

Behaviorally Realistic Risk Management

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National Science Advisory Board on Biosecurity

Bethesda, MD

October 22, 2014

Behaviorally Realistic Risk Management Addresses the Roles of

people in system performance,
as sources of vulnerability and resilience
expert judgment in analysis,
formulation, estimation, and interpretation
communication processes,
connecting design with users

Decision Science as an Organizing Discipline

Formal analysis of systems or decisions,
Empirical studies of human behavior, beliefs,
and preferences

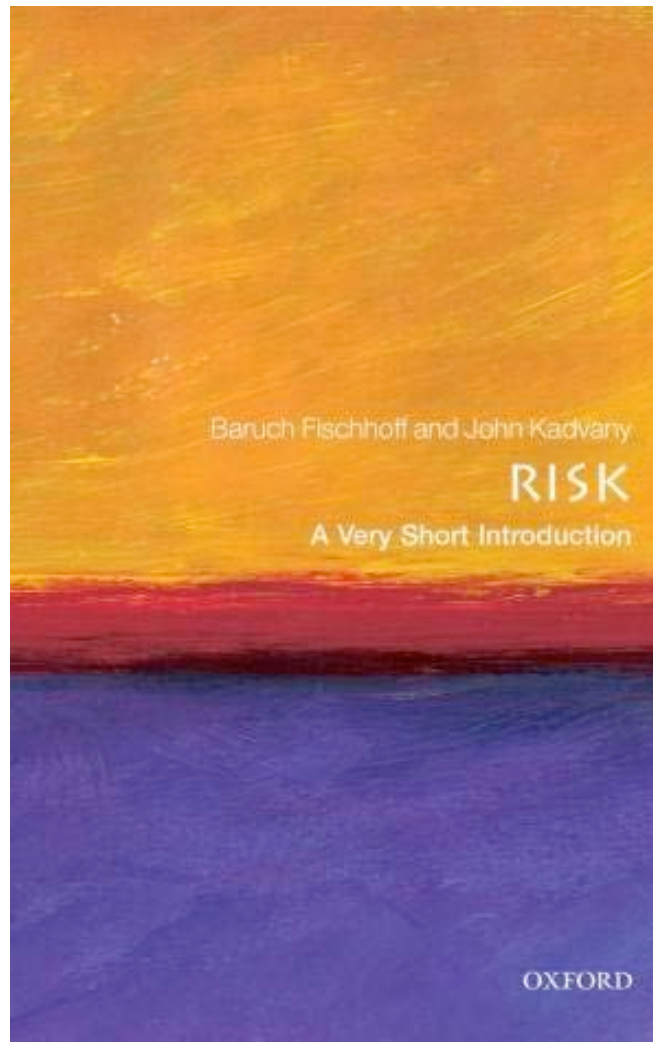
Interventions for improving system design,
with evaluations guiding iterations

Some Applications

sexual assault
perchloroethylene
plague
climate change
detergent
breast cancer
nuclear explosions
herpes
xenotransplantation
smart electric meters

domestic radon
methylene chloride
EMF
preterm birth
violent radicalization
breast implants
nuclear power in space
Plan B (morning after pill)
neonates
vaccines (anthrax, MMR)

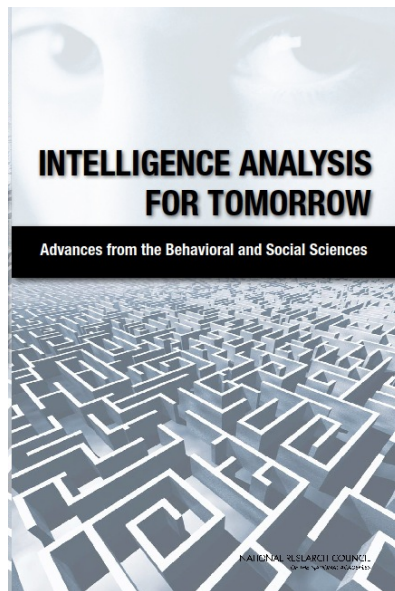
Risk: A Very Short Introduction



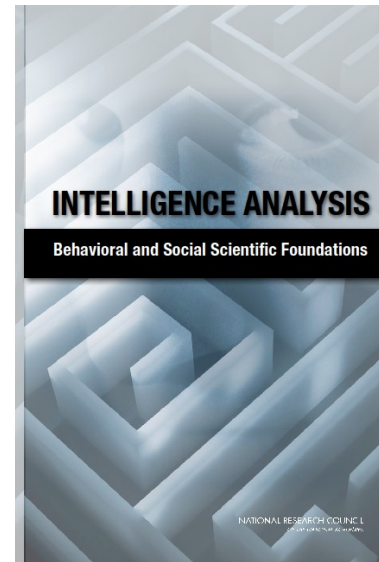
Fischhoff, B., & Kadvany, J. (2011). *Risk: A Very Short Introduction*. Oxford: Oxford University Press.

NAS Report for DNI

Consensus Report Edited Readings



http://www.nap.edu/catalog.php?record_id=13040



http://www.nap.edu/catalog.php?record_id=13062

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connecting experts with their publics

INDUSTRIAL FATIGUE AND EFFICIENCY

BY

H. M. VERNON, {M.A., M.D.

Investigator for the Industrial Fatigue

Research Board ;

Late Fellow of Magdalen College, Oxford.

