

Seminar – Psychology of Risk

Risk is a very large interdisciplinary topic that can be approached in many ways. The goal of this course is to think about psychological issues in risk analysis, risk assessment, risk perception, risk communication, and almost anything else related to risk that is of interest to the students in the class, as long as it is connected to psychology of risk. Each student will be required to complete a term paper with an oral presentation. Along the way students will work in teams on class presentations on journal articles or other issues. The term paper will be the major determinant of the course grade. Attendance in class and active participation is required. This is a graduate seminar with reading and discussion as the main activity, not listening to lectures. The calendar below is very approximate. We will choose among the readings as we go along, so you should regard the syllabus as a resource. I invite you to read as much as you want.

**Week 1: What is Risk and why is risk perception important?**

- Kahan, D. M. et al. (2006). Book review: Fear of democracy: A cultural evaluation of Sunstein on risk. *Harvard Law Review*, 119(4), 1071-1109. Explains why risk perceptions are important.
- Shrader-Frechette, K. (2004). Review of Sunstein 'Risk and Reason'. *Ethics*, vol#, 376-380. Explains why ethical issues are important. .
- Ben-Ari, A. & Or-Chen, K. (2009). Integrating competing conceptions of risk: A call for future direction of research, *Journal of Risk Research*, 12(6), 865-877. Good description of tension among approaches to risk.
- Gigerenzer, G. (2004). Dread risk, September 11, and fatal traffic accidents. *Psychological Science*, 15(4), 286-287.
- Sivak, M. & Flannagan, M. J. (2003). Flying and driving after the September 11 attacks. *American Scientist*, 91(1), 6.
- Letters to the editor in response to Sivak & Flannagan. *American Scientist*, 2003, 91(2).
- Lopes, L. (1983). Some thoughts on the psychological concept of risk. *Journal of Experimental Psychology: Human Perception and Performance*, 9(1), 137-144. Explains several important paradoxes of risky decisions, and reviews psychological ideas about them

**Week 2: Crunching the numbers and beyond crunching the numbers**

- National Research Council (1996). Understanding Risk, Executive Summary, Ch 1, The idea of risk characterization; Ch. 2, Judgment in the risk decision process. (read online in National Academies Press website)
- National Research Council (2009). Science and Decisions: Advancing risk assessment. Summary, p. 3-14. Ch 1, Introduction, p. 15-25. This volume concerns risk assessment practices in the US EPA in particular, but many of the issues are more general. (read online in National Academies Press website)
- Freudenburg, W. R. (1988). Perceived risk, real risk: Social science and the art of probabilistic risk assessment. *Science*, 242, 44-49.
- Slovic, P. (1987). Perception of risk. *Science*, 236, 280-285.
- Slovic, P. (1999). Comment: Are trivial risks the greatest risks of all? *Journal of Risk Research*, 2(4), 281-288.

**Week 3: Thinking about the numbers that were crunched.**

Moore, C. F. (2009). *Children and Pollution: Why Scientists Disagree*. Oxford University Press. Ch. 2, Mercury, esp. pp. 54-65.

National Academy of Sciences, Toxicological effects of methylmercury (2000), Ch. 7, Dose-response assessment, and Ch. 8, Risk characterization. (can read on-line at <http://books.nap.edu/books/0309071402/html/index.html> )

**Weeks 4-5: Oral reports (we will do these in teams of 2-3 people).**

Find a numerical risk analysis, read it, and critique it. What assumptions are embedded in it? What other outcomes could have been used, i.e., why were things measured in the way they were, and are there alternatives that are not mentioned? What judgment calls were made that are not mentioned? What ethical issues are pertinent?

**Week 6-7: Ethics, trust, and risk (we will select from these resources)**

Moore (2009), Ch 6, It isn't fair: Environmental pollution disasters and community relocations, esp. the section on Love Canal, pp. 207 ff., and Ch. 7, The best science, values, and the precautionary principle to protect children.

Shrader-Frechette, K. S. (2002). Trading jobs for health: Ionizing radiation, occupational ethics, and the welfare argument. *Science and Engineering Ethics*, 8(2), 139-154.

Shrader-Frechette, K. S. (2000). Duties to future generations, proxy consent, intra- and intergenerational equity: The case of nuclear waste. *Risk Analysis*, 20(6), 771-778.

Shrader-Frechette, K. S. (2007). Trimming exposure data, putting radiation workers at risk: Improving disclosure and consent through a National Radiation Dose-Registry. *American Journal of Public Health*, 97(10), 1782-1786.

Slovic, P. et al. (1991). Perceived risk, trust, and the politics of nuclear waste. *Science*, 254, 1604.

