



Low Dose Risk, Decisions, & Risk Communication

Agenda from Low Dose Risk,
Decisions, & Risk Communication
Workshop

June 12-14, 2000 in Eugene, OR





September 1999 to October 2002
(3 yr cooperative agreement)

This project provides basic research in the areas of risk perception and decision making as applied to the requirements for communication on behalf of the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research, and the Low Dose Radiation Research Program, Dr. David Thomassen, Program Director.

[Abstract](#) for poster presented at the EMSP National Workshop in Atlanta, April 24-28, 2000.

Special Reference -
Proposal (13 April 1999)
[Low Dose Risk, Decisions,
and Risk Communication](#)



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A Brief History of Risk Perception

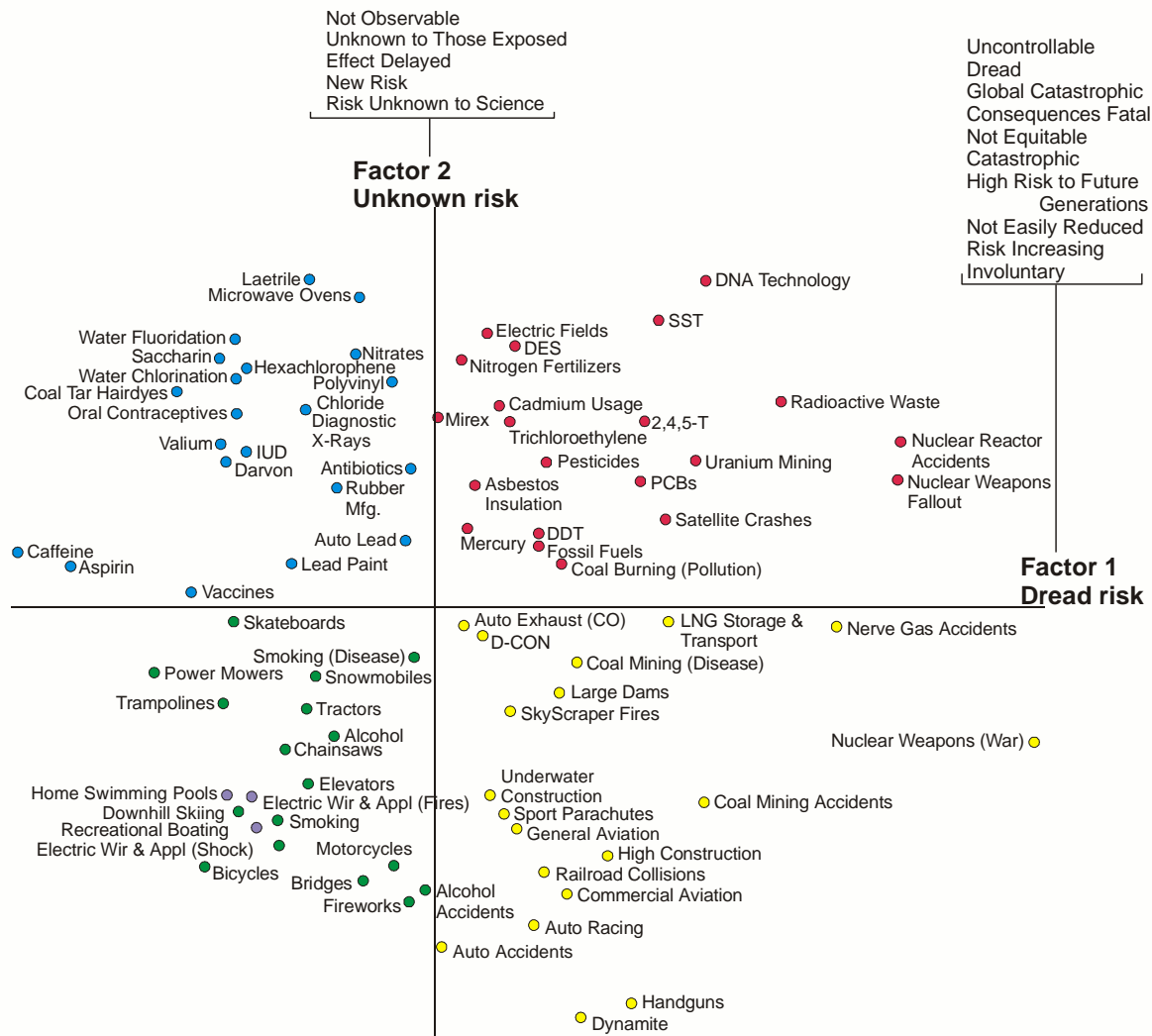
Perception of Risk

- ◆ Public is sensitive to quantitative risk and can generally rank-order a broad domain of hazards.
- ◆ Risk is perceived in qualitative terms.
 - Personal controllability over exposure.
 - Dreadedness of potential (or real) consequences.
 - Conflict between scientific/technical experts.
 - Equity or fairness of risk/benefit distributions.
 - Uncertainty

Perception of Risk

- ◆ “How safe am I, my family, my community, things that matter to me?” is a dominant psychological frame on risk issues.
- ◆ Risk = cognitive & emotional response to (expected) loss.
- ◆ Risk is attenuated by increasing levels of perceived benefit or value.

Perception of Risk



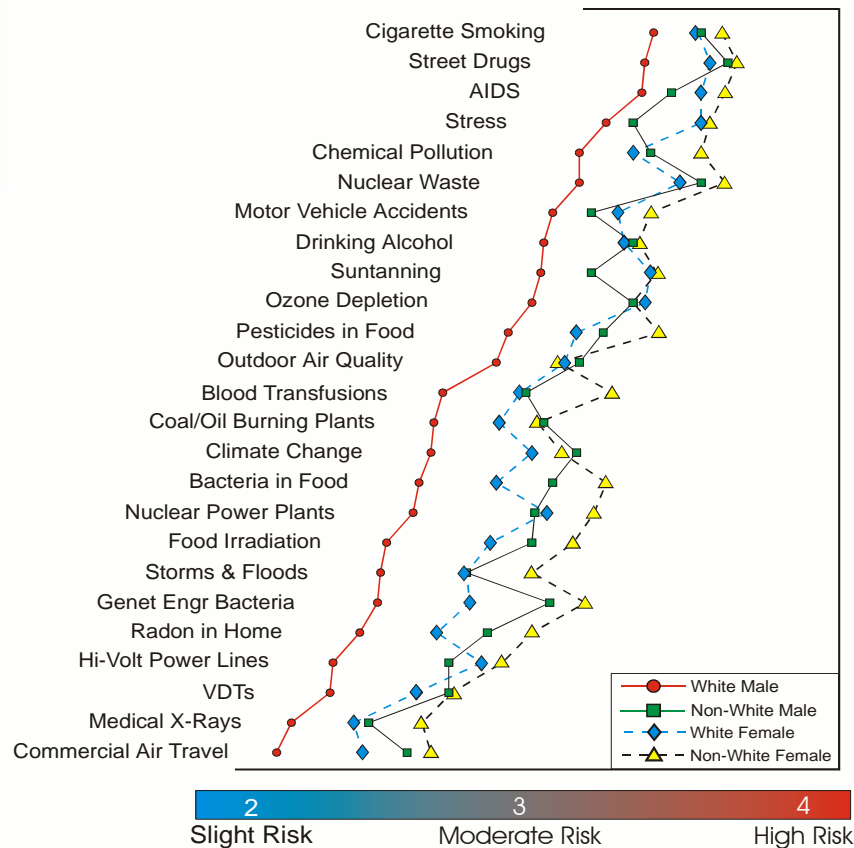
Location of 81 hazards on Factors 1 and 2 derived from the interrelationships among 15 risk characteristics. Each factor is made up of a combination of characteristics, as indicated by the diagram.

Adapted from:

[Slovic, P. \(1987\). Perception of risk. Science, 236, 280-285.](#)

Socio-cultural Context

Sociopolitical: "The Gender Effect"

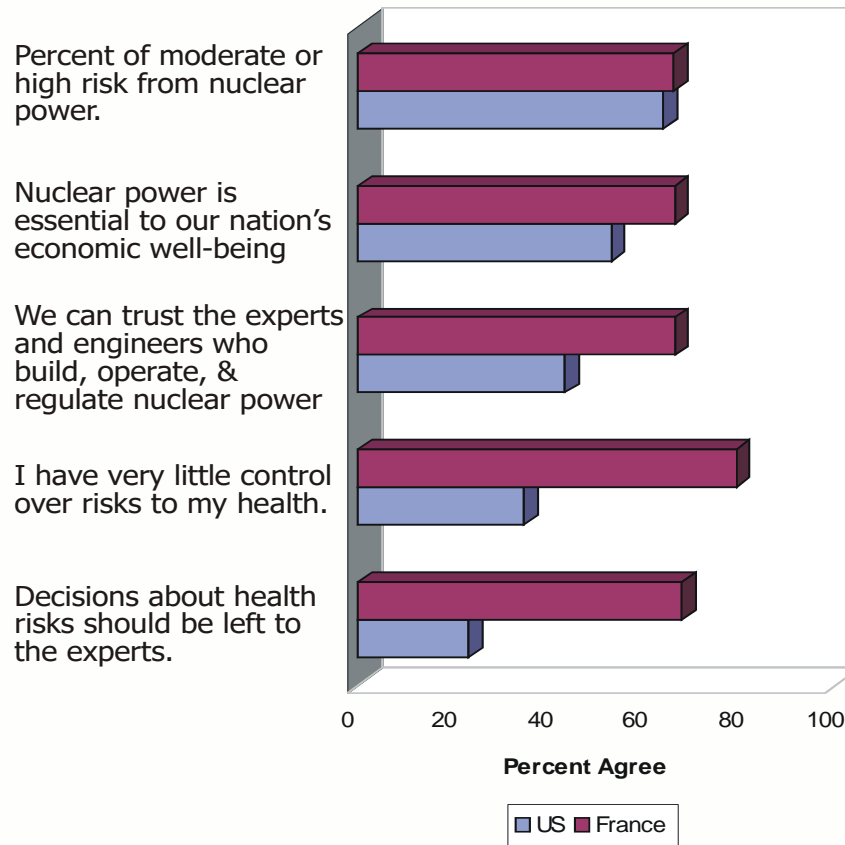


The data in this figure came from a national survey in which perceptions of environmental health risks were measured for 1275 white and 214 nonwhite persons. White males tended to differ from everyone else in their attitudes and perceptions — on average, they perceived risks as much smaller and much more acceptable than did other people. These results suggest that sociopolitical factors such as power, status, alienation, and trust are strong determiners of people's perception and acceptance of risk.

Source:

[Flynn, J., Slovic, P., & Mertz, C. K. \(1994\). Gender, race, and perception of environmental health risks. Risk Analysis, 14\(6\), 1101-1108.](#)

