

Mekong River Commission

Ecological Risk Assessment Training Program

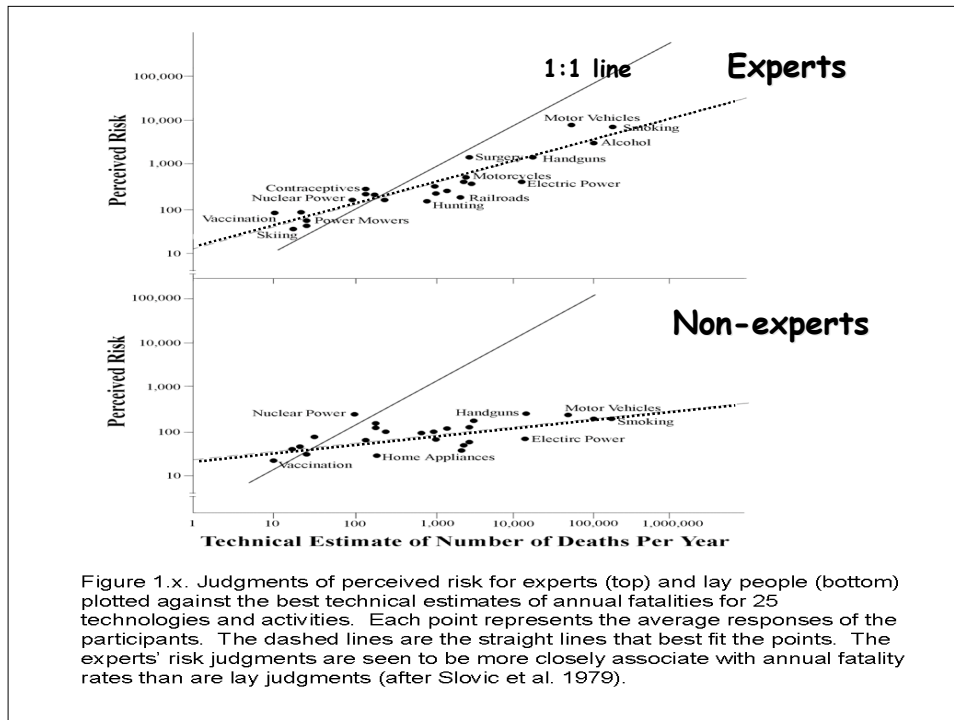
Risk Perception



Concepts of risk perception

- Considerable psychological research on risk perceptions
- Generally humans are bad judges of risk
- Even so-called experts are not as good as might be expected

MRC Ecological Risk Assessment Training Course - Workshop 1

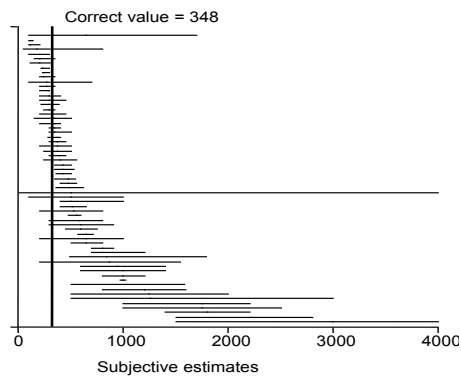


Five claims

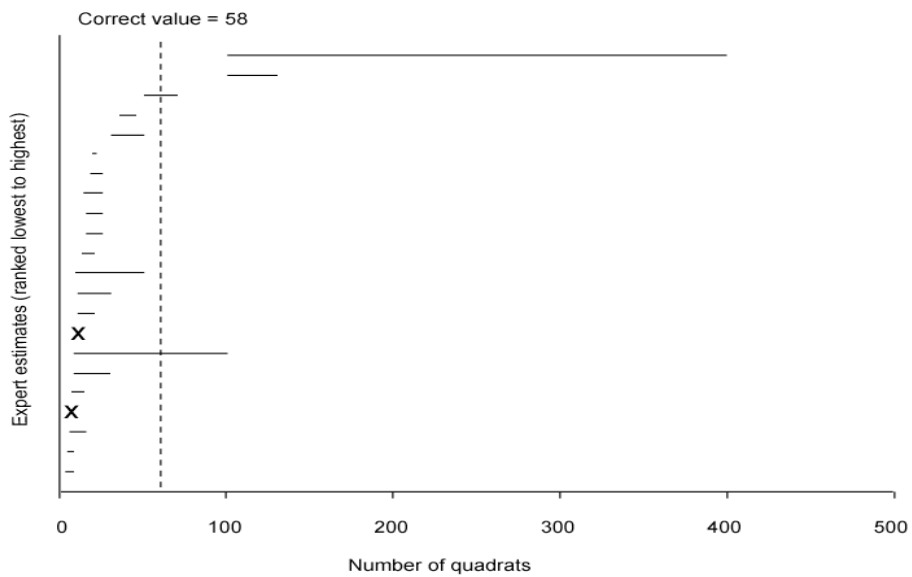
1. Experts are overconfident
2. Experts are susceptible to un-acknowledged psychological idiosyncracies
3. Experts are susceptible to un-acknowledged linguistic uncertainty
4. Experts methods of inference lead to irrational interpretations of data
5. Experts are susceptible to false appeals to authority

