Risk and expert judgment

Mark Burgman
Against the genie: in November last year, demonstrators took their grievances to the World Trade Organization in Paris.
Why people worry about the ‘wrong’ things

Judgements in uncertain situations are coloured by...

- overconfidence
- framing
- level of personal control
- understanding of the issues
- degree of personal experience
- dreadfulness of the outcome (kill size, outrage)
- equitability
- visibility
- status
Pathology of risk perception leading to ...

- insensitivity to sample size (Law of Small Numbers)
- appeals to authority
- framing effects
- overconfidence
- anchoring
- hindsight bias
- availability bias
- motivational bias
Bernardo De Bernardinis ... gave media interviews saying tremors "posed no danger". Photo: AFP

Read more:
http://www.theage.com.au/world/scientists-found-guilty-for-earthquake-deaths-20121023-2823y.html#ixzz2AkBfFkMV
What can groups do?

IQ gain vs Group Size graph.

Diagram with points A to P and coordinates:
- A = (0,0,1)
- B = (1/2,0,1/2)
- C = (1/3,1/6,1/2)
- D = (1/4,1/4,1/2)
- E = (1/6,1/3,1/2)
- F = (0,1/2,1/2)
- G = (1/2,1/6,1/3)
- H = (1/3,1/3,1/3)
- I = (1/6,1/2,1/3)
- J = (1/2,1/4,1/4)
- K = (1/4,1/2,1/4)
- L = (1/2,1/3,1/6)
- M = (1/3,1/2,1/6)
- N = (1,0,0)
- O = (1/2,1/2,0)
- P = (0,1,0)

Photo # NH 70305  USS Scorpion comes alongside USS Tallahatchie County, April 1968.
Integrated elicitation process

Before

- Draft calibration and elicitation questions
- Identify the experts

Online elicitation tool supports:
- Face-to-face workshops
- …or Virtual Panels via teleconference

During Elicitation

- Agree on question meaning
- Make initial estimate (4-step format)
- Discuss differences/similarities of opinion
- Provide a final confidential estimate

After

- Feedback on expert calibration
- Post-hoc analysis of results

For each question
The 3-step Procedure

Columbia University was the last ivy league school to admit women.

Columbia University admitted women before 1980 (Y/N)?

1. What do you think is the lowest probability that this statement is true?
2. What do you think is the highest probability that this statement is true?
3. Realistically, what is your best estimate?
Columbia University was the last ivy league school to admit women. Did it admit women before 1980 (Y/N)?
Columbia University was the last Ivy League school to admit women. Did it admit women before 1980 (Y/N)?

NO! They were admitted in 1983.
George Mason University (Mason)
- Charles Twardy (PI), Kathryn Laskey (Co-PI), Robin Hanson

Australian Center of Excellence for Risk Analysis

And a supporting cast of thousands….

Intelligence Advanced Research Projects Activity (IARPA) invests in high-risk/high-payoff research programs that have the potential to provide our nation with an overwhelming intelligence advantage over future adversaries
Peer versus self assessments

$r = 0.85$

Range across workshops

[0.675 to 0.944]
Do peer assessments correlate with performance?
‘Best’ expert versus the group
What doesn’t work

Relying on individuals...
• overconfidence, hindsight bias
• framing
• availability bias
• reference group, base rate neglect
• using the person who (everyone believes) knows the most: the status effect
• undetected linguistic uncertainty

Relying on naïve groups...
• naïve question formulation: linguistic uncertainty
• unstructured discussion
• dominance, group-think
• common data sources / lack of independence
• uniformity in context, culture, styles of reasoning
To fix the problems

Ask individuals to...
- Consider counter-arguments
- Answer the same question in different ways (lowest, highest, most likely)
- Indicate confidence
- Examine estimates made by other people (feedback)
- Revise original estimates after feedback
- Anticipate issues with conditional probabilities, base rates, …

Then, don’t rely on individuals...
- Discuss questions to eliminate linguistic uncertainty
- Make groups diverse—age, gender, background and cognitive style
- Encourage groups to discuss and revise question meaning
- Use psychologically, culturally and contextually diverse, independent people
- Avoid group think—Delphi / independent data / anonymity in judgments