Lynn, F.M. (1986). The interplay of science and values in assessing and regulating environmental risks. *Science, Technology, & Human Values*, 11(2), 40-50.

Greenberg, M. & Goldberg, L. (1994). Ethical challenges to risk scientists: An exploratory analysis of survey data. *Science, Technology & Human Values*, 19(2), 223-241.

*Science, Technology, & Human Values*, Vol. 12, No. 3/4, Special Issue on the Technical and Ethical Aspects of Risk Communication. (Summer - Autumn, 1987).

MacKinnon, B. (1986). Pricing human life. *Science, Technology & Human Values*, 11(2), 29-39.

\*\*\*At this point in the course we will hold a group discussion of the topics and directions we will consider in the following weeks. The list below provides examples of various areas we could examine. The last 2-3 weeks of class will be devoted to term paper presentations by students (15-20 min each).

**Some Suggested Resources**Decision Criteria and Scientific Uncertainty

Moore, C. F. (2009). *Children and Pollution: Why Scientists Disagree*. Oxford University Press. Ch. 1, esp. pp 3-8, 14-20, 35-36, Appendix pp. 255-256.

Freudenburg, W. R. (2008). Scientific certainty argumentation methods (SCAMs): Science and the politics of doubt. *Sociological Inquiry*, 78(1), 2-38.

Commentaries, Overviews, Theoretical Issues and Controversies

Weber, E. U. & Johnson, E. J. (2009). Mindful judgment and decision making. *Annual Review of Psychology*, 60, 53-85.

- Lopes, L. L. (1994). Psychology and economics: Perspectives on risk, cooperation, and the marketplace. *Annual Review of Psychology*, 45, 197-227.
- Special issue on Experience-based decision making, *Journal of Behavioral Decision Making*, January 2010.
- Haimes, Y. Y. (2009). On the complex definition of risk: A systems-based approach. *Risk Analysis*, 29(12), 1647-1654.
- Peters, E. et al. (2009). Bringing meaning to numbers: The impact of evaluative categories on decisions. *Journal of Experimental Psychology: Applied*, 15(3), 213-227.
- Loewenstein, G. F. et al. (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267-286.
- Slovic, P. et al. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk and rationality. *Risk Analysis*, 24(2), 311-322.
- Sagan, L. (1987). Beyond risk assessment. *Risk Analysis*, 7, 1-2.
- Fischhoff, B. (1996, May). Public values in risk research. *Annals of the American Academy of Political and Social Science*, 545, 75-84.
- Yates, J. F. (1990). Chapter 11, "Expected value versus risk." In *Judgment and decision making*. Englewood Cliffs, NJ: Prentice-Hall.
- Garvin, T. (2001). Analytical paradigms: The epistemological distances between scientists, policy makers, and the public. *Risk Analysis*, 21(3), 443-455.
- Simonet, S., & Wilde, G. (1997). Risk: Perception, acceptance and homeostasis. *Applied Psychology – An international review*, 46, 235-252.
- Apostolakis, G. E. (2004). How useful is quantitative risk assessment? *Risk Analysis*, 24(3), 516-520.
- Starr, C. (1969). Social benefit versus technological risk. *Science*, 165(3899), 1232-1238.
- Silbergeld, E. K. (1987). Risk assessment (letter to the editor). *Science*, 237(4821), 1399.
- (also see special issue of *Science*, April 17, 1987 on risk assessment)

#### Accuracy of Judgments and Measurement Issues

- Dawes, R. M. (1979). The robust beauty of improper linear models in decision making. *American Psychologist*, 571-582.
- Schapira, M. et al. (2004). Agreement between scales in the measurement of breast cancer risk perceptions. *Risk Analysis*, 24(3), 665-673.
- McGraw, A. P., Mellers, B. A. & Ritov, I. (2004). The affective costs of overconfidence. *Journal of Behavioral Decision Making*, 17, 281-295.

#### Risky Choice, Framing and Context Effects

- Mills, B., Reyna, V. F. & Estrada, S. (2008). Explaining contradictory relations between risk perception and risk taking. *Psychological Science*, 19(5), 429-433.
- Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist*, 39, 341-350.
- Levin, I. P. et al. (1998). All frames are not created equal: A typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes*, 76, 149-188.
- Sanne, J. M. (2008). Framing risks in a safety-critical and hazardous job: Risk-taking as responsibility in railway maintenance. *Journal of Risk Research*, 11(5), 645-658.