Important differences in attitudes between America and France

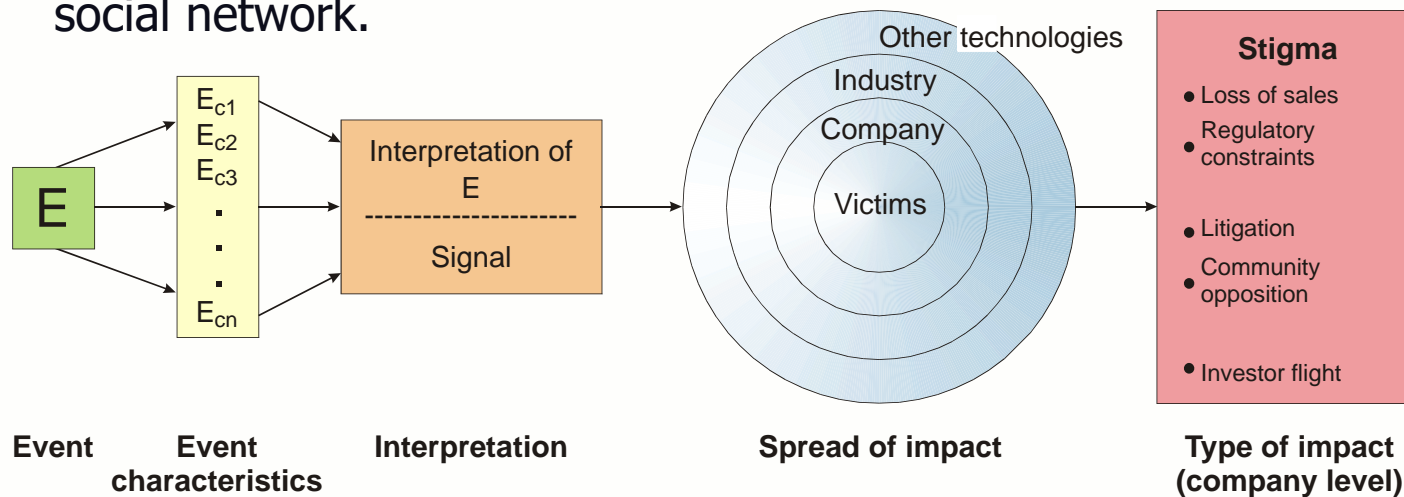


- Perceptions of nuclear risks are very similar in US & France
- French have greater trust in experts and civil authority
- French have greater trust in nuclear management.
- French see a greater need for nuclear power.
- French are more fatalistic about risks.

Adapted from [Slovic, P., Flynn, J., Mertz, C.K., Mays, C., & Poumadere, M. \(1996\). Nuclear power and the public: A comparative study of the risk perception in France and the United States \(Report number 96-6\). Eugene, OR: Decision Research.](#)

Social Amplification of Risk

- ◆ Social dynamics influence how risk events are represented and communicated.
- ◆ Risk events have a “signal value” that is propagated through a social network.



Special Reference:

[Stigma and the Social Amplification of Risk: Toward a Framework for Analysis. A chapter from Risk, Media, and Stigma. J. Flynn, P. Slovic, H. Kunreuther \(Eds.\), in publication. Chapter text](#)

Source: [Kasperson, R.E., Ortwin, R., Slovic, P., Brown, H., Emel, J., Goble, R.L., Kasperson, J.X., & Ratick, S.J. \(1988\). The social amplification of risk: A conceptual framework. Risk Analysis, 8\(2\), 177-187.](#)

Social Amplification of Risk (con't)

◆ Risk is amplified when:

- A new and possibly catastrophic risk has emerged
- The managers try to conceal the risks: they cannot be trusted
- The risk managers are not in control of the hazard
- The experts do not understand the risks or do not understand the long-term cumulative effects of chemicals

Social Amplification of Risk (con't)

◆ Risk is attenuated when:

- Risks do not resonate with public concerns and dreads.
- Media reporting on the hazard is limited and not sustained.
- Benefits of the hazard are necessary.
- Hazards are well understood and controlled.
- Managers are trusted and display control and expertise.

Trust & Confidence in Risk Management Institutions

- ◆ Asymmetry of trust.
 - It is easier to destroy trust than to create it.
- ◆ Risk management institutions are *sources* of risk.
 - Human factors
 - Organizational factors
 - Recreancy