London: George Routledge & Sons, 1921

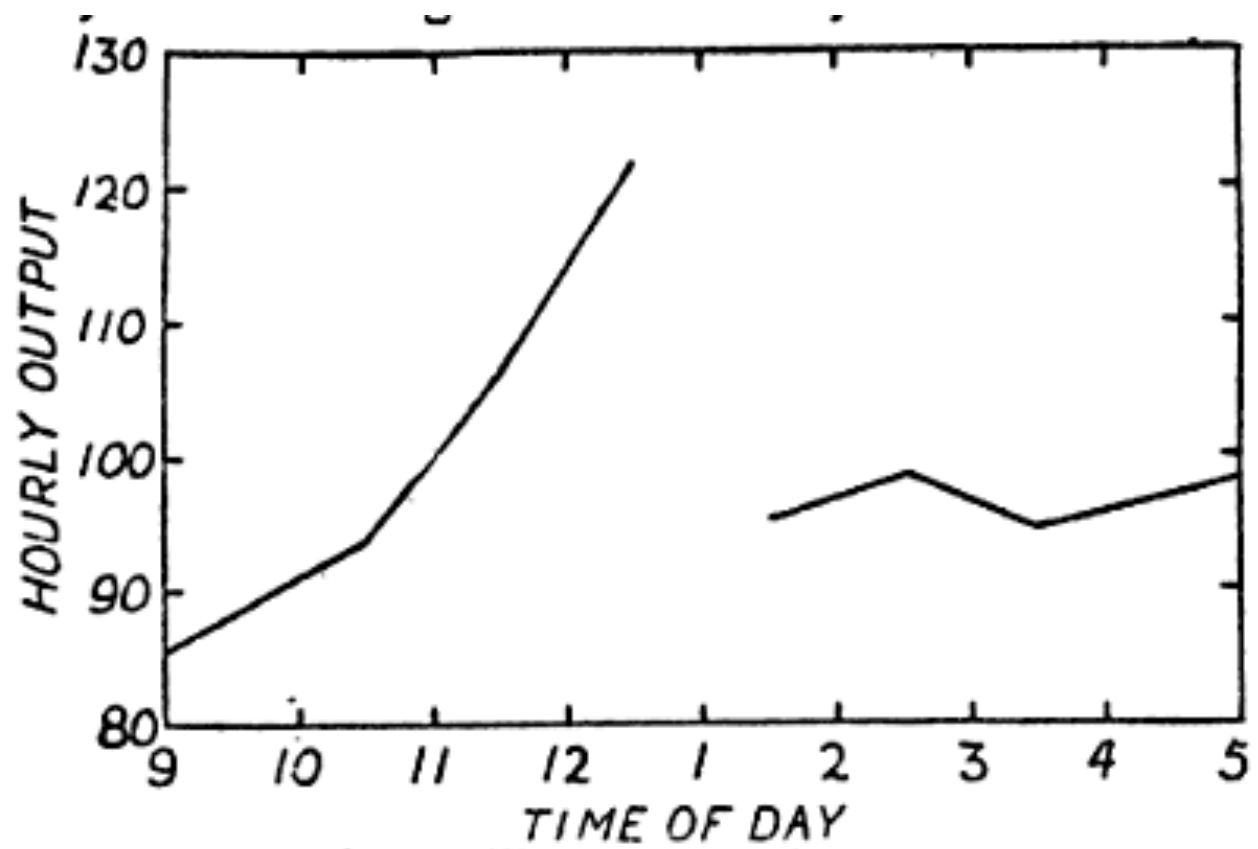


Fig. 4. - Women covering chocolates

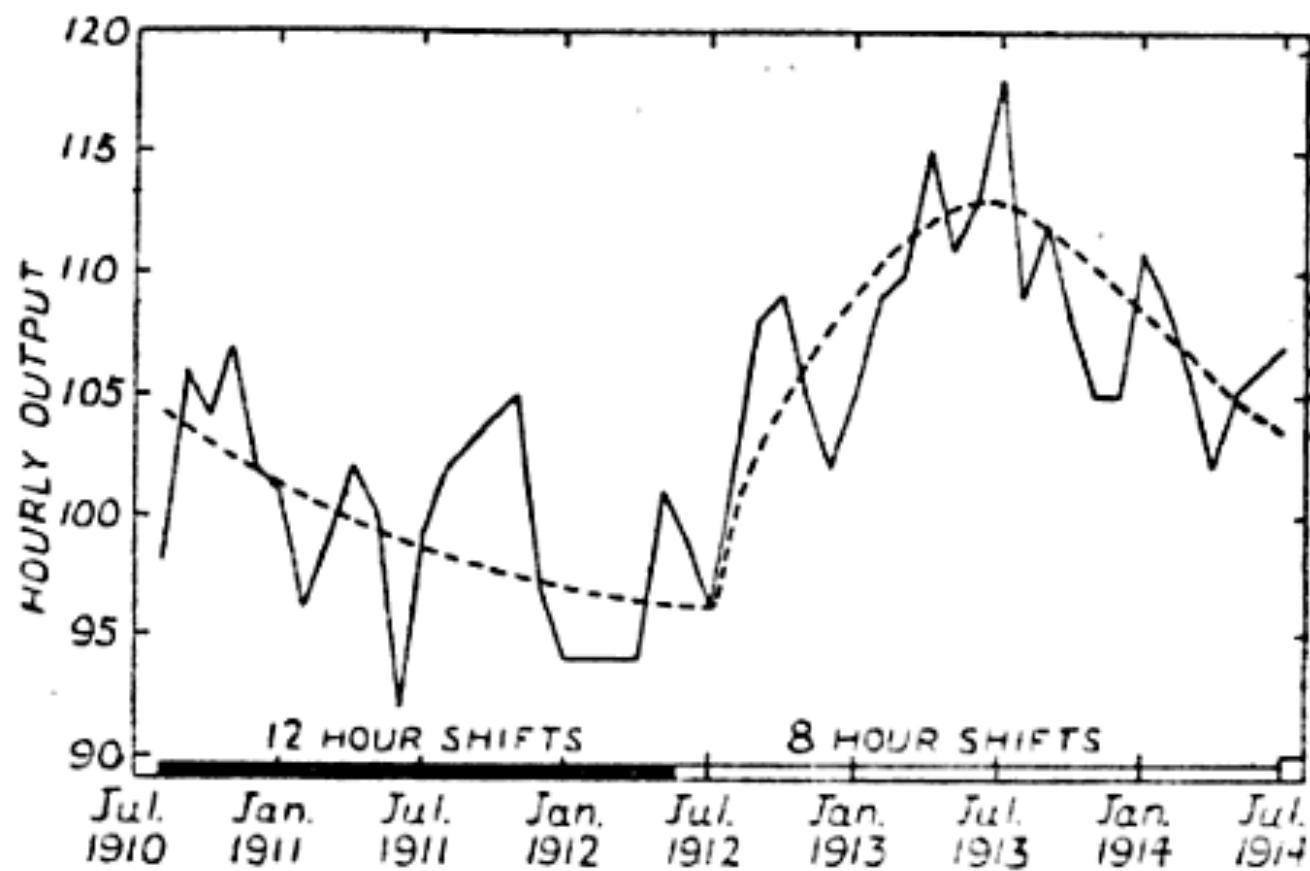
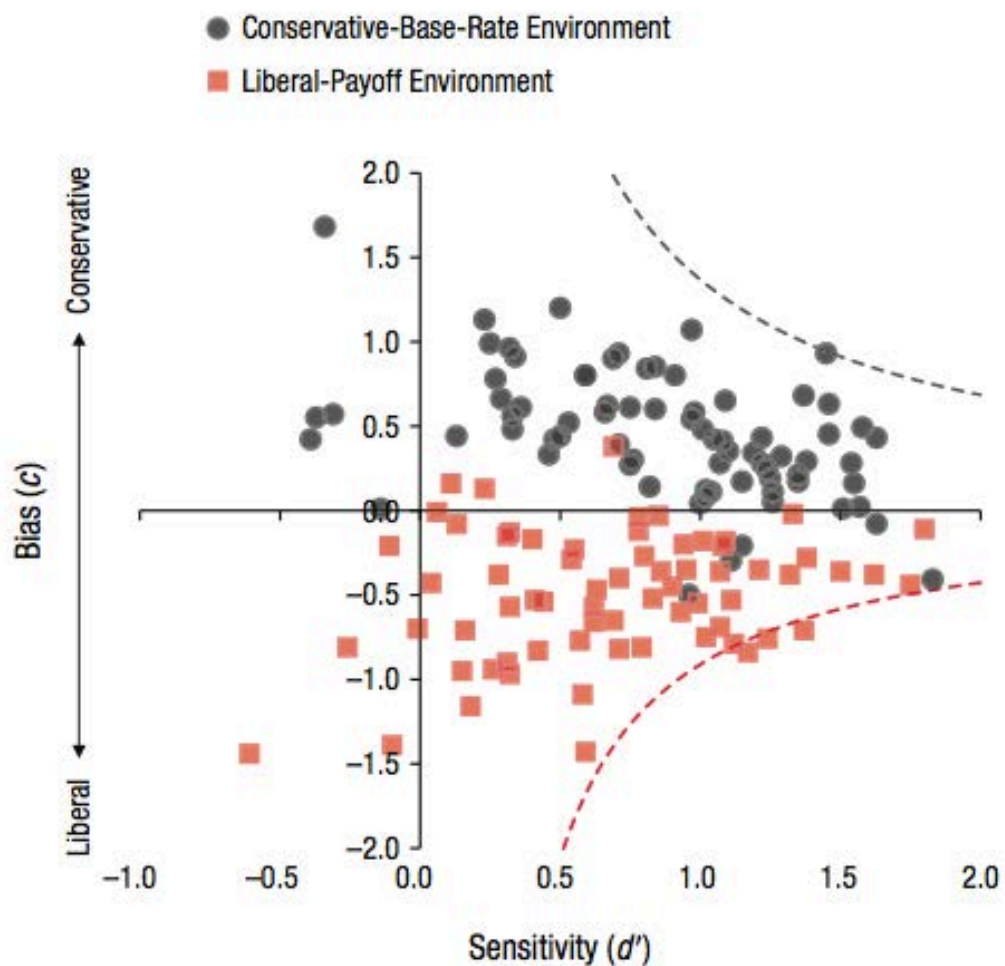


Fig. 10 - Output from steel furnaces

Vigilance Detection Ability and Decision Rules



Lynn, S. K., & Barrett, L. F. (2014). "Utilizing" Signal Detection Theory. *Psychological Science*, 1-11.

Slide courtesy of Casey Canfield, PhD Student, Department of Engineering and Public Policy, CMU

J Risk Uncertainty (2006) 33:131–149

DOI 10.1007/s11166-006-0175-8

Analyzing disaster risks and plans: An avian flu example

**Baruch Fischhoff · Wändi Bruine de Bruin ·
Ümit Güvenç · Denise Caruso · Larry Brilliant**

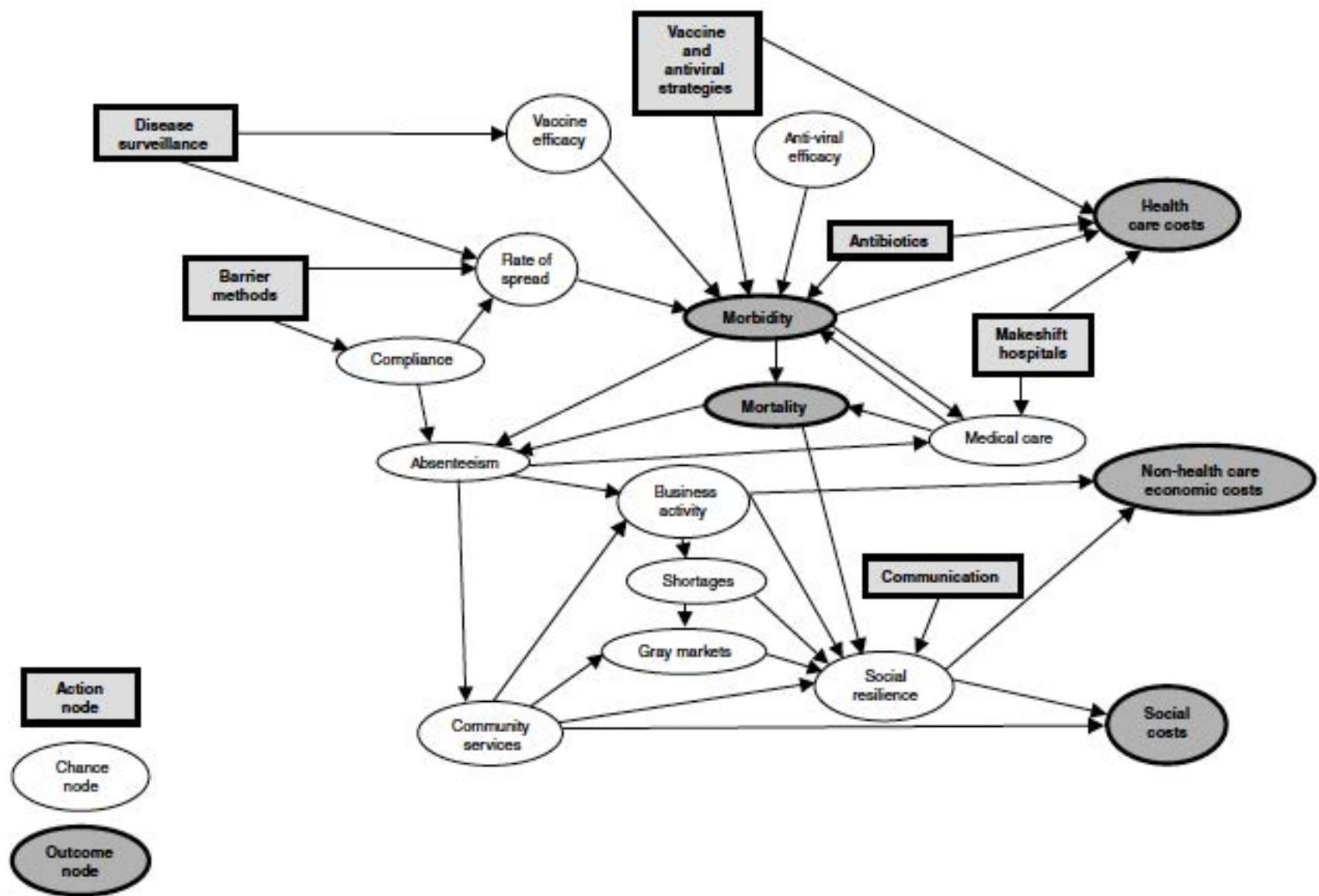


Fig. 2 Top-level risk model for a behavioral intervention, the use of barrier methods, along with intermediate processes affecting its impacts on the focal consequences of Figure 1. Ovals indicate uncertain variables, which need to be predicted. Rectangles indicate actions, which need to be planned and implemented

