Info-Gap Analysis of Preparedness and Response to Bio-Terrorism

The problems of uncertainty:
- Design or decide.
- Robustness to noise and info-gaps.
- Opportuneness: exploit windfall.
- Satisfice or optimize.

Information-gap uncertainty:
- Uncertainty is a limitation of knowledge.
- Uncertainty is a gap between what is known and what could be known.
- Surprises and ignorance.

Models:
- Characterize reality.
- Attributes of model correspond to attributes of reality.

Model-based decision: adapt decision to attributes of model.

Optimal model-based decision: Use best model to choose decision with best outcome.

Fallacy of optimal model-based decision:
- Severe uncertainty:
  - Best model errs seriously.
  - Some model attributes are correct.
  - Some model attributes err greatly.
- Best-model optimization:
  - Exploits all model attributes to the extreme.
  - Vulnerable to model error.

Resolution: robust-satisficing.
- Trade performance for robustness.
- Satisfice performance.
- Optimize robustness to uncertainty.

Robust-satisficing syllogism:
- Adequate performance must be attained.
- High reliability of adequate performance preferred over Low reliability of optimal performance.
- Max reliability of adequate performance is best.

Trade-off:
- Robustness vs. performance.
- Pareto efficiency.

Preference reversal: robustness curves may cross.

References: