



Experiences in Implementing Uncertainty Assessments in the Defense/Intelligence Communities

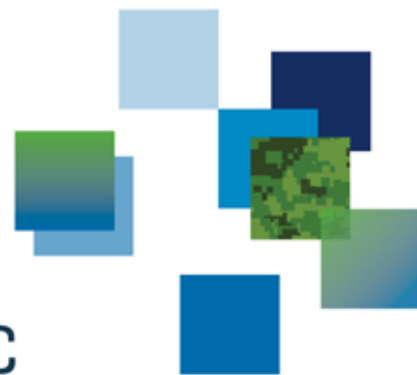
David R. Mandel

DRDC, Toronto Research Centre

David.Mandel@drdc-rddc.gc.ca

Characterizing and Communicating Uncertainty in the Assessment of Benefits and Risks of Pharmaceutical Products: An Institute of Medicine Workshop, February 12-13, 2014, White Oak, MD.

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- The views expressed here are my own and not the organizations I represent.
- I acknowledge the partnership of Alan Barnes, a retired intelligence director in the Canadian government, who introduced me to many of the intelligence community's human challenges.

Intelligence analysis as judgment under uncertainty

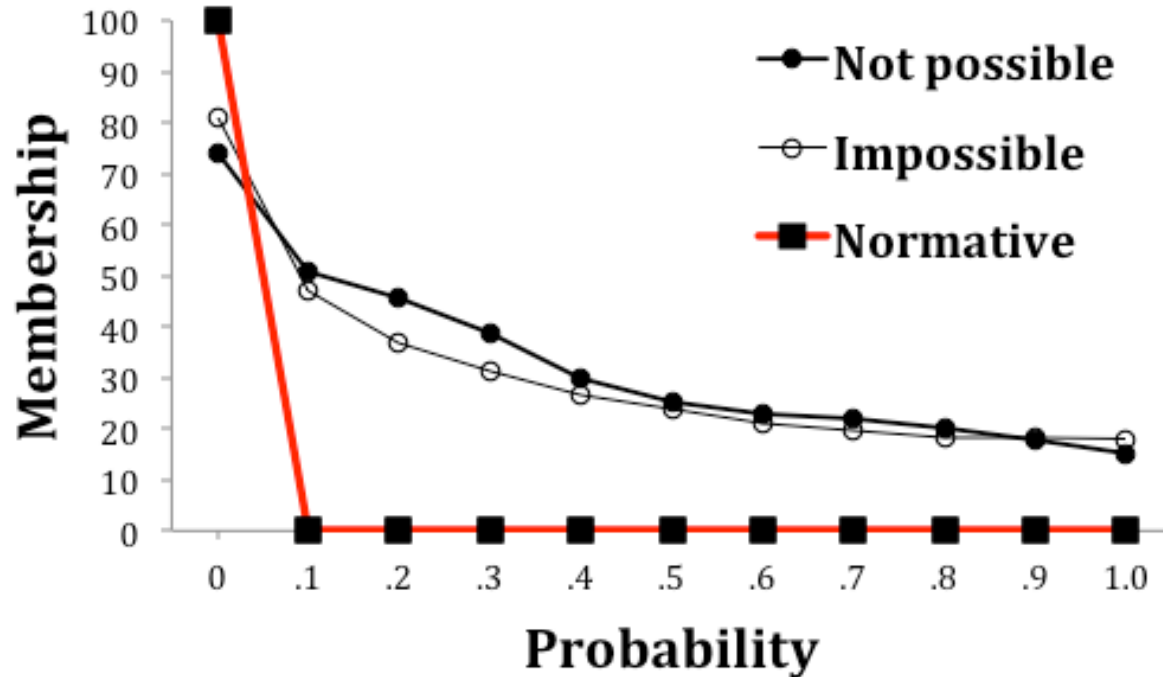


“The briefing officer was reporting a photoreconnaissance mission. Pointing to the map, he made three statements:

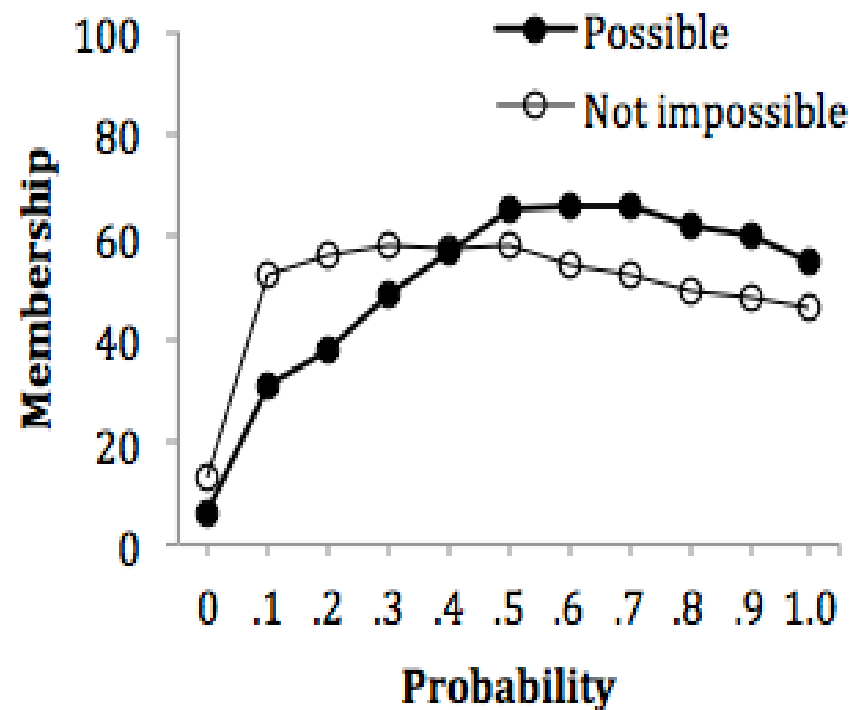
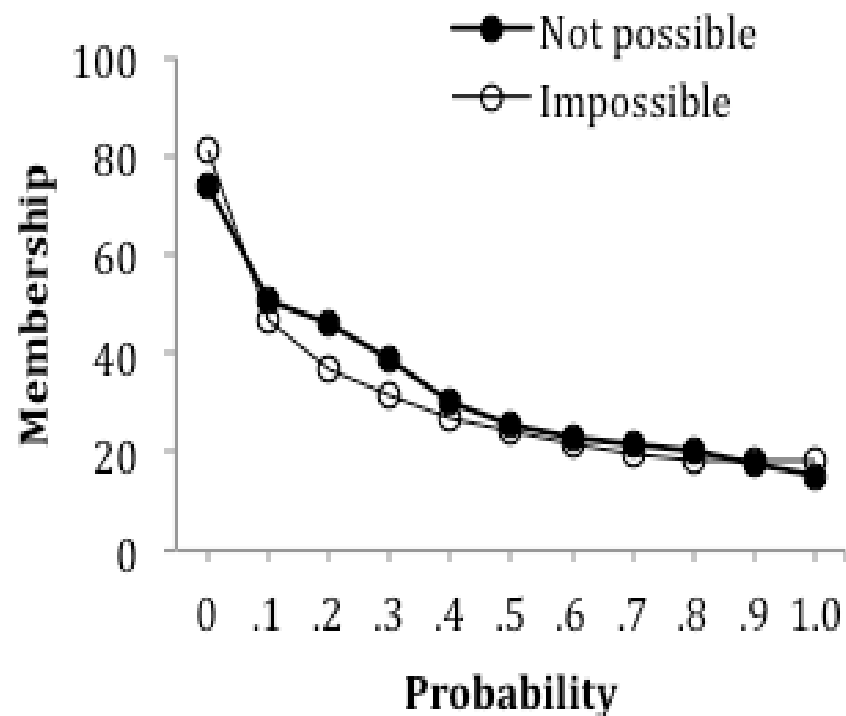
1. ‘And at this location there is a new airfield. [He could have located it to the second on a larger map.] Its longest runway is 10,000 feet.’
2. ‘It is almost certainly a military airfield.’
3. ‘The terrain is such that the Blanks could easily lengthen the runways, otherwise improve the facilities, and incorporate this field into their system of strategic staging bases. It is possible that they will.’ Or, more daringly, ‘It would be logical for them to do this and sooner or later they probably will.’”

Some of the difficulties:

- Words are imprecise and vague, their imprecision varies across individuals, and is not necessarily aligned with normative meanings.



