Risk Management REVIEW

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RISK MANAGEMENT AND DECISION PROCESSES CENTER
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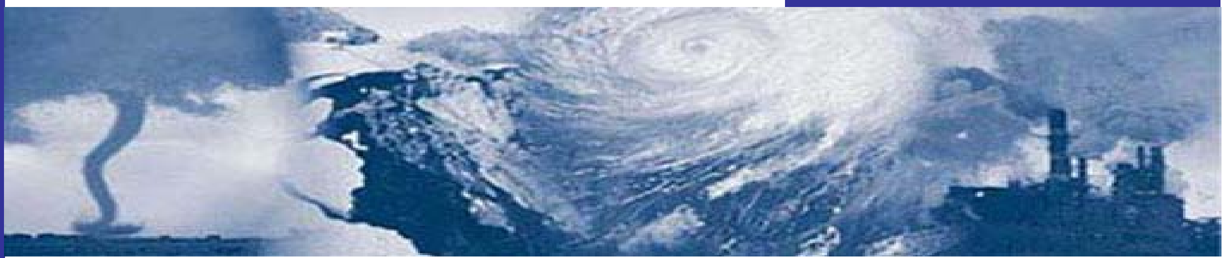

Risk Center Releases Findings of Two-Year Study

"Managing Large-Scale Risks in a New Era of Catastrophes"

Who should pay the costs associated with catastrophic losses suffered by homeowners residing in hazard-prone areas? This is the central question addressed in ***Managing Large-Scale Risks in a New Era of Catastrophes***, a report by the Wharton Risk Management and Decision Processes Center, in conjunction with Georgia State University and the Insurance Information Institute. The study comes as Congress considers several bills to determine the future of insuring, mitigating and financing recovery from natural disasters in the United States.

For **Howard Kunreuther** and **Erwann Michel-Kerjan**, who co-led the study, the question is not *whether* catastrophes will occur, but *when,* and *how frequently* they will strike, and the extent of damages they will cause. "A coherent strategy is necessary to assure a sustainable recovery from large-scale disasters and the appropriate future development of hazard-prone areas. This report provides the elements for designing such a program."

Kunreuther and Michel-Kerjan, with Risk Center Fellows **Neil Doherty** and **Mark Pauly**, and Georgia State partners **Martin Grace** and **Robert Klein**, analyzed millions of homeowners' policies in four hurricane-prone states: Florida, New York, South Carolina, and Texas. "To our knowledge, this is the first time that these types of data have been collected simultaneously for several consecutive years, analyzed and interpreted in the context of existing state insurance regulatory systems and of the structure of the property insurance market in the United States."

The findings suggest a set of innovative strategies that may reshape the way the insurance industry provides protection, while at the same time encouraging residents in hazard-prone areas to invest in loss-reduction measures against future hurricanes and floods.

The study points to the need for **changes in state regulatory involvement, premiums reflecting risk, adherence to building codes**, and **a means to provide affordable insurance coverage to residents of hazard-prone areas who have financial need**.

The report, which was released in March, has gained the attention of business practitioners and policymakers, and will be published next year by MIT Press.

The executive summary and the full report (400+ pages) are available on the Wharton Risk Center's website, http://opim.wharton.upenn.edu/risk/.

Managing Large-Scale Risks in a New Era of Catastrophes

by Howard Kunreuther and Erwann Michel-Kerjan

Our nation is facing large-scale risks at an accelerating pace. Of the twenty most costly insured catastrophes in the world since 1970, ten of them occurred since 2001, nine of these here in the U.S. In 2005, three major hurricanes – Katrina, Rita and Wilma – made landfall in the Gulf of Mexico within a six-week period, killing over 1,500 people and leading to insurance reimbursements and federal disaster relief of over $180 billion – an historic record. These three storms occurred after four other hurricanes caused severe damage in Florida in 2004.

Today, more than 50 percent of the U.S. population lives in coastal counties. In Florida, 80 percent of insured property is located near the coast.