#### Neuroscience and biology of risk

- Long, A.B. et al. (2009). Serotonin shapes risky decision making in monkeys. *Social, Cognitive and Affective Neuroscience*, 4, 346-356.
- Loewenstein, G. et al. (2008). Neuroeconomics. *Annual Review of Psychology*, 59, 647-672.

- Zyphur, M. J. et al. (2009). The genetics of economic risk preferences. *Journal of Behavioral Decision Making*, 22, 367-377.
- Boorman, E. D. & Sallet, J. (2009). Mean-variance or prospect theory? The nature of value representations in the human brain. *The Journal of Neuroscience*, 29(25), 7945-7947.
- Xue, G. et al. (2010). The impact of prior risk experiences on subsequent risky decision-making: The role of the insula. *Neuroimage*, (prepublication).
- Christopoulos, G. I. et al. (2009). Neural correlates of value, risk, and risk aversion contributing to decision making under risk. *The Journal of Neuroscience*, 29(40), 12574-12583.
- Carlson, S. M. et al. (2009). Neural correlates of decision making on a gambling task. *Child Development*, 80(4), 1076-1096.
- Berns, G.S. et al. (2009). Adolescent engagement in dangerous behaviors is associated with increased white matter maturity of frontal cortex. *PloS ONE*, 4(8), e6773.

### Heuristics and Biases, Rationality

--See famous work by Kahneman & Tversky, including their work on prospect theory.

--See also work on affect listed in this syllabus.

- Keren, G. & Willemsen, M.C. (2009). Decision anomalies, experimenter assumptions, and participants' comprehension: Re-evaluating the uncertainty effect. *Journal of Behavioral Decision Making*, 22, 301-317. Excellent paper on whether claims of irrational decision making is overblown.
- Lopes, L. (1981). Decision making in the short run. *Journal of Experimental Psychology: Human Learning and Memory*, 7(5), 377-385. Expected values might not be the best valuation method in all situations, unless time is infinite.
- Mellers, B. A. & Locke, C. (2007). What have we learned from our mistakes? In W. Edwards et al. (Eds.), *Advances in decision analysis: From foundations to applications* (pp. 351-374). Cambridge University Press. Has nice overview of heuristics and biases
- Arkes, H.R. et al. (2008). Reference point adaptation: Tests in the domain of security trading. *Organizational Behavior and Human Decision Processes*, 105, 67-81.
- Brandstatter, E. et al. (2006). The priority heuristic: Making choices without trade-offs. *Psychological Review*, 113(2), 409-432. See also commentaries by many scholars and replies. Many scholars disagree.
- Shafir, E. & LaBoeuf, R. A. (2002). Rationality. *Annual Review of Psychology*, 53, 491-517.

### Communication, Information, Risk Perception, and Protection/Prevention

See the special issue on risk communication, *Risk Analysis*, 2003, 23(2).

- Griffin, R. J., Dunwoody, S., & Neuwirth, K. (1999). Proposed model of the relationship of risk information seeking and processing to the development of preventative behaviors. *Environmental Research (Section A)*, 80, S230-S245.
- Trumbo, C. W. & McComas, K. A. (2003). The function of credibility in information processing for risk perception. *Risk Analysis*, 23(2).
- Perry, M. J., & Christiani, D. C. (1999). Herbicide and insecticide exposures among dairy farm pesticide applicators. *American Journal of Public Health*, 89, 1118-1119.
- Niewohner, J. et al. (2004). Evaluating the efficacy of a mental models approach for improving occupational chemical risk protection. *Risk Analysis*, 24(2), 350-362.
- Cox, P. et al. (2003). The use of mental models in chemical risk protection: Developing a generic workplace methodology. *Risk Analysis*, 23(2).
- Stone, E. R. et al. (1994). Risk communication: Absolute versus relative expressions of low probability risk. *Organizational Behavior and Human Decision Processes*, 60, 387-408.

Knuth, B. A. et al. (2003). Weighing health benefit and health risk information when consuming sport-caught fish. *Risk Analysis*, 23(6).