Phrases that ought to be synonymous aren't necessarily so



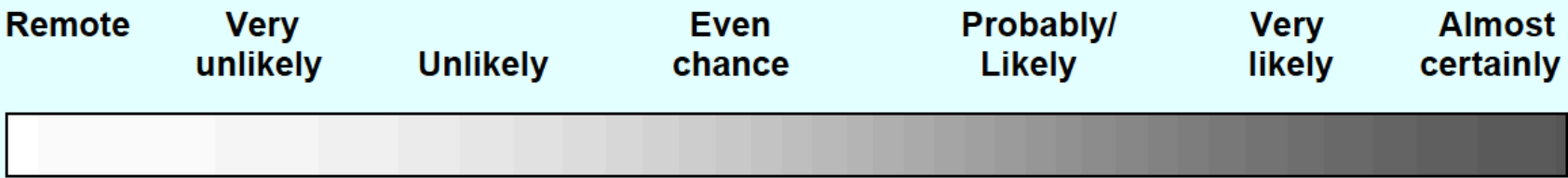
Poetic expression and weasel words

- Phrases that seem to say more than they commit the speaker to.
- *Distinctly* possible that... → possible that... (or something stronger)
- May *well* be that... → may be that... (e.g., is likely that...)
- Weasel words: reportedly, apparently, seems, appears, suggests, indicates...

Conventional corrective measures

- Prohibitory standards – e.g., omit weasel words.
- Definitional standards – institutionalize a rank ordering of terms.

Estimates of Likelihood. Because analytical judgments are not certain, we use probabilistic language to reflect the Community’s estimates of the likelihood of developments or events. Terms such as *probably*, *likely*, *very likely*, or *almost certainly* indicate a greater than even chance. The terms *unlikely* and *remote* indicate a less than even chance that an event will occur; they do not imply that an event will not occur. Terms such as *might* or *may* reflect situations in which we are unable to assess the likelihood, generally because relevant information is unavailable, sketchy, or fragmented. Terms such as *we cannot dismiss*, *we cannot rule out*, or *we cannot discount* reflect an unlikely, improbable, or remote event whose consequences are such that it warrants mentioning. The chart provides a rough idea of the relationship of some of these terms to each other.



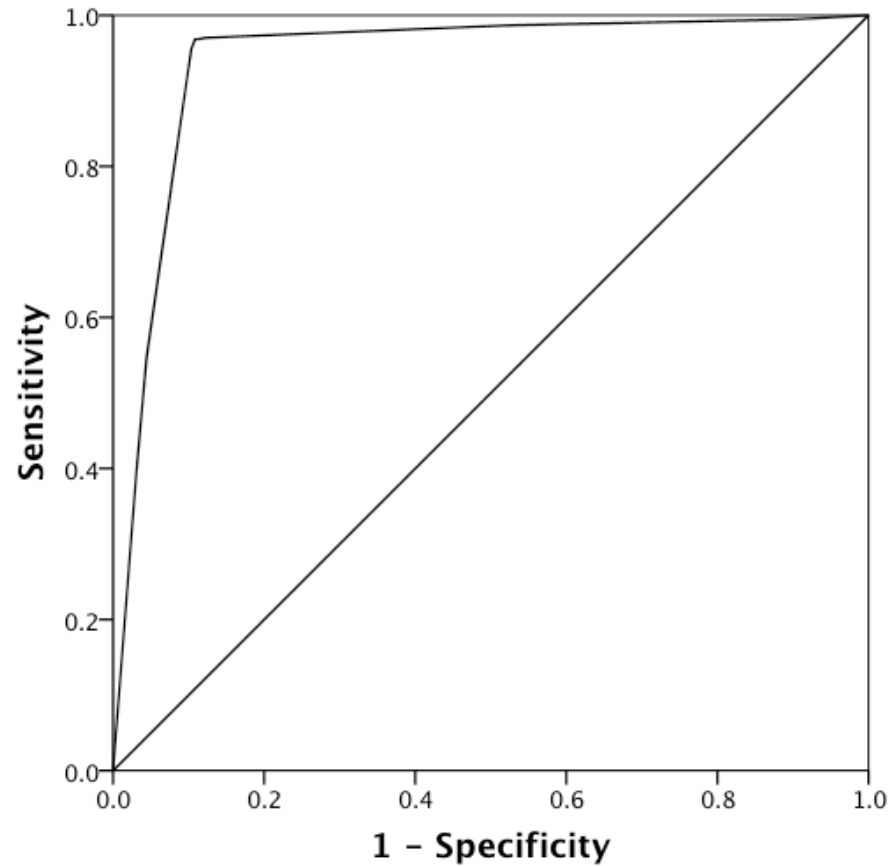
I m p a c t	Severe 5	Significant	High	High	Very High	Very High
	Major 4	Medium	Significant	High	High	High
	Moderate 3	Low	Medium	Significant	Significant	High
	Minor 2	Low	Low	Medium	Medium	Significant
	Insignificant 1	Low	Low	Low	Medium	Medium
		Rare 1	Unlikely 2	Possible 3	Likely 4	Almost Certain 5
		Likelihood				