Given the increasing concentration of population in high-risk coastal areas of the country, a coherent strategy is urgently needed to assure a sustainable recovery from large-scale disasters and the appropriate future development of hazard-prone areas. The Wharton Risk Center report (undertaken jointly with Georgia State University and the Insurance Information Institute) on *Managing Large Scale Risks in a New Era of Catastrophes* examines alternative *long-term* sustainable strategies for reducing losses from natural disasters and for providing financial support to victims of these events.

The following two guiding principles underlie proposed strategies for using the insurance infrastructure to deal more effectively with natural disasters:

Principle 1: Premiums Reflecting Risk

Insurance premiums should be based on risk in order to provide signals to individuals as to the hazards they face, and to encourage them to engage in cost-effective mitigation measures to reduce their vulnerability to catastrophes.

Principle 2: Dealing with Equity and Affordability Issues

Any special treatment given to homeowners currently residing in hazard-prone areas (e.g., low-income uninsured or inadequately insured homeowners) should come from general public funding and not through insurance premium subsidies.

The report addresses the following questions:

- How can the above principles guide the design of insurance and mitigation programs for reducing future disaster losses and providing financial support for victims of these events?
- What roles can the key interested parties affected by natural disasters play in implementing these programs?
- Who should pay (and how much should they pay) to mitigate damages from future natural disasters and the losses that occur following these events?
- How can these analyses inform private sector decisions and the policy debate in state legislatures and the U.S. Congress?

Source: National Oceanic and Atmospheric Administration / Department of Commerce

This photo, taken in south Florida after Hurricane Andrew, shows that homes on one side of a street were completely destroyed, while homes on the other side were still standing. Later inspection determined that, in many cases, construction of the destroyed buildings was well below the standard required by the building code in effect.

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The Fly on the Wall in Disasters

by Robert Meyer

Behavioral hazard researchers have long lamented the rarity of the beast they study. We know much less than we should about how people interpret storm warnings and make mitigation decisions, it is said, for the simple reason that there are so few opportunities to study such decisions at the time they are being made.

To illustrate, consider the massive over-evacuation that occurred of the Houston metropolitan area in advance of Hurricane Rita in 2004. Why did so many residents choose to evacuate who had no need to, and suffered deeply because of it? The common explanation one hears is that people left because they were frightened that Houston would suffer the same fate as New Orleans a month earlier from Hurricane Katrina. But is this the real reason? Since no researchers were "on the ground" interviewing evacuees as the storm threat was actually in progress, it is hard to know for sure. On one hand, in a survey that was conducted of evacuees after the storm, only 10% indicated that Katrina played a major role in their decisions—a finding that would seem to dismiss the link as myth (Morss and Zhang, April 2008 issue of the *Bulletin of the American Meteorological Society*). On the other hand, retrospective reports of why people do what they do are notoriously unreliable; we often have limited insights into our own psychologies, we have a hard time articulating our beliefs, and when pressed to provide explanations we often construct answers that will be seen as reasonable or justifiable. In the face of such indeterminacies, one often hears the refrain among risk researchers, "if only I could be a fly on the wall" in the homes of residents facing impeding disasters, gathering unobtrusive real-time measures of thoughts and decisions as they are being made.

Consider the massive over-evacuation that occurred of the Houston metropolitan area in advance of Hurricane Rita in 2004. Why did so many residents choose to evacuate who had no need to?

In a recent paper, **Ka Lok Lee**, **Robert Meyer**, and **Eric Bradlow** explore a possible way of becoming such a fly, by analyzing internet site-visitation patterns in the course of an unfolding natural disaster. Internet retailers have long realized that web visitation patterns carry an enormous amount of latent information about consumer preferences and habits—information that can be gained unobtrusively without the need for market research surveys. With over 70% of the U.S. population now being internet users, web data is thus a potentially rich source of information about how and when individuals respond to critical events.

In their paper, the authors illustrate this potential by analyzing a unique dataset provided by *Compete.Com* that documented the hourly web-surfing behavior of over 140,000 Internet users in five southeastern states during Hurricane Katrina in August of 2005.

The authors analyzed the hourly web-surfing behavior of over 140,000 Internet users in five southeastern states during Hurricane Katrina in August of 2005.