#### Ethnicity, Culture, Gender, SES, Other Individual Differences

- DeBruin, W. B., Parker, A.M. & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology*, 92(5), 938-956.
- Rivers, L., Arvai, J. & Slovic, P. (2010). Beyond a simple case of Black and White: Searching for the White male effect in the African-American Community, *Risk Analysis*, 30(1), 65-77.
- Satterfield, T. A. et al. (2004). Discrimination, vulnerability, and justice in the face of risk. *Risk Analysis*, 24(1), 115-129.
- Flynn, J. et al. (1994). Gender, race, and perception of environmental health risks. *Risk Analysis*, 14, 1101-1108.
- Johnson, B. B. (2004). Arguments for testing ethnic identity and acculturation as factors in risk judgments. *Risk Analysis*, 24(5), 1279-1287.
- Yates, J. F. et al. (1998). Cross-cultural variations in probability judgment accuracy: Beyond general knowledge overconfidence. *Organizational Behavior and Human Decision Processes*, 74, 89-117.
- Rayner, S., & Cantor, R. (1987). How fair is safe enough? The cultural approach to societal technology choice. *Risk Analysis*, 7, 3-9.
- Davidson, D. J. & Freudenburg, W. R. (1996). Gender and environmental risk concerns: A review and analysis of available research. *Environment and Behavior*, 28, 302-339.
- Lindbladh, E. & Lyttkens, C. H. (2003). Polarization in the reaction to health-risk information: A question of social position? *Risk Analysis*, 23(4).
- See special issue of *Developmental Review*, 28(1), March 2008, on 'Current Directions in Risk and Decision Making'

#### Expert vs non-expert

- Weiss, D.J. & Shanteau, J. (2003). Empirical assessment of expertise. *Human Factors*, 45(1), 104-114. Interesting piece on measuring expertise.
- Weiss, D. J. et al. (2006). People who judge people. *Journal of Behavioral Decision Making*, 19, 441-454. Similar to the 2003 paper, but focused on clinical judgment.
- Kahneman, D. & Klein, G. (2009). Conditions for intuitive expertise. *American Psychologist*, 64(6), 515-526. Given Kahneman's Nobel prize-winning career documenting poor decision making, this paper is interesting for its attempt at a rapprochement with an alternative view.
- Barke, R. P., & Jenkins-Smith, H. C. (1993). Politics and scientific expertise: Scientists, risk perception, and nuclear waste policy. *Risk Analysis*, 13, 425-439.
- Kasperson, R. E. et al. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, 8, 177-187. (also Commentaries on , pp. 193-204)
- Gregory, R. et al. (1995). Technological stigma. *American Scientist*, 83, 220-223.
- Savatori, L. et al. (2004). Expert and public perceptions of risk from biotechnology. *Risk Analysis*, 24(5), 1289-1299.
- Wright, G. et al. (2002). An empirical test of the relative validity of expert and lay judgments of risk. *Risk Analysis*, 22(6).

#### Medical and health risk

A lot of current work focuses on 'numeracy' in decision making about risks. See also 'framing effects'. There is a very large literature on patient safety and reducing medical errors.

- Siegrist, M. et al. (2008). Risk communication, prenatal screening, and prenatal diagnosis: the illusion of informed decision-making. *Journal of Risk Research*, 11(1), 87-97.
- Eidesen, K. et al. (2009). Risk assessment in critical care medicine: A tool to assess patient safety. *Journal of Risk Research*, 12(3-4), 218-294.
- Gibbons, F. X., & Gerrard, M. (1995). Predicting young adults' health risk behavior. *Journal of Personality and Social Psychology*, 69, 505-517.
- Steiner, J. F. (1999). Talking about treatment: The language of populations and the language of individuals. *Annals of Internal Medicine*, 130, 618-622. (also letters, Vol. 132, pp. 93-94)
- Phillips, K. et al. (1999). Putting the risk of breast cancer in perspective. *New England Journal of Medicine*, 340, 141-144.
- Holtgrave, D. R., & Weber, E. U. (1993). Dimensions of risk perception for financial and health risks. *Risk Analysis*, 13, 553-558.
- Mearns, K., & Flin, R. (1996, September). Risk perception in hazardous industries. *The Psychologist*, 401-404.
- Hofstetter, P. & Hammitt, J. K. (2002). Selecting human health metrics for environmental decision-support tools. *Risk Analysis*, 22(5).

### Time and risk

- Kortenkamp, K.V. & Moore, C. F. (2006). Time, uncertainty, and individual differences in decisions to cooperate in resource dilemmas. *Personality and Social Psychology Bulletin*, 32, 603-615.
- Weber, B. J. & Chapman, G. B. (2005). The combined effects of risk and time on choice: Does uncertainty eliminate the immediacy effect? Does delay eliminate the certainty effect? *Organizational Behavior and Human Decision Processes*, 96, 104-118.
- Hardisty, D. J. & Weber, E. U. (2009). Discounting future green: Money versus the environment. *Journal of Experimental Psychology: General*, 138(3), 329-340.
- Keren, G., & Roelofsma, P. (1995). Immediacy and certainty in intertemporal choice. *Organizational Behavior and Human Decision Processes*, 63, 287-297.
- Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes*, 35, 124-140.

