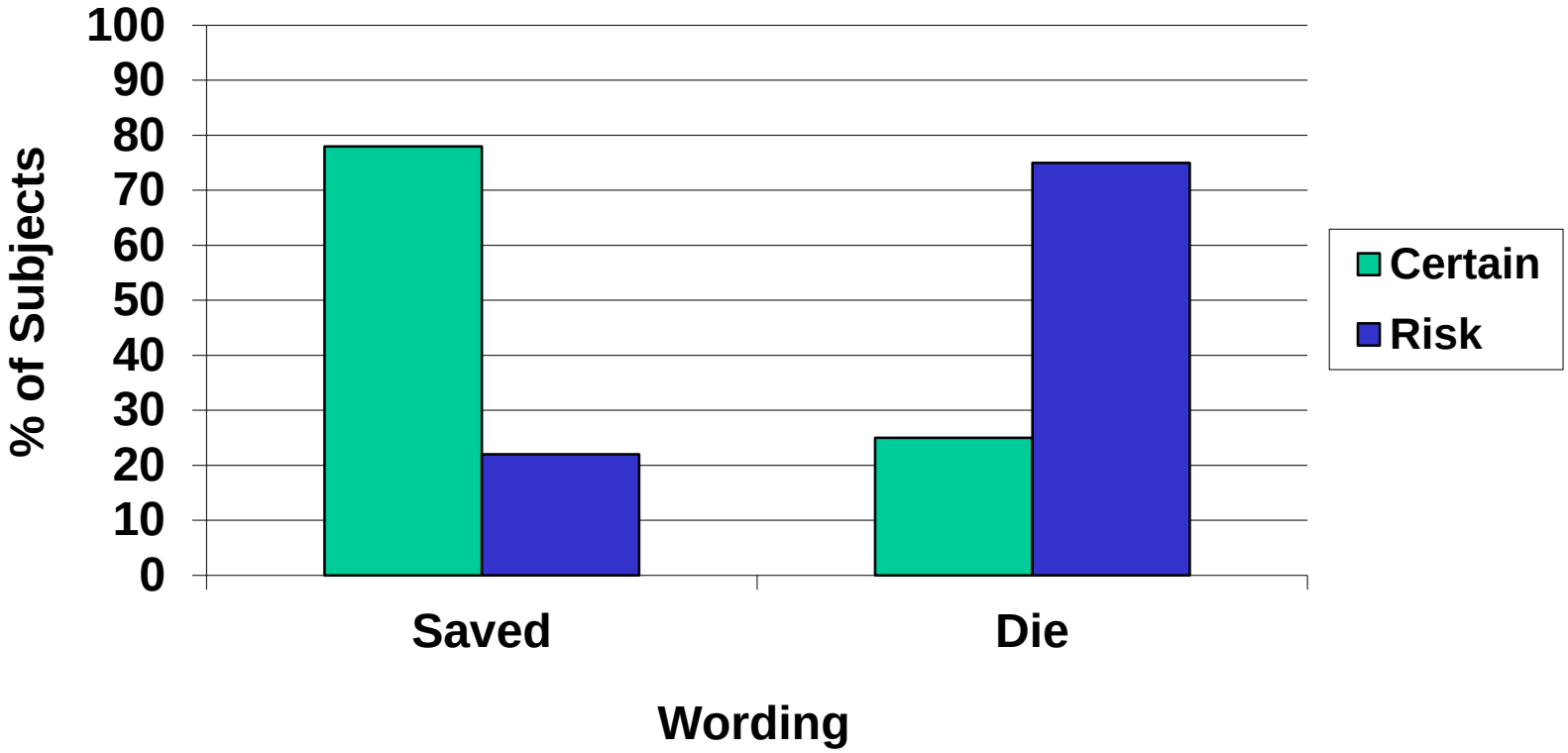
Expected Values of the Programs

Program	Saved	Lost
A	200	(400)
B	200	(400)
C	(200)	400
D	(200)	400

The Four Programs Are Normatively Equivalent
Why Do People Prefer One Over the Other?