They focused on how storm events (such as the posting of warnings) affected traffic to weather-related web sites, and how this traffic varied across locations and by characteristics of the web user. Katrina represented a unique testing ground for the use of such data because it was one the few storms in history to make landfall near two major metropolitan areas (Miami and New Orleans), and the study area exhibited considerable natural variation in residents' recent experiences with storms. The Florida Panhandle, for example, had experienced the impact of a major hurricane just one month before (Dennis), others (such as New Orleans) had experienced recent false alarms (Ivan the year before), while other areas had no recent experience with such storms (inland Mississippi).

The analysis yielded a number of intriguing insights about when and who responded to news about the storm as it progressed. One of the findings was that, possibly contrary to beliefs by the National Hurricane Center, there was limited evidence that residents routinely gathered storm information (at least on

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Risk Center Reviews Accident History Data under the RMP Rule

by Paul Kleindorfer and Irv Rosenthal

The Wharton Risk Center has been actively involved with the **U.S. Environmental Protection Agency (EPA)** since the inception of the RMP Rule, enacted as part of the Clean Air Act Amendments of 1990. Clean Air Act, Section 112(r) is referred to as the Risk Management Program or RMP Rule, because this law and its implementing regulations impose requirements on facilities that manufacture or handle certain chemicals that encompass the development of a Risk Management Program and Plan for the facility.

Now, after ten years of data collection under the RMP Rule, the Risk Center has completed a major evaluation of the results of the Rule. The full report, **"Accident Epidemiology and the RMP Rule: Learning from a Decade of Accident History Data for the U. S. Chemical Industry"** is available on the Risk Center website at http://opim.wharton.upenn.edu/risk/library/2007_EPA-Wharton_RMPRule.pdf. The study is also featured on the EPA website at http://www.epa.gov/OEM/accident_epidemiology.htm.

The report describes analysis undertaken by an interdisciplinary team of researchers from the Wharton Risk Center, the Oregon Health & Science University, and the EPA. The team includes Risk Center Research Fellows **Michael Elliott, Paul Kleindorfer, Robert Lowe** and **Irv Rosenthal**.

The study examined data filed by each regulated facility on its accident history for the period covered by the RMP Rule, and for the five-year period preceding the filing of the RMP. In 1999-2000, data were collected on 15,145 facilities in the U.S. that stored or used listed toxic or flammable chemicals believed to be a hazard to the environment or to the health of facility employees or off-site residents of host communities. A second major set of data under the RMP Rule became available in 2004-2005, covering 12,065 facilities, of which some 10,500 were facilities that also filed in 1999-2000, allowing, therefore, a comparative assessment for these facilities of accident trends over the ten-year period 1995-2005.

The resulting database, RMP*Info, has become a key resource for regulators, researchers and external stakeholders concerned with analyzing the frequency and severity of accidents, and understanding the underlying facility-specific factors that are statistically associated with accident and injury rates and potential worst-case scenarios. This report analyzes the key findings arising from the first ten years of data collected under the RMP Rule, including characteristics of facilities that filed under the Rule and associated results on accident frequencies and severities available from the RMP*Info database.

The report also presents summaries of related results from RMP*Info on Offsite Consequence Analysis (OCA), scenario-based estimates of the potential consequences of hypothetical worst-case and alternative accidental releases on the public and environment around the facility. The study includes a detailed review of accidents over the past ten years in the U.S. chemical industry, including the nature of the facilities that reported and the changes in their worst-case footprints (the OCA analyses) and their hazardousness. The heart of the report is focused on trends in accident rates and consequences for an important subset of the facilities filing under the RMP Rule, that is, those that filed during both the initial wave of filings in 1999-2000 and the five-year anniversary filings in 2004-2005, that had not de-registered by December 31, 2005 – a cohort of 10,446.

A number of key findings are provided in the report. These include, foremost, a significant decline in RMP reported accident rates between Waves 1 and 2 of RMP filings, both for all accidents and for accidents with reportable consequences. However, in contrast to this finding, the report also notes that there was no decrease in the total accidents with reportable off-site consequences, so that the major reason for the decline was a drop in on-site consequence accidents. The principal cause for this drop in accidents with on-site consequences is a decrease in the sub-category "injuries to employees and contractors" which are in essence those injuries reportable under OSHA OII (Occupational Illnesses and Injuries).