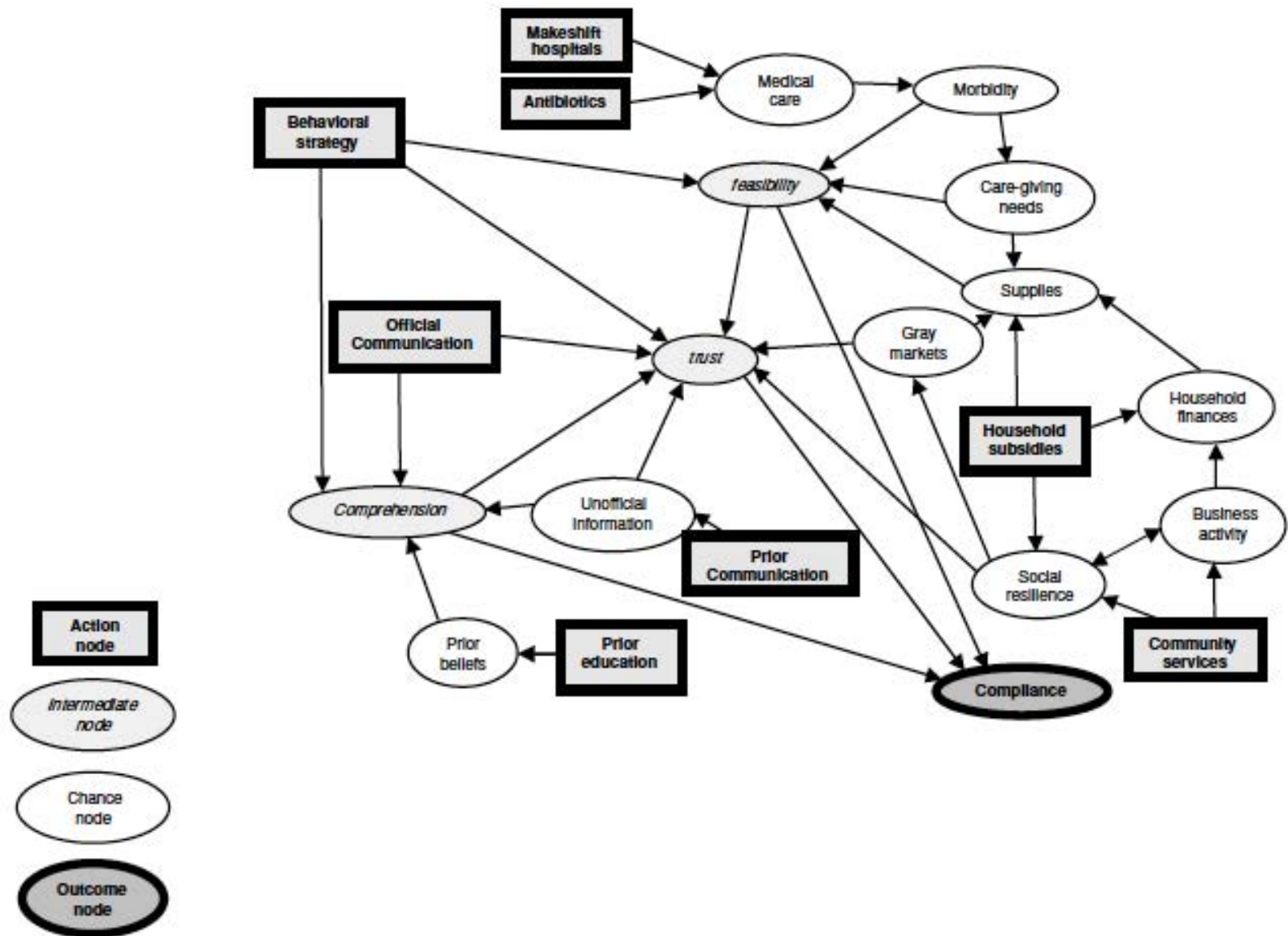


Fig. 3 Second-level model for factors shaping compliance with a behavioral intervention. Ovals indicate uncertain variables, which need to be predicted. Rectangles indicate actions, which need to be planned and implemented

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Expert judgments of pandemic influenza risks

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D. CARUSO⁴

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²*Department of Engineering and Public Policy, Carnegie Mellon University, PA, USA,*

³*Seva Foundation CA, USA and Google Foundation CA, USA, and* ⁴*Hybrid Vigor Institute CA, USA*