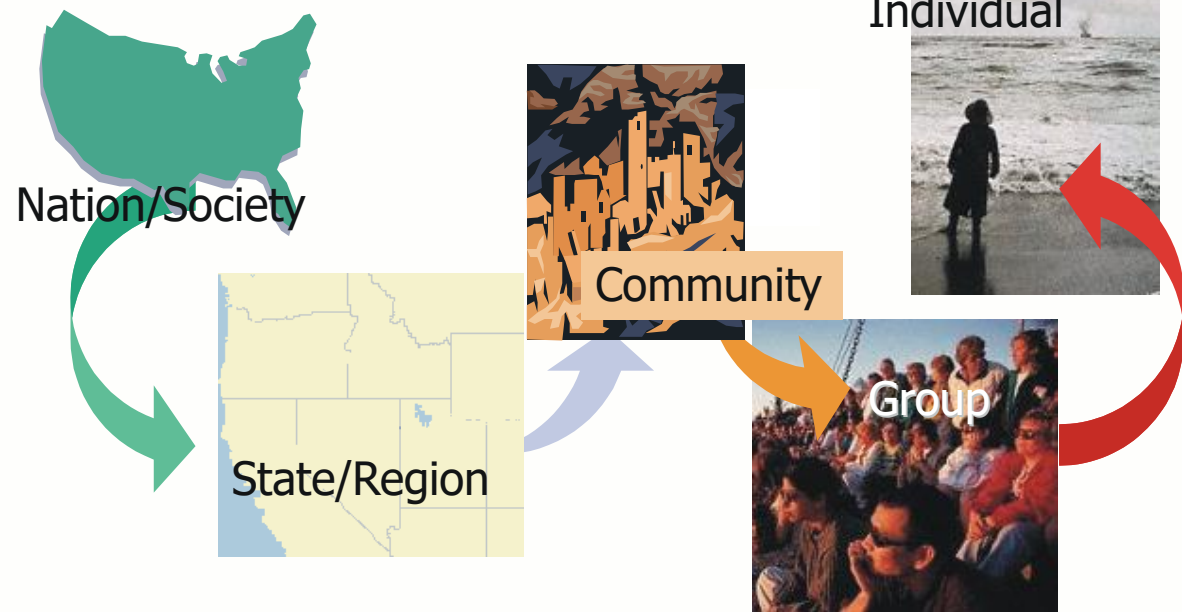
Trust & Confidence in Risk Management Institutions (con't)



◆ Local solutions are preferred to imposed solutions.

Source: [Slovic, P. \(1993\). Perceived risk, trust, and democracy. Risk Analysis, 13, 675-685.](#)

Social Science to Support Risk Communication



Social Geography of Risk Communication

How does the Social Geography of Risk frame risk communication?

- ◆ Looks at social and geographical context to understand public perceptions, attitudes, and behaviors.
- ◆ Defines empirical data needs for specific cases
- ◆ Identifies information needs for communication.
- ◆ Allows efforts to monitor and adjust communication needs on an ongoing basis.

Studies in Progress

Two Modes of Thinking: Comparison of the Experiential and Rational Systems

Experiential System	Rational System
<ul style="list-style-type: none">• Holistic	<ul style="list-style-type: none">• Analytic
<ul style="list-style-type: none">• Affective: pleasure-pain oriented	<ul style="list-style-type: none">• Logical: reason oriented (what is sensible)
<ul style="list-style-type: none">• Associationistic connections	<ul style="list-style-type: none">• Logical connections
<ul style="list-style-type: none">• Behavior mediated by “vibes” from past experience	<ul style="list-style-type: none">• Behavior mediated by conscious appraisal of events
<ul style="list-style-type: none">• Encodes reality in concrete images, metaphors and narratives	<ul style="list-style-type: none">• Encodes reality in abstract symbols, words and numbers
<ul style="list-style-type: none">• More rapid processing: oriented towards immediate action	<ul style="list-style-type: none">• Slower processing: oriented towards delayed action
<ul style="list-style-type: none">• Self-evidently valid: “experiencing is believing”	<ul style="list-style-type: none">• Requires justification via logic and evidence