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Invited Column:

Has Risk Management Peaked?

Has risk management reached a peak in its acceptance and effectiveness?

The current signs are not encouraging. The March 2008 bailout of Bear Stearns, an investment bank presumed equipped with superior financial risk management, is an indication that our sophisticated risk models may be useless whenever a bubble bursts, whenever the classic herd instinct overruns all our rational risk assessments and responses.

In addition, why can't risk officers challenge some of the irrational decisions of senior executives and board members, such as in their bloated pay packages? And when these quantitative models are based solely on past data, how can they possibly anticipate Taleb's "Black Swan," the event or situation that has never occurred before? Has the relative success and growth of risk management from 1985 onwards lulled its proponents into thinking they really understand the nature of risk? And, finally, why are the sub-disciplines (finance, public policy, safety, information technology, auditing, and insurance) concentrating in their own tents, reluctant to talk with the others? An answer to that last question may lie in the increasingly arcane and abstruse language used by each of these sub-disciplines, as they become unintelligible to the others. Risk management may become the latest Tower of Babel!

"Risk management" has morphed from its original use as a euphemism for insurance buying into a rainbow of different interpretations and usages. It is now found in public policy pronouncements, financial trading, advice on investments, safety and security, the military, politics, and in almost every aspect of our daily lives. That we have actually made some modest progress in managing life's uncertain affairs is more the result of some intelligent use of the ideas behind the phrase than of the convoluted semantics and unnecessary complexities offered by so many organizations and observers.

The goal of risk management is to build and maintain the confidence of stakeholders in the organization

Isn't it time for us to take a fresh look at this discipline, to clarify its aims and processes, and to free it from the verbosity and jargon that have crept in over the past two decades?

– H. Felix Kloman,
author of *The Fantods of Risk: Essays on Risk Management*,
Seawrack Press, 2008.
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RMP Rule

(Continued from page 4)

There are several possible explanations for the above noted results on the decreases in accident rates between the two filing periods. First is the possibility that the RMP Rule may have had its intended effect in lowering accidents and consequences, at least for on-site employees and contractors. An additional factor that could explain all or part of the decrease in reported accidents is the possibility that facility practices for reporting worker injuries may have changed, with different reporting criteria being used in the second wave than in the first wave. Such changes have been noted for OSHA OII rates, so there is reason to believe that such changes could have occurred also with respect to RMP reporting. This matter is examined in detail in the report.

The report concludes with a preliminary assessment of the regulatory effectiveness of the RMP Rule in sharing information on environmental risks with affected stakeholders and in reducing the frequency and severity of chemical accidents. The most important conclusion from the study is that the RMP Rule provides, at a relatively modest cost, data that enhance the understanding of the actual outcomes of U.S. chemical facilities in respect to accidental releases. This general finding is underscored by many detailed results arising from the first ten years of RMP data. In the process, this study emphasizes the importance of the RMP data as a foundation for developing and evaluating industry risk management and regulatory strategies aimed at reducing the consequences of chemical process safety risks on the environment and the public.

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Relying on Pain

by Scott Rick

Imagine that while on vacation, you find yourself drawn to an attractive souvenir t-shirt. What a subtle yet effective way to tell onlookers where you've been! But, is it worth the $14.99 price tag? How will you decide?

According to the standard economic perspective, the price of the t-shirt captures its opportunity cost, or the next best use of the $14.99. Once the good's opportunity cost is assessed, the choice becomes a simple one between the anticipated pleasure of wearing the t-shirt and the anticipated pleasure of using the money elsewhere.

Intuition and recent behavioral research, however, suggests that purchasing decisions are rarely as simple as the standard economic perspective would suggest. First, assessing how happy the t-shirt will make us is incredibly difficult. Who knows how many people will ask us about our shirt, or how long it will be before we get tired of recounting the same vacation stories over and over again? Even more difficult than estimating the pleasure that a tangible, immediately available object will deliver, however, is determining what precisely is foregone by spending immediately. Indeed, behavioral research suggests that many people fail to spontaneously interpret prices in terms of opportunity costs.

Study participants chose whether or not to purchase a series of consumer goods while having their brains scanned.