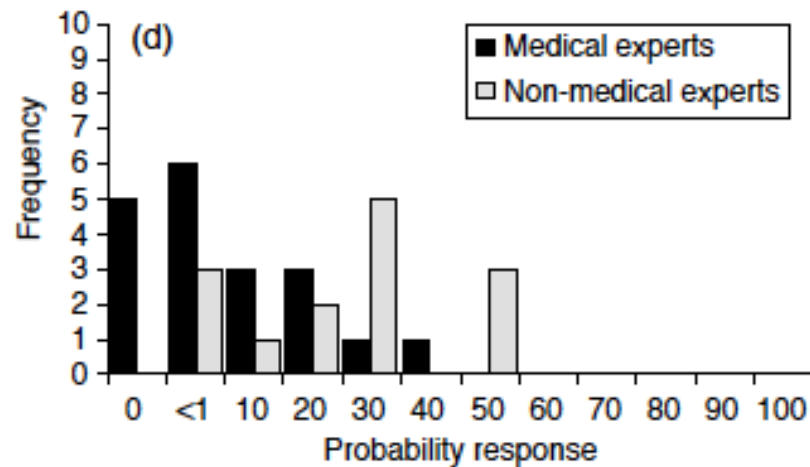
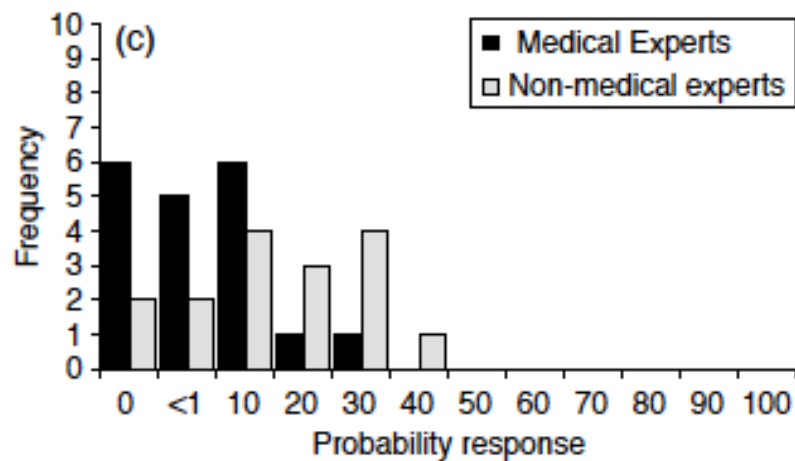
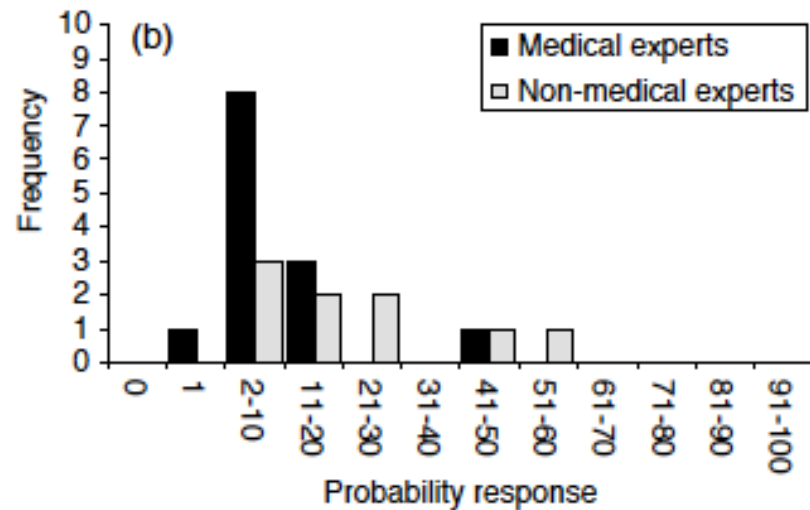
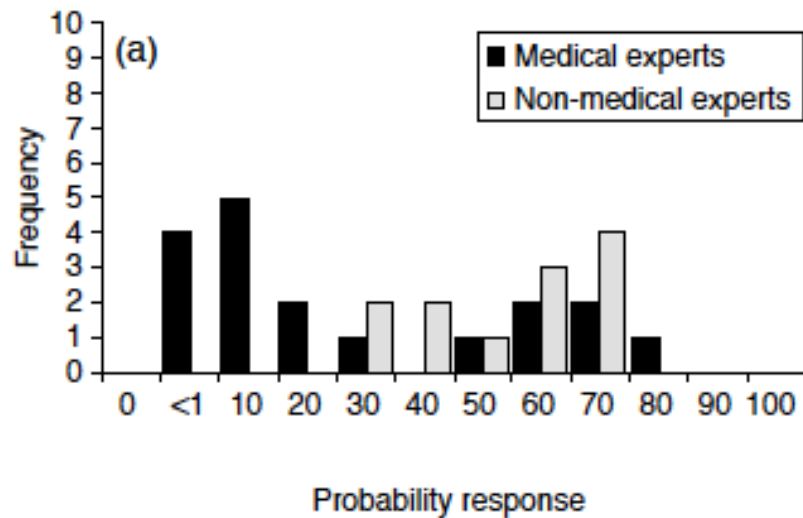


