



Chapter 17

Psychological Influences on Personal Probability

Thought Question 1:



During Cold War, Plous (1993) presented readers with the following test: Place a check mark beside the alternative that **seems most likely to occur within the next 10 years**:

- An all-out nuclear war between the United States and Russia
- An all-out nuclear war between the United States and Russia in which neither country intends to use nuclear weapons, but both sides are drawn into the conflict by the actions of a country such as Iraq, Libya, Israel, or Pakistan.

Using your intuition, pick the more likely event at that time. Now consider the probability rules discussed in Chapter 16 to try to determine which statement is more likely.

Thought Question 2:



Which is a more likely cause of death in the United States, homicide or diabetes?
How did you arrive at your answer?

Thought Question 3:



Do you think people are **more likely to pay to reduce their risk** of an undesirable event from **95% to 90%** or to reduce it from **5% to zero**?

Explain whether there should be a preferred choice, based on material from Chapter 16.

Thought Question 4:

A fraternity consists of 30% freshmen and sophomores and 70% juniors and seniors. Bill is a member of the fraternity, he studies hard, he is well-liked by his fellow fraternity members, and he will probably be quite successful when he graduates.

Is there any way to tell if Bill is **more likely** to be a lower classman (freshman or sophomore) or an upper classman (junior or senior)?

17.1 Revisiting Personal Probability



- Some situations not repeatable.
- **Personal probabilities:** values assigned by individuals based on how likely they think events are to occur.
- Still should *follow the rules* of probability.

17.2 Equivalent Probabilities, Different Decisions



Certainty Effect: people more willing to pay to reduce risk from fixed amount down to 0 than to reduce risk by same amount when not reduced to 0.

Example 1: Probabilistic Insurance

- Students asked if want to buy “probabilistic insurance”
... costs half as much as regular insurance but only covers losses with 50% probability.
- Majority (80%) not interested.
- Expected value for return is same as regular policy.
- Lack of assurance of payoff makes it unattractive.

Source: Kahneman and Tversky (1979)

Pseudocertainty Effect: people more willing to accept a complete reduction of risk on certain problems and no reduction on others than to accept a reduced risk on a variety (all) problems.



Example 2: Vaccination Questionnaires

- *Form 1: probabilistic protection* = vaccine available for disease that afflicts 20% of population but would protect with 50% probability. **40% would take vaccine.**
- *Form 2: pseudocertainty* = two strains, each afflicting 10% of population; vaccine completely effective against one but no protection from other. **57% would take vaccine.**
- In both, vaccine reduces risk from 20% to 10% but complete elimination of risk perceived more favorably.

Source: Slovic, Fischhoff, and Lichtenstein, 1982, p. 480.

17.3 How Personal Probabilities Can Be Distorted



The Availability Heuristic

Tversky and Kahneman (1982a, p. 11) note that “there are situations in which people assess the . . . probability of an event by the ease with which instances or occurrences can be brought to mind. . . . This judgmental heuristic is called *availability*.”

Which do you think caused more deaths in the United States in 2000, homicide or diabetes?

Most answer *homicide*. The actual death rates were 6.0 per 100,000 for homicide compared with 24.6 per 100,000 for diabetes (*National Center for Health Statistics*).

Distorted view that homicide is more probable results from the fact that *homicide receives more attention in the media*.

Distorted Personal Probabilities



Detailed Imagination

Risk perceptions distorted by having people vividly imagine an event.

Example:

Salespeople convince you that \$500 is a reasonable price to pay for an extended warranty on your new car by having you imagine that if your air conditioner fails it will cost you more than the price of the policy to get it fixed. They don't mention that it is extremely unlikely that your air conditioner will fail during the period of the extended warranty.

Distorted Personal Probabilities



Anchoring

Risk perception distorted by providing a reference point, or an **anchor**, from which they adjust up or down.

Most tend to stay close to the anchor provided.

Example 3: Nuclear War *Source: Plous (1993, pp. 146-147)*

What is the chance of nuclear war between U.S. and Soviet Union?

- **Low-anchor** version: Do you think the chances were higher or lower than 1%? Give your best estimate of the exact chances.
- **High-anchor** version: Do you think the chances were higher or lower than 90%? Give your best estimate of the exact chances.
- **No-anchor** version: Give your best estimate of the exact chances.

Low-anchor estimates < No-anchor estimates < High-anchor estimates

Distorted Personal Probabilities



The Representativeness Heuristic and the Conjunction Fallacy

Representativeness heuristic leads people to assign higher probabilities than warranted to scenarios that are representative of how we imagine things would happen.

This leads to the **conjunction fallacy** ... when detailed scenarios involving the conjunction of events are given higher probability assessments than statements of one of the simple events alone.

Example 5: An Active Bank Teller

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 antinuclear demonstrations.

Respondents asked which of two statements was *more probable*:

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

Results: “in a large sample of statistically naïve undergraduates, 86% judged the second statement to be more probable”.

Problem: If Linda falls into the second group, she must also fall into the first group (bank tellers). Therefore, the first statement must have a higher probability of being true.

Source: Kahneman and Tversky (1982, p. 496)

Distorted Personal Probabilities



Forgotten Base Rates

The representativeness heuristic can lead people to ignore information about likelihood of various outcomes

Example:

Subjects told a population has 30 engineers and 70 lawyers.

Asked: What is the likelihood that a *randomly selected individual* would be an engineer? Average close to 30%.

Then subjects given this description and asked likelihood:

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.

Subjects ignored base rate of 30%, median response was 50%.