If prices do not play their advertised role in spending decisions, then what role do they play? In a recent article entitled "Neural Predictors of Purchases," **Brian Knutson, George Loewenstein, Drazen Prelec, Elliott Wimmer** and I investigated this question in a study in which participants chose whether or not to purchase a series of consumer goods (for example, Godiva Chocolate; Crest Whitestrips) while having their brains scanned with functional magnetic resonance imaging.

In each trial of our SHOP ("Save Holdings or Purchase") task, participants were initially shown a good that could be purchased, followed seconds later by its price, and finally by the opportunity to indicate whether or not they would like to buy the good at the offered price. Critically, we found that activation in a brain region known as the insula during the period when participants first saw the price correlated negatively with purchasing decisions. Given that the insula is routinely active in response to a variety of painful stimuli (for example, when smelling disgusting odors, when being treated unfairly, or when being socially excluded), we concluded that the brain relies on a "pain of paying" as a proxy for deliberative consideration of opportunity costs. The pain of paying protects us from overspending by transforming intangible costs (vague notions of what will be foregone at some unknown point in the future) into tangible ones (in the form of immediate, visceral pain).

Inconsistent with persistent media attention to the problem of excessive spending, we found that "tightwaddism" was more common than "spendthriftiness."

Because people are not making explicit tradeoffs, it is difficult to "get it right," and it is easy to get it wrong in either direction. Some people do not experience enough pain, anxiety, or guilt for their own good. Others experience too much pain, which leads them to spend too little.

To measure chronic individual differences in the pain of paying, **Cynthia Cryder, George Loewenstein** and I developed a "Spendthrift-Tightwad" scale that divides respondents into three categories: "tightwads" spend less than they think they should, "unconflicted consumers" spend about as much as they think they should, and "spendthrifts" spend more than they think they should. Inconsistent with persistent media attention to the problem of excessive spending, we not only found that many people make mistakes in both directions (spending too little or spending too much), but also that "tightwaddism" was more common than "spendthriftiness." In our nationwide sample of over

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13,000 respondents, tightwads outnumbered spendthrifts by a 3:2 ratio (24% vs. 15%).

Consistent with the claim that tightwads and spendthrifts often behave differently than they would ideally like to behave, we find that Spendthrift-Tightwad scale scores non-monotonically correlate with self-reported happiness. Tightwads and spendthrifts are about equally happy, but unconflicted consumers are significantly happier than both extremes. Crucially, Spendthrift-Tightwad scale scores also predict several spending-related behaviors. For example, spendthrifts who use credit are three times as likely to carry debt as tightwads who use credit (60% vs. 20%). Spendthrifts are twice as likely as tightwads to have less than $10,000 in savings (52% vs. 24%), and tightwads are twice as likely as spendthrifts to have more than $250,000 in savings (28% vs. 12%), and these differences persist after controlling for income.

However, chronic individual differences in the pain of paying are not all-powerful determinants of spending behavior. We find that tightwads and spendthrifts behave most similarly when situational factors diminish the pain of paying. In one experiment, for example, we asked tightwads and spendthrifts whether they would be willing to pay $5 to have DVDs shipped to them overnight, rather than waiting four weeks. We simply varied whether the cost of shipping was framed as a "$5 fee" or a "small $5 fee." Although both phrases represent equivalent amounts of money, a "small" fee sounds less painful to pay. Since tightwads are most prone to experiencing the pain of paying, they were predicted to be most sensitive to the manipulation. Indeed, tightwads were significantly more likely to pay the "small $5 fee" than the "$5 fee," but spendthrifts were completely insensitive to the manipulation. The results of this and other studies suggest that situational factors that diminish the pain of paying diminish spending differences between tightwads and spendthrifts by motivating tightwads to behave more like spendthrifts.

Of course, uncovering ways to encourage tightwads to spend more is only half of the therapeutic agenda. Encouraging greater saving among spendthrifts is also important. In an initial attempt to achieve both objectives simultaneously, we conducted an experiment in which tightwads and spendthrifts shopped while listening to sad or neutral music. Given that sadness frequently motivates people to change their circumstances, we predicted that sadness would have opposing effects on tightwads and spendthrifts. As anticipated, we found that sadness increased spending by tightwads and decreased spending by spendthrifts. Future research should attempt to uncover other interventions that simultaneously encourage tightwads and spendthrifts to abandon their chronic spending habits.