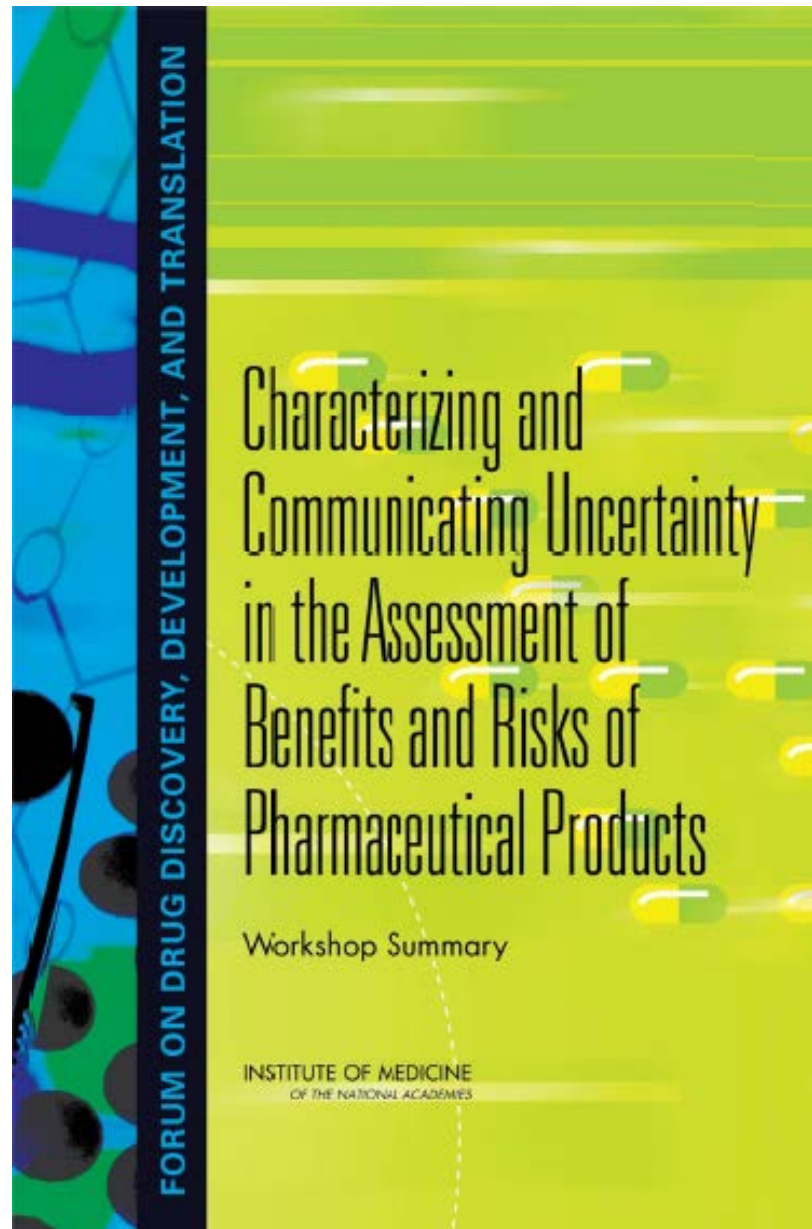
Figure 1. Response distributions for the probability that (a) H5N1 or a similar virus will become an efficient human-to-human transmitter in the next 3 years, (b) someone who is infected will die, or the case-fatality rate, (c) we will not have sufficient quantities of effective vaccines at that time, and (d) we will not have sufficient quantities of effective antiviral pharmaceuticals at that time. Figure (b) presents categories of open-ended responses, whereas the other figures present responses on the probability scale described in the text.



Structured Approach to Benefit-Risk Assessment in Drug Regulatory Decision-Making

Draft PDUFA V Implementation Plan - February 2013
Fiscal Years 2013-2017





http://www.nap.edu/catalog.php?record_id=18870

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http://www.pnas.org/content/110/Supplement_3



The Science of Science Communication II

September 23–25, 2013

at the National Academy of Sciences building
2101 Constitution Avenue, NW
Washington, DC