1. Overconfidence

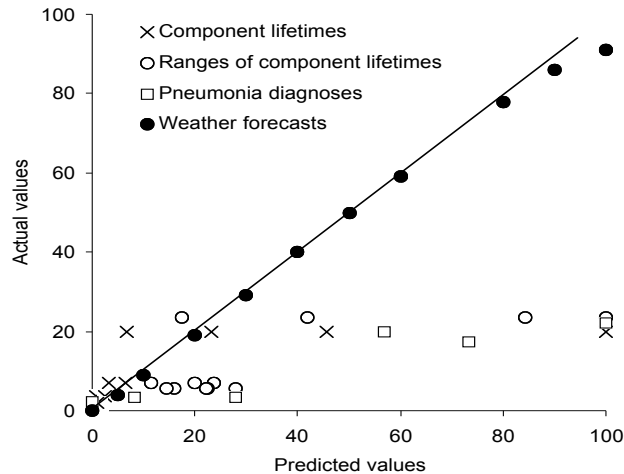
Bean counters



Field ecologists



Weather forecasters



Successful risk assessors

- Weather forecasters, bookmakers, bridge players
- Why?
 - They practice
 - They make predictions on a routine basis and receive immediate feedback on their performance
 - Their judgements reflect on them personally when they get it wrong

Human perceptions of risk

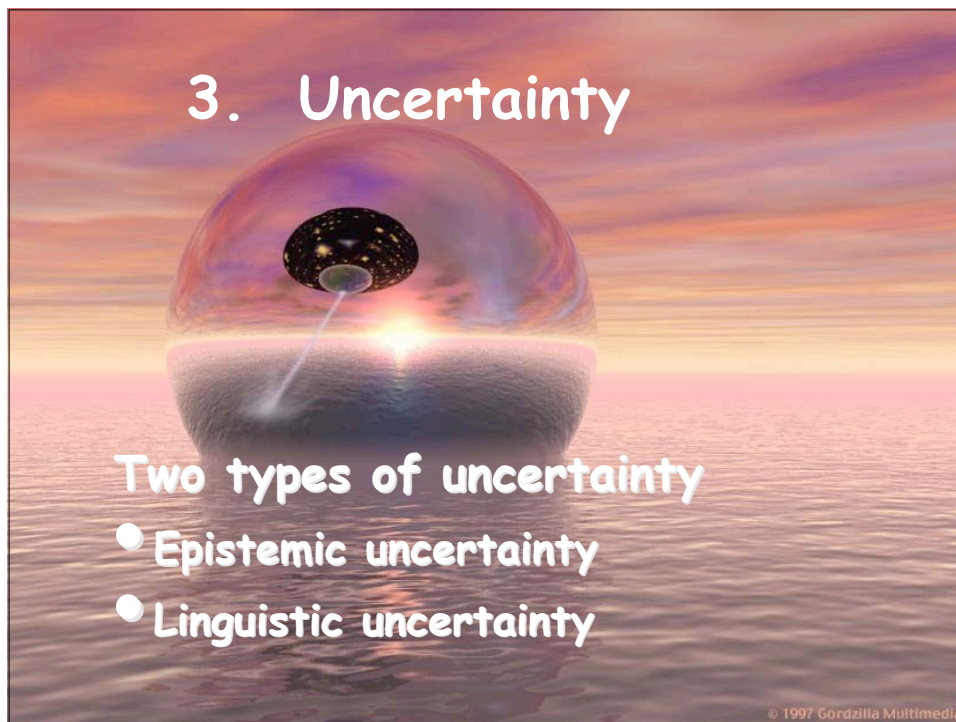
- Human make judgements about risky situations depending upon their personal history
- **Insensitive to sample size**
 - Expectation that small samples represent large population
 - Leads to:
 - Underestimation of risk by proponents
 - Overestimation of risk by those dealing with consequences
 - Undue confidence in early trends and apparent patterns
 - Undue confidence in the failure to detect impacts
- **This is one of the reasons why we advocate formal, transparent, repeatable & quantitative risk assessments**

2. Cognitive errors (psychology)

- People colour their judgements in uncertain situations with perceptual idiosyncrasies...
- An individuals response & tolerance to risk depends upon:
 - **Level of personal control** - if person feels in control of situation will tolerate higher risk
 - **Voluntary acceptance** - people will tolerate higher risks when they are given a choice
 - **Understanding** - people will tolerate higher risk when they understand technical details