Source: Kahneman and Tversky (1973, p. 243)

17.4 Optimism, Reluctance to Change, and Overconfidence



Optimism

Slovic and colleagues (1982, pp. 469–470) note that “the great majority of individuals believe themselves to be better than average drivers, more likely to live past 80, less likely than average to be harmed by the products they use, and so on.”

Example 6: Optimistic College Students

On the average, students rated themselves as 15 percent more likely than others to experience positive events and 20 percent less likely to experience negative events.

Sources: Weinstein (1980) and Plous (1993, p. 135)

Reluctance to Change

The reluctance to change one's personal-probability assessment or belief based on new evidence.

Plous (1993) notes, “*Conservatism* is the tendency to change previous probability estimates more slowly than warranted by new data” (p. 138).

Overconfidence

The tendency for people to place too much confidence in their own assessments.

When people venture a guess about something for which they are uncertain, they tend to overestimate the probability that they are correct.

Example 7: How Accurate Are You?

Study Details:

Asked people hundreds of questions on general knowledge.
e.g. Does *Time* or *Playboy* have a larger circulation?
Also asked to rate odds they were correct, from 1:1
(50% probability) to 1,000,000:1 (virtually certain).

Results: the more confident the respondents were,
the more the true proportion of correct answers
deviated from the odds given by the respondents.

Solution: Plous (1993, p. 228) notes, “The most effective
way to improve calibration seems to be very simple:
Stop to consider reasons why your judgment might be wrong”.

Source: Fischhoff, Slovic, and Lichtenstein (1977)

17.5 Calibrating Personal Probabilities of Experts



Professionals who help others make decisions (doctors, meteorologists) often use personal probabilities themselves.

Using Relative Frequency to Check Personal Probabilities

For a *perfectly calibrated* weather forecaster, of the many times they gave a 30% chance of rain, it would rain 30% of the time. Of the many times they gave a 90% chance of rain, it would rain 90% of the time, etc.

Can assess whether probabilities are **well-calibrated** only if we have enough repetitions of the event to apply the relative-frequency definition.

Case Study 17.1: Calibrating Weather Forecasters and Physicians

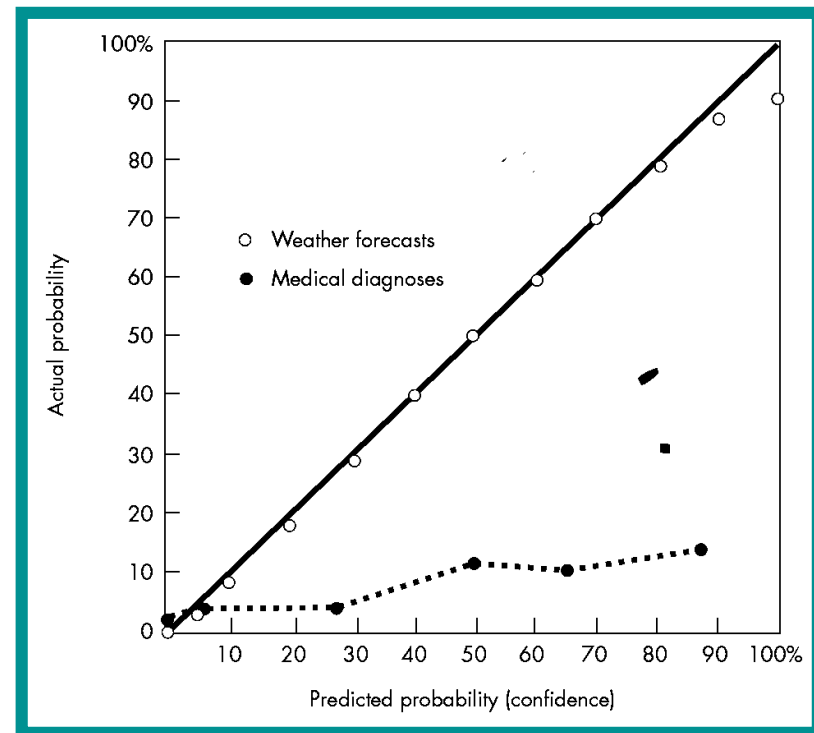


Open circles: actual relative frequencies of rain vs. forecast probabilities.
Dark circles relative frequency patient actually had pneumonia vs. physician's personal probability they had it.

Weather forecasters were quite accurate, well calibrated.

Physicians tend to overestimate the probability of disease, especially when the baseline risk is low.

When physician quotes a probability, ask “personal or based on data?”



Source: Plous, 1993, p. 223

17.6 Tips for Improving Personal Probabilities and Judgments



1. Think of the *big picture*, including risks and rewards that are not presented to you. For example, when comparing insurance policies, be sure to compare coverage as well as cost.
2. When considering how a decision changes your risk, try to *find out what the baseline risk is* to begin with. Try to determine risks on an equal scale, such as the drop in *number* of deaths per 100,000 people rather than the *percent* drop in death rate.

Tips for Improving Personal Probabilities and Judgments



3. Don't be fooled by *highly detailed scenarios*. Remember that excess detail actually decreases the probability that something is true, yet the representativeness heuristic leads people to increase their personal probability that it is true.
4. Remember to list reasons why your judgment might be wrong, to provide a more realistic confidence assessment.

Tips for Improving Personal Probabilities and Judgments



5. Do not fall into the trap of thinking that bad things only happen to other people. *Try to be realistic* in assessing your own individual risks, and make decisions accordingly.
6. Be aware that the techniques discussed in this chapter are often used in marketing. For example, *watch out for the anchoring effect* when someone tries to anchor your personal assessment to an unrealistically high or low value.
7. If possible, *break events into pieces* and try to assess probabilities using the information in Chapter 16 and in publicly available information.