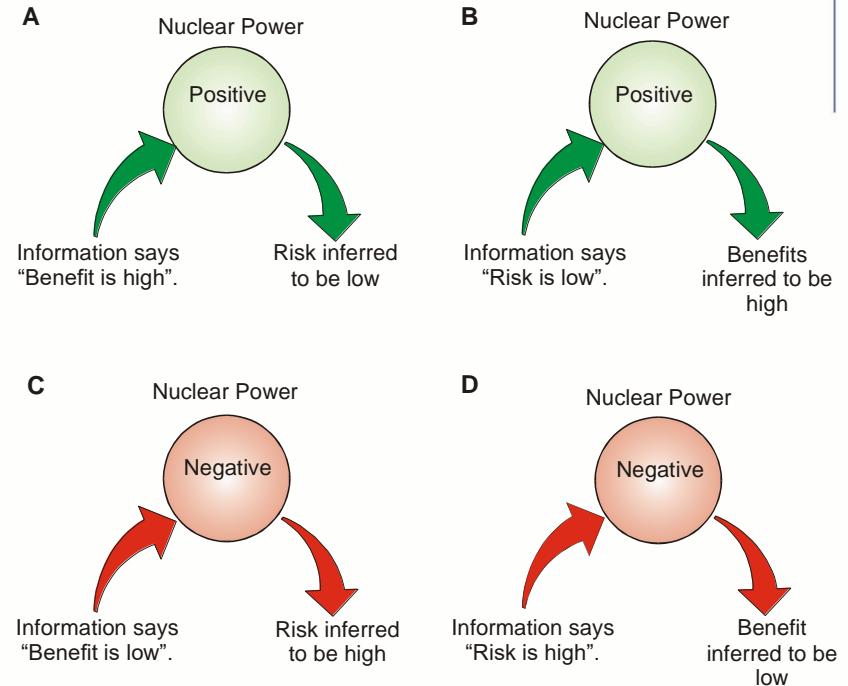
Note: Adapted from Epstein, 1994

◆ Emotion plays an essential role in making risk judgments.

Adapted from Epstein, S. (1994). Integration of the cognitive & psychodynamic unconscious. *American Psychologist*, 49, 709-724.

The Affect Heuristic

- ◆ For a review of the affect heuristic, see Slovic, P., Monahan, J., & MacGregor, D.G. (in press). Violence risk assessment and risk communication: The effects of using actual cases, providing instruction, and employing probability versus frequency formats. *Law and Human Behavior*.
- ◆ Although risks and benefits are positively correlated in the real world, they are negatively correlated in people's perceptions. Affect mediates this negative correlation such that if a person feels bad about a technology, they will perceive greater risks and lower benefits. Alternately, if a person feels good about a technology, they will perceive greater benefits and lower risks.



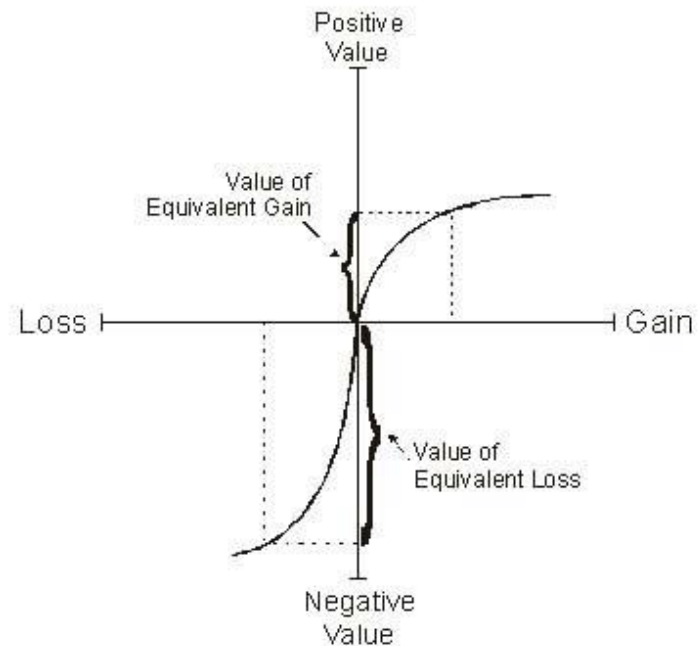
Model showing how information about benefit (A) or information about risk (B) could increase the overall affective evaluation of nuclear power and lead to inferences about risk and benefit that coincide affectively with the information given. Similarly, information could decrease the overall affective evaluation of nuclear power as in C and D.

[Finucane, M.L., Alhakami, A., Slovic, P., & Johnson, S.M. \(2000\). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making*, 13, 1-17.](#)