Choices in the Disease Problem

Tversky & Kahneman (1981)



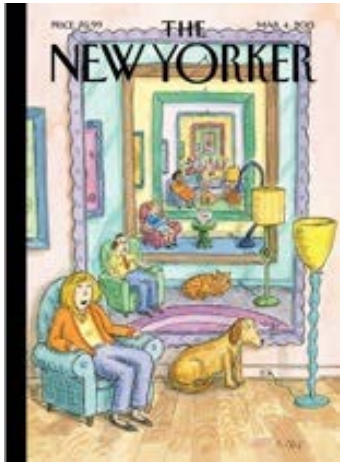
Framing the Disease Problem

- Programs A and B Focus on Gains
  - People's Lives to be Saved
  - Prefer Sure Gain, Averse to Risk
- Programs C and D Focus on Losses
  - People's Lives to be Lost
  - Avoid Sure Loss, Seek Risk

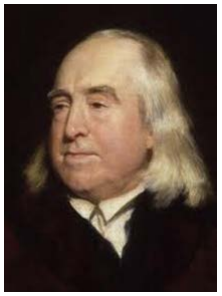
People Are Not Always Risk-Averse

Framing Effects

- Judgment is Not Invariant Over Different Descriptions of a Problem
  - Depends on How Problem is *Framed*



- Violates Normative Rationality
  - Rational Choice Determined by Abstract Representation of Problem
    - Values, Utilities are a Matter of Algebra
  - Judgment Should Not Depend on Wording of Problem



Expected Value Theory

Bentham (1789); von Neumann & Morgenstern (1947)

Value = Outcome x Probability

- Gamble A: 1/3 chance of winning $75
  - Expected Value = $75 x 1/3 = $25
- Gamble B: 1/2 chance of winning $40
  - Expected Value = $40 x 1/2 = $20

Violations of Expected Value Theory

- Lottery
  - 1 in 1,000,000 Chance of Winning $1,000,000
    - Expected Value: $1
    - But People Buy Lottery Tickets Anyway

- Choice Between Gambles
  - 1/3 Chance of $75 vs. 1/2 Chance of $40
  - Choose Gamble with Highest Odds
  - Choose the Gamble with the Highest *Utility*
    - Surplus Value

Expected Utility Theory

Bernoulli (1738); von Neumann & Morgenstern (1947)

- Determinants of Utility
  - Value = Outcome x Probability
  - Risk Aversion
  - Assets and Preferences
- Problems
  - Preference Reversals
    - Utilities Depend on Probability
  - Framing Effects

Subjective Expected Utility Theory

Prospect Theory

Kahneman & Tversky (1979)

Framing as Perception

- People Base Decisions on Subjective Utilities
  - Not Objective Values
- Anomalies of Expected-Utility Theory
  - Losses Loom Larger than Gains
  - First Impressions Shape Final Judgments
    - Anchoring and Adjustment
  - Vivid Examples Overshadow Statistical Summaries
    - Representativeness

Prospect Theory

Kahneman & Tversky (1979)

- People Base Decisions on Subjective Utilities
  - Not Objective Values
- Don’t Multiply Utilities by Objective Probability
  - Rather, Psychological (Subjective) Probability
    - Overweight Very High, Very Low Risks
- Don’t Evaluate Utilities in Absolute Sense
  - Rather, Against Background or Reference Point
  - Framing Alters Reference Point
    - Makes Prospects Appear Better or Worse Than They Really Are

The "People Are Stupid" School of Psychology

Kihlstrom (2004)

- People are Fundamentally Irrational
  - Don't Follow Logical Principles
  - Don't Think Very Hard About Anything
  - Let Feelings, Desires Get In the Way of Thinking
- People Usually Operate on "Automatic Pilot"
  - Swayed by First Impressions, Immediate Responses
  - Don't Pay Too Much Attention to Anything
- People Usually Don't Know What They Are Doing
  - Behavior is Mostly Unconscious
  - "Reasons" are Post-Hoc Rationalizations
  - Consciousness Gets in the Way of Adaptive Behavior

Bounded Rationality

Simon (1955, 1983)

- Normative Rationality as Idealization
  - Unrealistic
- Real World is Uncertain
  - Problems Not Well Defined
  - Information Available but Uneconomical
  - Algorithm Available but Uneconomical
- Limited Information-Processing Capacity
  - Cannot Attend to All Relevant Information
  - Cannot Perform Complex Computations

Satisficing

Simon (1955, 1983)

- Decision-Makers Do Not *Optimize*
  - Maximize Gains, Minimize Losses
- Rather, *Satisfice*
  - Evaluate Alternatives
  - Identify Those Whose Outcomes are Satisfactory
- Among Satisfactory Outcomes
  - Choose First Available (or Cheapest)
  - Choose Arbitrarily
  - Choose on Basis of Other (Noneconomic) Policy

Bounded Rationality is Based on "Fast and Frugal" Heuristics

Gigerenzer et al. (1999); Gigerenzer (2000)

- Heuristics Are Often the Best Approach
  - Many Problems are Ill-Defined
  - Many Algorithms are Uneconomical
- It is Rational to Inject Economies into Decision-Making
  - So Long as We Can Pay the Price of Error
- Reduce Errors
  - Understanding Normative Principles
  - Understanding Liabilities of Heuristics