MRC Ecological Risk Assessment Training Course - Workshop 1

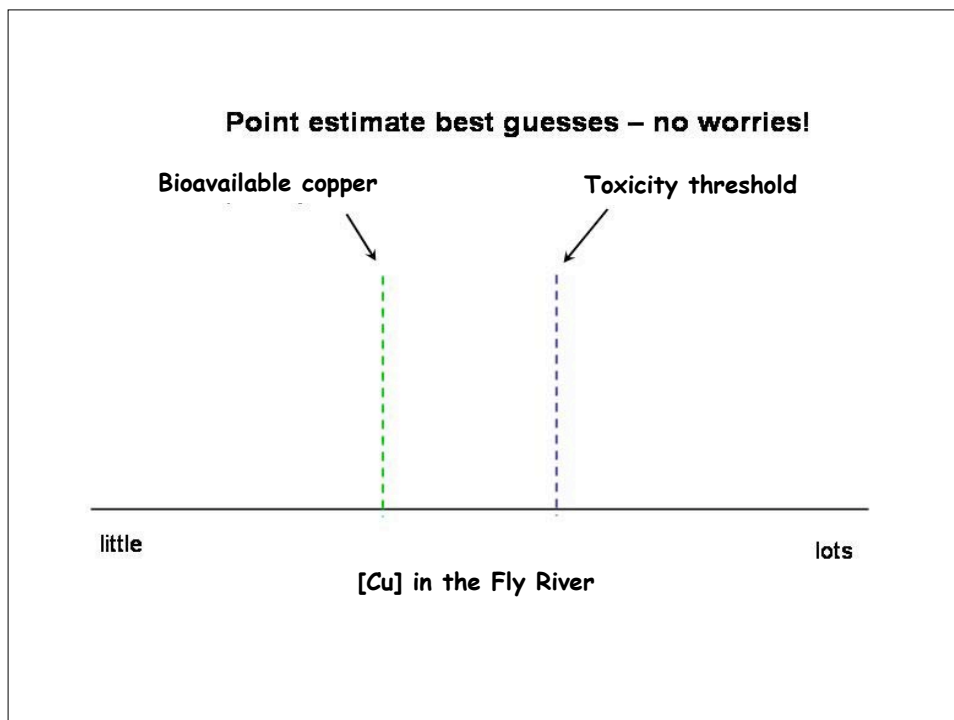
- **Uncertainty about the consequences** - people less likely to tolerate risk if consequences are uncertain (new technology)
- **Dreadfulness of outcome** - tolerance of risk strongly dependent upon how terrible the consequences appear ('outrage factor')
- **Visibility of the hazard** - risk tolerance is influenced by the profile of the potential hazard (deaths in aeroplanes & earthquakes more newsworthy than car deaths)