Negativity Bias

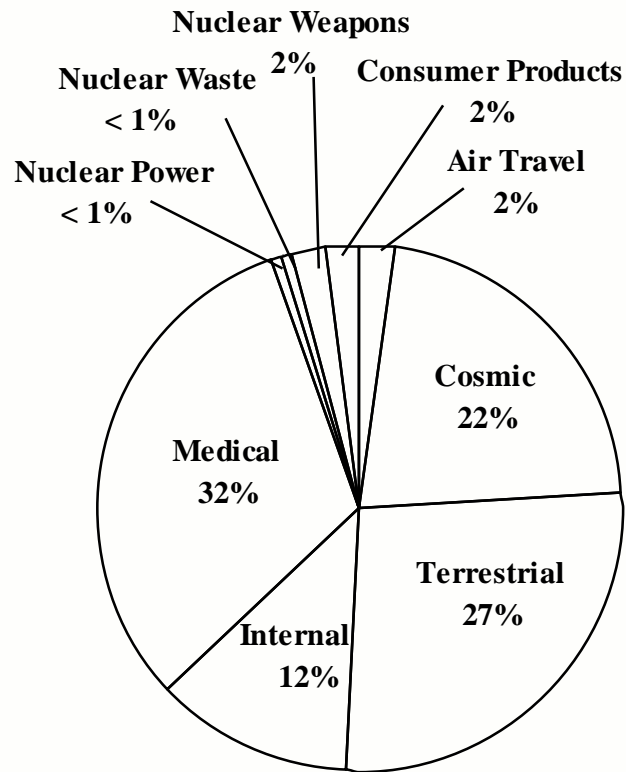
- ◆ Negative information tends to be weighed more heavily than positive information. This predisposition can be adaptive because it allows us to avoid or withdraw from threatening events. Risk perceptions about events involving radiation may be particularly susceptible to the over weighting of negative affect.

Adapted from Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, **47**, 263-292.



In a variety of domains, experimental subjects presented with objectively-equivalent gains and losses respond more strongly to the losses than to the gains. In the figure above, the loss "hurt more" than the equivalent gain "felt good". In other words, losses loom larger than gains.

Studies in Progress (con't)



◆ People construct different evaluations of radiation exposure depending on the source: natural, industrial, medical.

Adapted from "Personal Radiation Inventory: How to Estimate Your Yearly Whole-Body Exposure to Ionizing Radiation" in Radiation: All You Need to Know to Stop Worrying . . . or to Start by M.D. Ecker, M.D., & N.J. Bramesco, (1980), New York: Vintage.

Guiding Research Questions

- ◆ What values do the public hold about sciences and how do these values alter perception of risk from radiation?
- ◆ How does “intuitive epidemiology” shape public attitudes about health-effect outcomes in communities?
- ◆ How are messages about the research results of low-dose radiation science perceived by non-scientists?
- ◆ How do people make tradeoffs between the benefits of nuclear science and the risks of radiation?
- ◆ Why are there differential responses to radiation risks across different communities, states, and regions?

Additional resources – Socio-cultural

- ◆ Finucane, M., & Slovic, P., (in press). Risk and the white male: A perspective on perspectives, *Framtider*.
- ◆ Slovic, P., & Gregory, R. (1999). Risk analysis, decision analysis, and the social context for risk decision making. In J. Shanteau, B. Mellers, & D. Schum (Eds.), *Decision science and technology: Reflections on the contributions of Ward Edwards*. Norwell, MA: Kluwer Academics.
- ◆ [Slovic, P., & Peters, E. \(1998\). The importance of worldviews in risk perception. *Risk Decision and Policy*, 3\(2\), 165-170.](#)

Additional resources – Emotion

- ◆ Alhakami, A.S., & Slovic, P. (1994). A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis*, 14(6), 1085-1096.
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- ◆ Peters, E., & Slovic, P., (in press). The springs of action: Affective and analytical information processing in choice. *Personality and Social Psychology Bulletin*.
- ◆ Peters, E., & Slovic, P. (1996). The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power. *Journal of Applied Social Psychology*, 26(16), 1427-1453.

Additional resources – Sources

- ◆ MacGregor, D.G., Slovic, P., & Malmfors, T. (1999). "How exposed is exposed enough?" Lay inferences about chemical exposure. *Risk Analysis*, 19(4), 649-659.
- ◆ Slovic, P. (1996)/ Perception of risk from radiation. *Radiation Protection Dosimetry*, 68(3/4), 165-180.