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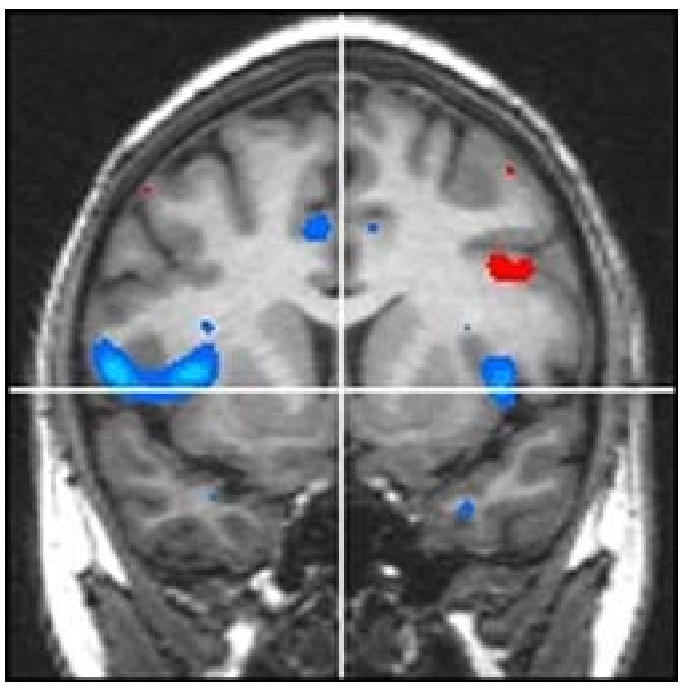

The map above displays the areas of the brain that correlate with real spending decisions when participants first see the offered product's price. The blue areas along the horizontal axis indicate that activation in the insula correlates negatively with subsequent spending decisions.

Large-Scale Risks

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Our focus is on hurricanes but the concepts apply more broadly to other disasters. Four states (Florida, New York, South Carolina and Texas) are studied in depth because they have the largest property exposure to hurricane risk in the country and also present significant differences in insurance market regulation. Florida presents a specific challenge due to its hurricane exposure, increasing population and rapid economic development, all of which makes this state a world peak-zone for extreme event coverage and capital allocation. Recently, it has been a source of controversy because its state government has intervened in the functioning of the private insurance market more explicitly than any other state in the country.

We are mindful that new alternative strategies for reducing risks and aiding the recovery process may be extremely difficult to implement at this time because 2006 and 2007 have seen much lower levels of damage. There is a tendency for all of us, whether homeowner, decision maker in a private or public sector organization, or elected official, to focus only on immediate crises.

Our nation remains highly vulnerable to large-scale disasters, however. For this reason, decisions by Congress and other legislative bodies must be based on a sound long-term conceptual framework and well-documented empirical analyses.

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Among the 41 key findings of the report:

- Under a scenario that permits insurers to charge premiums reflecting risk (competitive market), private insurers and reinsurers would be able to cover most (if not all) losses from severe hurricanes if homeowners mitigate their property.
- Despite the cost-effectiveness of mitigation measures, many homeowners do not voluntarily invest in them. Hence, there is a need for well-enforced building codes, tax rebates, zoning ordinances, and premiums reflecting risk that take the benefits of mitigation into account.
- Mitigation has the potential to provide significant cost savings. For a 100-year hurricane, mitigation would reduce the potential losses by 61 percent in Florida, 44 percent in South Carolina, 39 percent in New York, and 34 percent for Texas. In Florida alone, the use of mitigation leads to a $51 billion savings for a 100-year event, and $83 billion for a 500-year event.

The Fly on the Wall

(Continued from page 3)

the web) before they really had to—that is, before their location was put under a warning. Likewise, contrary to the traditional finding that women tend to be more sensitive to risks than men, when Katrina began to threaten the coast it was the men who displayed the larger relative increase visitation to weather-sites that carried information about the storm. Finally, the data offered one other insight that may address the debate over the role that Katrina played in Houston's evacuation in anticipation of Rita the next month.