### Precautionary Principle

- Hansen, S. F. et al. (2008). The precautionary principle and risk-risk tradeoffs. *Journal of Risk Research*, 11(4), 423-464.
- Hrudey, S. E. & Leiss, W. (2003). Risk management and precaution: Insights on the cautious use of evidence. *Environmental Health Perspectives*, 111(13), 1577-1581.
- Starr, C. (2003). The precautionary principle versus risk analysis. *Risk Analysis*, 23(1).
- Farrow, S. (2004). Using risk assessment, benefit-cost analysis, and real options to implement a precautionary principle. *Risk Analysis*, 24(3), 727-735.
- Leszczynski, D. (2001). Mobile phones, precautionary principle, and future research (letter to the editor). *Lancet*, 358, 1733.
- Editorial. (2000). Caution required with the precautionary principle. *Lancet*, 356 (9226), 265.
- Starr, C. (1980). Risks of risk decisions. *Science*, 208(4448), 1114-1119.
- Fox, G. A. (2001). Wildlife as sentinels of human health effects in the Great Lakes-St. Lawrence Basin. *Environmental Health Perspectives*, 109(Supplement 6), 853-861.

### Terrorism and catastrophic events

- Slovic, P. (2002). Terrorism as hazard: A new species of trouble. *Risk Analysis*, 22(3), 425-426. See also Slovic's classic *Science* paper on risk perception and catastrophic potential.

- Lee, J. E. C. & Lemyre, L. (2009). A social-cognitive perspective of terrorism risk perception and individual response in Canada. *Risk Analysis*, 29(9), 1265-1280.
- Wilson, R. (2005). Editorial: Making life safer with a risk analysis approach. *Reliability Engineering and System Safety*, 87, 299-301.
- Chanel, O. & Chichilnisky, G. (2009). The influence of fear in decisions: Experimental evidence. *Journal of Risk and Uncertainty*, 39, 271-298.
- Fischhoff, B. et al. (2005). Evolving judgments of terror risks: Foresight, hindsight, and emotion. *Journal of Experimental Psychology: Applied*, 11(2), 124-139.
- Bogen, K. T. & Jones, E. D. (2006). Risks of mortality and morbidity from worldwide terrorism: 1968-2004. *Risk Analysis*, 26(1), 45-59.
- Baker, J. et al. (200). Changes in subjective risks of hurricanes as time passes: analysis of a sample of Katrina evacuees. *Journal of Risk Research*, 12(1), 59-74.
- Armas, I. (2006). Earthquake risk perception in Bucharest, Romania. *Risk Analysis*, 26(5), 1223-1234.

#### Applications to new technologies, environmental risks and wildlife

- Kahan, D. M. et al. (2008). Cultural cognition of the risks and benefits of nanotechnology. *Nature Nanotechnology*, 4, 87-90.
- Marx, S. M. , Weber, E. U. et al. (2006). Communication and mental processes: Experiential and analytic processing of uncertain climate information. *Global Environmental Change*, 17(1), 47-58.
- Shrader-Frechette, K. (1998). What risk management teaches us about ecosystem management. *Landscape and Urban Planning*, 40, 141-150.
- Vyas, N. B. (1999). Factors influencing estimation of pesticide-related wildlife mortality. *Toxicology and Industrial Health*, 15, 186-191.
- Von Winterfeldt, D. et al. (2004). Managing potential health risks from electric powerlines: A decision analysis caught in controversy. *Risk Analysis*, 24(6).
- Von Krauss, M. P. et al. (2004). Elicitation of expert judgments of uncertainty in the risk assessment of herbicide-tolerant oilseed crops. *Risk Analysis*, 24(6).
- McKibben, B. (2000). Consuming nature. *The Sun*, Issue 295, 20-23. (An interesting essay on whether we ought to control black flies).
- Aipanjiguly, S., Jacobson, S. D. & Flamm, R. (2003). Conserving manatees: Knowledge, attitudes, and intentions of boaters in Tampa Bay, Florida. *Conservation Biology*, 17(4), 1098-1105..
- Gibbs, J. P. & Shriver, G. (2002). Estimating the effects of road mortality on turtle populations. *Conservation Biology*, 16(6), 1647-1652..
- Jacobson, S. K., Sieving, K. E., Jones, G. A. & VanDoorn, A. (2003). Assessment of farmer attitudes and behavioral intentions toward bird conservation on organic and conventional Florida farms. *Conservation Biology*, 17(2), 595-606.
- Fernandez-Juricic, E., Jimenez, M. D. & Lucas, E. (2001). Alert distance as an alternative measure of bird tolerance to human disturbance: Implications for park design. *Environmental Conservation*, 28(3), 263-269.