Additional resources – Trust

- ◆ Flynn, J., Burns, W., Mertz, C.K., & Slovic, P. (1992). Trust as a determinant of opposition to a high-level radioactive waste repository: Analysis of a structural model. *Risk Analysis*, 12(3), 417-429.
- ◆ Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis*, 19(4), 689-701.
- ◆ Slovic, P., Layman, M., & Flynn, J. (1993). Perceived risk trust, and nuclear waste: Lessons from Yucca Mountain In R.E. Dunlap, M.E. Kraft, & E.A. Rosa. (Eds.), *Public reactions to nuclear waste: Citizens' views of repository siting* (pp. 64-86). Durham, NC: Duke University.

Additional resources – Social Amplification of Risk

- ◆ Burns, W.J., Slovic, P., Kasperson, R.E., Kasperson, J.X., Renn, O., & Emani, S. (1993). Incorporating structural models into research on the social amplification of risk: Implications for theory construction and decision making. *Risk Analysis*, 13, 611-623.
- ◆ Flynn, J., Peters, E., Mertz, C.K., & Slovic, P. (1998). Risk, media, and stigma at Rocky Flats. *Risk Analysis*, 18(6), 715-727.
- ◆ Gregory, R., Flynn, J., & Slovic, P. (1995). Technological stigma. *American Scientist*, 83, 220-223.
- ◆ Kasperson, R.E., Ortwin, R., Slovic, P., Brown, H., Emel, J., Goble, R.L., Kasperson, J.X., & Ratick, S.J. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, 8(2), 177-187.
- ◆ Renn, O., Burns, W., Kasperson, J.X., Kasperson, R.E., & Slovic, P. (1992). The social amplification of risk: Theoretical foundations and empirical applications. *Journal of Social Issues*, 48(4), 137-160.
- ◆ Slovic, P., Layman, M., Kraus, N., Flynn, J., Chalmers, J., & Gesell, G. (1991). Perceived risk, stigma, and potential economic impacts of a high-level nuclear waste repository in Nevada. *Risk Analysis*, 11, 683-696.

Additional resources – Methodology

- ◆ Flynn, J. (1996). Constructing and reconstructing respondent attitudes during a telephone survey. In American Statistical Association 1996 Proceedings of the Section on Survey Research Methods (Vol. 2, pp. 896-899). Alexandria, VA: ASA.
- ◆ Gregory, R., Flynn, J., Johnson, S.M., Satterfield, T.A., Slovic, P., & Wagner, R. (1997). Decision pathway surveys: A tool for resource managers. *Land Economics*, 73(2), 240-254.
- ◆ Gregory, R., & Slovic, P. (1997). A constructive approach to environmental valuation. *Ecological Economics*, 21, 175-181.
- ◆ Slovic, P. (1995). The construction of preference. *American Psychologist*, 50, 364-371.

Additional resources – Risk communication

- ◆ [Flynn, J., Slovic, P., & Mertz, C.K. \(1993\). The Nevada initiative: A risk communication fiasco. *Risk Analysis*, 13\(5\), 497-502.](#)
- ◆ Flynn, J. (1992, April 15). How not to sell a nuclear waste dump. *The Wall Street Journal*, p. A20.
- ◆ MacGregor, D.G. (1994). *Risk perception, communication, and community relations* (Report No. 94-11). Eugene, OR: Decision Research.

Additional resources – Perception of Risk

- ◆ [Flynn, J., Slovic, P., & Mertz, C. K. \(1994\). Gender, race, and perception of environmental health risks. *Risk Analysis*, 14\(6\), 1101-1108.](#)
- ◆ [Slovic, P. \(1987\). Perception of risk. *Science*, 236, 280-285.](#)
- ◆ [Slovic, P. \(1992\). Perception of risk: Reflections on the psychometric paradigm. In S. Krimsky & D. Golding \(Eds.\), *Social theories of risk* \(pp 117-152\). New York: Praeger.](#)
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- ◆ [Slovic, P., Flynn, J., Mertz, C.K., Mays, C., & Poumadere, M. \(1996\). Nuclear power and the public: A comparative study of the risk perception in France and the United States. In O. Renn & B. Rohrman \(Eds.\), *Cross-cultural risk perception: A survey of empirical studies* \(pp. 55-102\). Dordrecht, The Netherlands: Kluwer Academic.](#)

Special Reference:

[A Selected Bibliography of Resources on Low Dose Radiation, Risk, Decisions & Risk Communication from Decision Research](#)