http://www.pnas.org/content/111/Supplement_4

The sciences of science communication

Baruch Fischhoff¹

www.pnas.org/cgi/doi/10.1073/pnas.1213273110

PNAS | August 20, 2013 | vol. 110 | suppl. 3 | 14033–14039

Communicating scientific uncertainty

Baruch Fischhoff^{a,b,1} and Alex L. Davis^a

www.pnas.org/cgi/doi/10.1073/pnas.1317504111

**FDA'S
STRATEGIC PLAN
FOR
RISK COMMUNICATION**

Fall, 2009

RCAC Recommendations

Communication for Emerging Events

Have a consistent policy in all domains

Provide useful, timely information

Address: risks and benefits, uncertainty,
personal actions, FDA actions

Audience needs should drive agency
analyses

Use standard formats; evaluate routinely

Consider needs of diverse populations

<http://www.fda.gov/oc/advisory/OCRCACACpg.html>

The Voice of the Patient

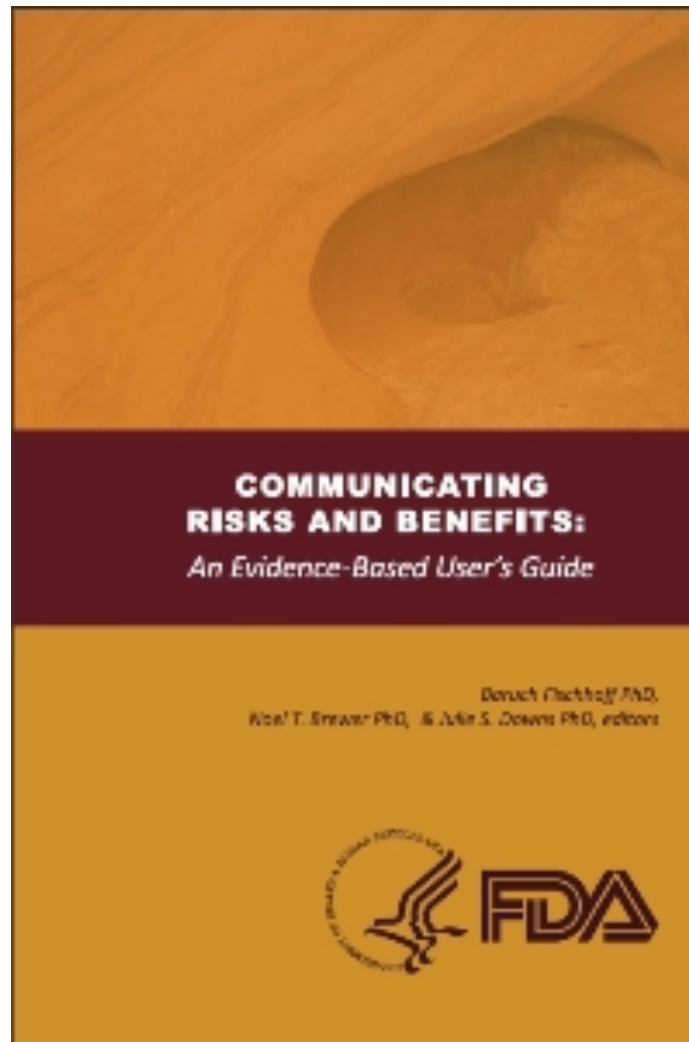
A series of reports from the U.S. Food and Drug Administration's (FDA's)
Patient-Focused Drug Development Initiative

Chronic Fatigue Syndrome and Myalgic Encephalomyelitis

Public Meeting: April 25, 2013

Report Date: September 2013

FDA Risk Communication Advisory Committee



<http://www.fda.gov/AboutFDA/ReportsManualsForms/Reports/ucm268078.htm>

Applications Require

continuing contact with users

broad use of behavioral and social sciences

avoidance of simplistic solutions

empirical evaluation

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Proposal

Create a trusted resource center providing publication-quality research for behaviorally realistic risk management.

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Create a trusted resource center providing publication-quality research for behaviorally realistic risk management.

- quality assurance
- economies of scope
- pool lessons learned
- anticipate problems
- access to current science

Books

- Fischhoff, B., Brewer, N., & Downs, J.S. (eds.). (2011). *Communicating risks and benefits: An evidence-based user's guide*. Washington, DC: Food and Drug Administration.
<http://www.fda.gov/AboutFDA/ReportsManualsForms/Reports/ucm268078.htm>
- Fischhoff, B., & Chauvin, C. (eds.). (2011). *Intelligence analysis: Behavioral and social science foundations*. Washington, DC: National Academy Press
http://www.nap.edu/catalog.php?record_id=13062
- Fischhoff, B., & Kadvany, J. (2011). *Risk: A very short introduction*. Oxford: Oxford University Press.
- Fischhoff, B., Lichtenstein, S., Slovic, P., Derby, S. L. & Keeney, R. L. (1981). *Acceptable risk*. New York: Cambridge University Press. (NUREG/CR-1614).
- Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar Giroux & Strauss.
- Morgan, M.G., Henrion, M. (1990). *Uncertainty*. New York: Cambridge University Press.
- Slovic, P. (ed.) (2000). *Perception of risk*. London: Earthscan.

Research Articles

- Bruine de Bruin, W., Parker, A., & Fischhoff, B. (2007) Individual differences in adult decision-making competence (A-DMC). *Journal of Personality and Social Psychology*. 92, 938-956.
- Fischhoff, B. (1992). Giving advice: Decision theory perspectives on sexual assault. *American Psychologist*, 47, 577-588.
- Fischhoff, B. (2011). Communicating the risks of terrorism (and anything else). *American Psychologist*, 66, 520-531.
- Fischhoff, B. (2012, Summer). Communicating uncertainty: Fulfilling the duty to inform. *Issues in Science and Technology*, 29, 63-70 ,
- Fischhoff, B., Bruine de Bruin, W., Guvenc, U., Caruso, D., & Brilliant, L. (2006). Analyzing disaster risks and plans: An avian flu example. *Journal of Risk and Uncertainty*, 33, 133-151.

<http://www.hss.cmu.edu/departments/sds/src/faculty/fischhoff.php>

Carnegie Mellon Electricity Center: <http://wpweb2.tepper.cmu.edu/ceic/>

Center for Climate and Environmental Decision Making: <http://cedm.epp.cmu.edu/index.php>

Center for Risk Perception and Communication: <http://sds.hss.cmu.edu/risk/>

Center for Human Rights Science: <http://www.cmu.edu/chrs/>

Figure 1: FDA Benefit-Risk Framework

Decision Factor	Evidence and Uncertainties	Conclusions and Reasons
Analysis of Condition		
Current Treatment Options		
Benefit		
Risk		
Risk Management		
Benefit-Risk Summary Assessment		

FDA. (2013). *Structured approach to benefit-risk assessment for drug regulatory decision making*. Draft PDUFA V implementation plan (2/13). FY2013-2017.