

# Considerations for Risk Management in the Face of Uncertainty

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# Uncertainty and Risk

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- Present at every stage of risk assessment and risk management.
- Runs through the entire decision-making process

# Risk Management Framework should:

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- Explicitly characterize the impact of risk assessment assumptions
- Present accurate information for regulators and stakeholders
- Encourage protective and timely regulatory action

# Criteria for Good Risk Management Decisions

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- Address clearly articulated problem
- Account for views of those affected by the decision
- Be based on scientific weight of evidence
- Examine a range of options
- Lead to a reduction or elimination of risks
- Be implementable effectively, expeditiously, flexibly, and with stakeholder support
- Have a significant impact on the risks of concern
- Be subject to change and revision

# Questions for Risk Management

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- Who bears the burden of proof?
- Who bears the costs?
- Who bears the consequences?

# National Research Council

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“Even great uncertainty does not imply that action to promote or protect public health should be delayed. Decisions about whether to act, when to act, and how aggressively to act can only be made with some understanding of the likelihood and consequences of alternative courses of action. The potential for improving decisions through research must be balanced against the public health costs incurred because of a delay in the implementation of controls. *Complete certainty is an unattainable ideal.*”

National Research Council. Estimating the Public Health Benefits of Proposed Air Pollution Regulations (2002) [http://books.nap.edu/openbook.php?record\\_id=10511&page=127](http://books.nap.edu/openbook.php?record_id=10511&page=127) (emphasis is added).

# Evaluation of Scientific Evidence

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“The public health system must ensure that scientific evidence is evaluated in a manner that assures the public's health and environment will be adequately protected.”

Michaels, David and Monforton, Celeste A., "Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment" . American Journal of Public Health, Vol. 95, No. S1, pp. S39-S48, 2005 Available at SSRN: <http://ssrn.com/abstract=776525>

# Waterborne Diseases

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- Adverse health effects range from minor to fatal
  - Gastrointestinal problems
  - Nervous system or organ damage
  - Developmental or reproductive effects
  - Cancer

# Cryptosporidium outbreak

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A microbial outbreak of cryptosporidium in Milwaukee in 1993 made about 400,000 people sick and killed more than 50.

Hoxie, N.J., J.P. Davis, J.M. Vergeront, R.D. Nashold, and K.A. Blair.  
Cryptosporidiosis - associated mortality following a massive waterborne outbreak in Milwaukee, WI. American Journal of Public Health 87 (12): 2032-2035 (1997).

# Waterborne Diseases

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- This is a serious public health issue
- Tens of millions of victims annually sickened by contaminated water
- Result: billions of dollars in health cost

# Sir Austin Bradford Hill

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"All scientific work is incomplete – whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time."

Hill AB. The environment and disease: association or causation? *Proc R Soc Med.* 1965;**58**:295–300.