Experts of probability are accurate – Murphy & Winkler (1984) showed that weather experts were good at making probability estimates, as were bookies.

Are lay people? – Busheyhead et al. (1981) asked doctors to estimate the probability their patients had pneumonia. They overestimated the probability.

Gigerenzer & Hoffrage (1995) – Presented people with the **Mammography Problem** in a probability and a frequency format and found that people made much less errors when it was presented in a frequency format. **McClelland** (in press) found neither of these to be the case. However, he did find a significant effect of educational background.

Initially developed by **Savage (1954),** this theory proposed the same as Expected Utility Theory (Von Neumann et al. 1944) but allowed for people's subjective or personal probabilities of outcomes (instead of just relative frequencies).

For some events, it is only possible to make a Subjective judgement, as they can only happen once. For example, under expected utility theory, it would be useless to produce the **probability** of a nuclear war.

The assumption behind this theory is that probability information is available to people. E.g. the coin will produce 6 heads in every 10 throws. **However,** this is rarely the case in reality.

This theory fails as a descriptive theory if people do not follow similar rules to Expected Utility Theory when making judgments (e.g. cancellation, dominance and invariance) Can this theory be used **prescriptively?**

Subjective Expected Utility Theory (Savage, 1954)

Evaluating SEU (Savage) and Decision Analysis (Raiffa)
These theories assume that probability judgements follow probability rules.

Decision Analysis (Raiffa, 1968)
This is a **prescriptive** use of SEU theory. It is based on the notion that the best course of action follows a formal presentation of the maximum expected utility **action axiom** (an If – Then statement). This is used in applied settings (e.g. military) to provide decision support.

Probabilities sum to one – Tversky et al. **(1994)** showed that when an alternative is broken down in to sub–alternatives, people make subjective probabilities sum to more than one.

The Conjunction Fallacy (Tversky & Kahneman 1983) Linda is a 31 year old woman who is outspoken and bright. She majored in philosophy. As a student, she was concerned with social justice and participated in antinuclear demonstrations. Is 1) Linda a bank teller or 2) A bank teller, active in the feminist movement.

Inappropriate Optimism – Fischhoff et al. (1982) found that people are usually overconfident about their judgments for general knowledge questions. For perceptual judgments or forecasts, this effects seems to disappear however.

Tversky & Kahneman argue that people often judge probabilities according to the **representativeness heuristic (by the degree to which A is representative of B).** In this case, A is Linda and B is our knowledge of a feminist. Though we know that there are more non–feminist (at least non–active feminist) bank tellers, we still predict **a higher probability** that she is active in the feminist movement, because she is more representative of the description.

This led **Gigerenzer** and other ecological psychologists within the Brunswikian tradition to suggest that experimenters include too many questions that seem easy but actually have counterintuitive answers. They suggest that the effect disappears when questions are more ecologically valid.

Do people know what they like? Kahneman & Snell (1990) found that although people predicted that they would like their chosen food (yoghurt or ice cream) less after a week of eating it, they actually liked it the same amount. People who plan lunches tend to incorporate a lot more variety in to them than those that go day by day.

1) Structure the problem – Determine your options and the possible events that might occur. An example of the action axiom in the example could be '**If** I go for a picnic and it is sunny, **then** that will be my most preferred option'.

2) Estimate probabilities & utilities – Get people to directly estimate **probabilities**, % likelihoods or odds of an event occurring. Or, get them to choose between wagers, where they get £10 for a shaded segment of a circle and nothing otherwise. At the point where they are indifferent between wagers, their subjective utilities can be measured and given as ratings.

3) Calculate – Calculate each outcome's utility and probability.

4) Select – Choose the outcome with the largest sum of utility and probability ratings.

Fischhoff, Slovic et al. (1978) showed that failure to include all possible events biases subjective probabilities.