Risk Assessment Matrix						
		Probability				
Severity		Frequent A	Likely B	Occasional C	Seldom D	Unlikely E
Catastrophic	I	E	E	H	H	M
Critical	II	E	H	H	M	L
Marginal	III	H	M	M	L	L
Negligible	IV	M	L	L	L	L

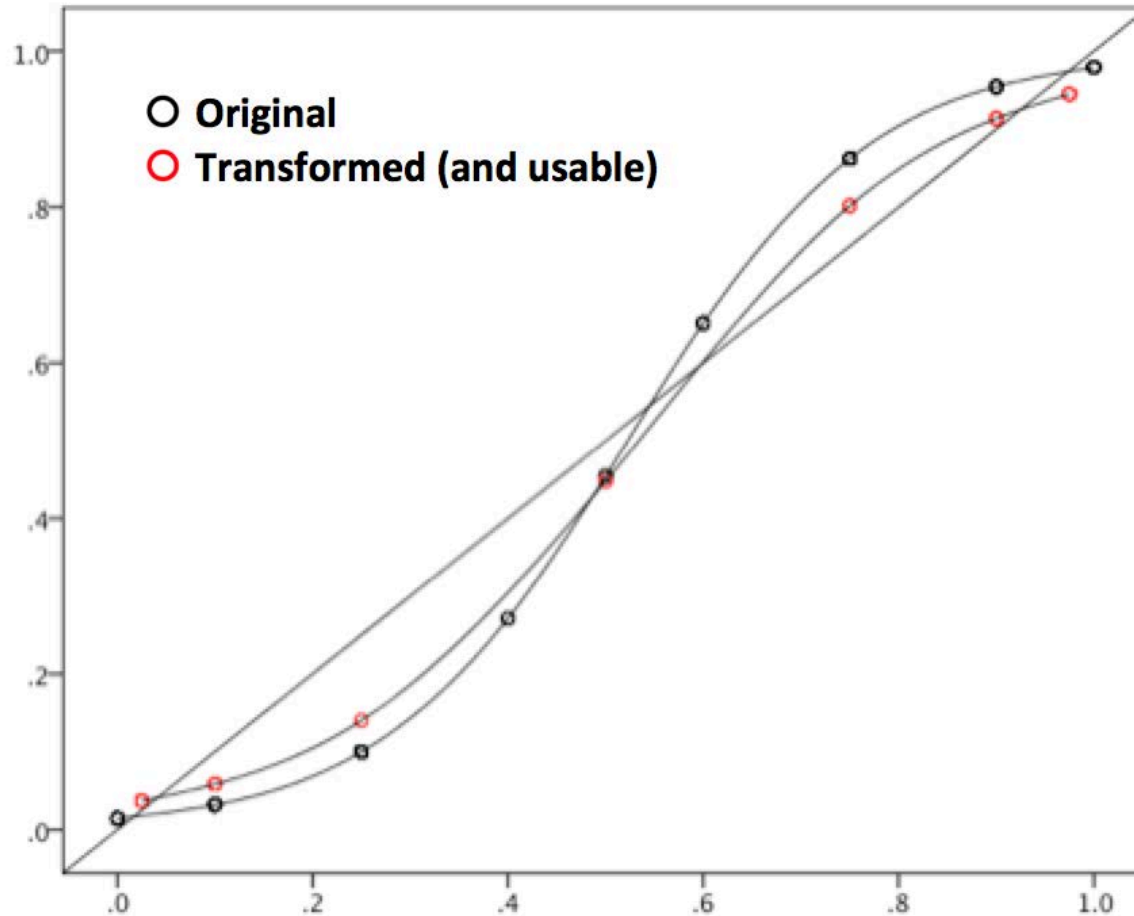
A more radical proposal is to use numbers

- Numbers smoke out some of the weasels (no distinctly 50%^s)
- Numbers can be operated on (likely X very improbable = ?)
- Numbers can be imprecise, yet clear. 95% confident $P = .7 \pm .1$.
- Numbers (even if just used internally for audit purposes) lend themselves to verification of judgment quality, detection of systematic biases and subsequent correction.

ROC curve (AUC = .94)



Calibration curve before and after (usable) transformation





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Can Researchers Accurately Predict Trial Outcomes?

Lead Investigator: [Jonathan Kimmelman](#)

Co-investigators: [Jamie Brehaut](#), [Dean Fergusson](#), [Alex John London](#), [David Mandel](#), [Ian Shrier](#), [Russell Steele](#)

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