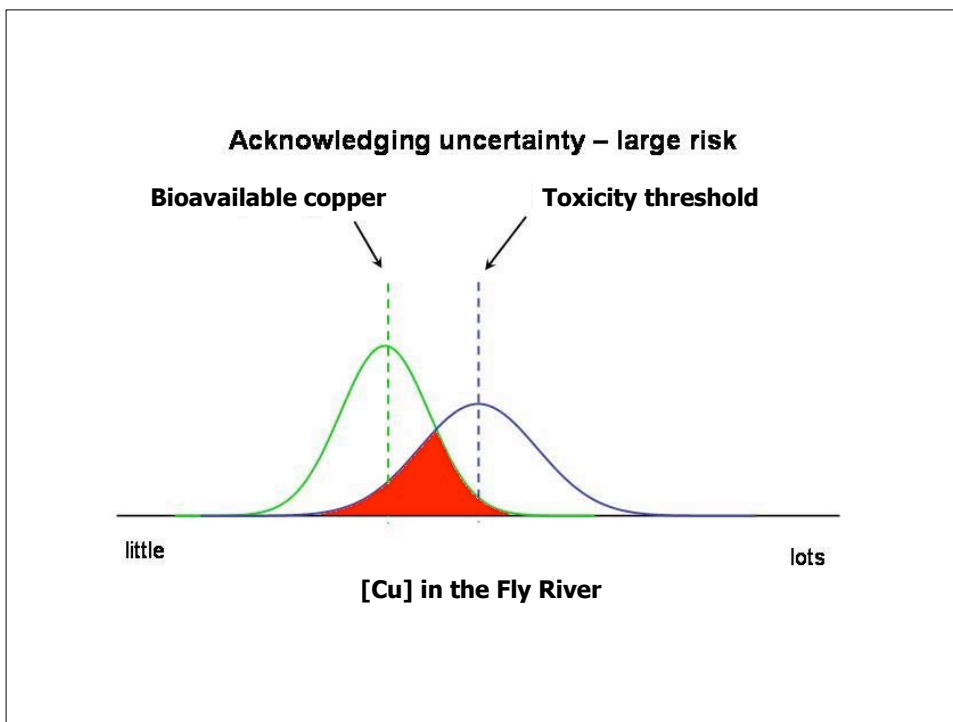
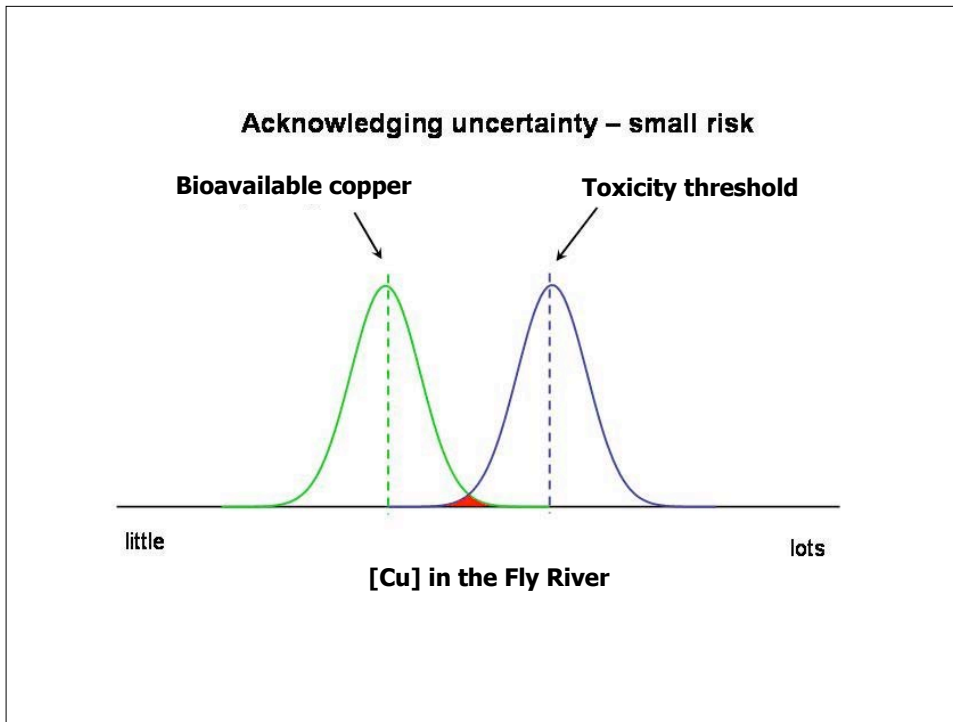
MRC Ecological Risk Assessment Training Course - Workshop 1

Epistemic uncertainty

- Facts are clouded by measurement error, structural uncertainty, natural variation, ...
- Measurement error and bias
- Natural variation
- Model uncertainty
- Subjective (expert) judgment



MRC Ecological Risk Assessment Training Course - Workshop 1



Linguistic uncertainty

- Facts are clouded by language, including ambiguity, vagueness, ...
- Ambiguity
- Vagueness
- Underspecificity

Ambiguity

Terms for non-indigenous plant species:

'alien', 'exotic', 'invasive', 'imported', 'weedy',
'introduced', 'non-native', 'immigrant', 'colonizer' and
'naturalized'

Shrader-Frechette (2001)

Ambiguity in statistical inference

e.g., 'No Observed Effect Concentration'

- the highest amount of a substance for which no significant effect was found (at $\alpha=0.05$) in a statistical test between a treatment and a control
- the acronym is easily and frequently interpreted to mean a no **observable** effect level

(Laskowski 1995).

Vagueness: risk-related terms

*'The risk of further collapse is **very high**'*

*'The chance of a ship collision is **low**'*

*'The risk of gene transfer is **remote**'*

Almost certain

Very likely

Highly likely

Reasonably likely

Fairly likely

Even chance

Fairly unlikely

Reasonably unlikely

Highly unlikely

Very unlikely

Almost impossible

4. Personal values dominate

- People often prefer smaller reward with greater certainty than larger reward with less certainty (e.g. risk in stock market)
- Behaviour of individuals is governed by personal views of what is to be gained or lost by a decision
- Risk aversion can be modified by apparent context
- Risk decisions involve two elements:
 - The objective facts
 - The subjective view of the desirability of what is to be gained or lost by the decision
- Types
 - Risk takers
 - Risk avoiders

Key messages

- Experts are generally over confident
- Experts have (unacknowledged) biases
- Linguistic uncertainties cause difficulties with risk assessments
- Personal values dominate in qualitative risk assessments
- Qualitative rankings mainly hide biases
- For these reasons we advocate formal, transparent, repeatable & quantitative risk assessments