While users throughout the study area began going to weather sites only when their areas were threatened, there was one exception: users in Santa Rosa County, Florida were unusually antsy, increasing visitation rates when the storm was hundreds of miles away, off the southeast Florida coast. Why so? They had good reason to be antsy: Santa Rosa was the county that received the brunt of Hurricane Dennis just a month earlier. Houston residents thus seemed to respond to the threat of Rita the same way Santa Rosa residents did to Katrina—while Houston was not hit by Katrina, its residents saw the effects indirectly through the news and through the stories of the thousands of Katrina survivors who sought refuge in their city.

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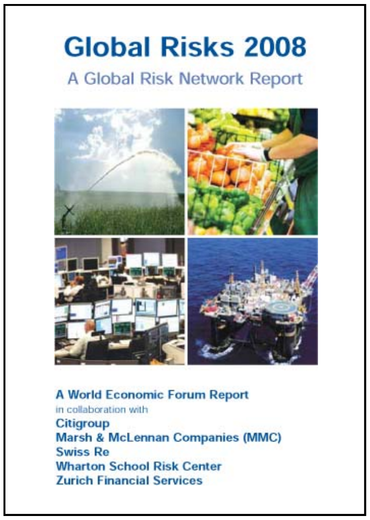
Risk Center Deepens its Involvement with the World Economic Forum

Global Risks Report 2008

The Wharton Risk Center has partnered with the **World Economic Forum** to present the ***Global Risks Report, 2008***.



Witold Henisz, Wharton, Associate Professor of Management, **Howard Kunreuther**, and **Erwann Michel-Kerjan**, provided research and content for the report, which was discussed by global business leaders and public policy decision makers at the World Economic Forum's Annual Meeting in Davos in January.

The Risk Center is the academic partner with the World Economic Forum (WEF) and several firms (**Citigroup**, **Marsh & McLennan, Swiss Re**, and **Zurich Financial Services**) on the Global Risks network, whose purpose is to develop strategies for mitigating and managing risks through the active engagement of all sectors of the international community. The project provides information on the global risks, focusing on interdependencies across risk.

Global Risks 2008 highlights the need for new thinking and concerted action on a number of issues. It also recommends a set of principles for risk management and examines how the financial sector might take on an increasingly important role in risk transfer in the future.

In addition to drawing attention to specific risks, the report recommends a set of principles for risk management and examines how the financial sector can take an increasingly important role in risk transfer in the future.

Global Risks 2008 has received positive attention from a variety of news outlets, including *Business Report*, *The Financial Times*, *AP Forbes*, *CNN*, *The Times* and *Reuters*.

Howard Kunreuther and **Erwann Michel-Kerjan** represented the Risk Center at the **Annual Meeting of the World Economic Forum**.

Kunreuther served on two panel discussions: *The Threat of Biotechnology*, and *Update 2008: Assessing Global Risks* (with Wharton Risk Center Fellow and Jeane J. Kirkpatrick Chair in National Security, Council on Foreign Relations **Stephen Flynn**). Michel-Kerjan was an invited discussion leader on the topic of *2008 World Economic Brainstorming: Addressing Uncertainty*.

University of Pennsylvania President **Amy Gutmann** and Wharton professor **Mike Useem** also attended the four-day event.

WEF-Wharton Global Agenda Council

Wharton Risk Center co-director **Howard Kunreuther** and **Mike Useem**, Director, Wharton Center for Leadership and Change Management, were appointed in March to serve as co-chairs of a WEF Global Agenda Council on ***"Leadership and Innovation for Reducing Risks from Natural Disasters."***

Approximately 20 world leaders from the public and private sectors will join them in this initiative. **Erwann Michel-Kerjan** also serves on this council.

The initiative will develop a set of guiding principles that will help provide a framework for action to reduce global risks from natural disasters and from other large-scale risks, such as terrorism, financial crises and governance failures.

It will also suggest a set of innovative risk management strategies for reducing risks from natural disasters which can be utilized in other contexts. Among the issues to be addressed are emergency management/disaster relief efforts, ecosystem management, implications for business, and climate change as a cause of natural disasters.

Findings will be presented at the inaugural **Summit on the Global Agenda** in **Dubai** in November 2008. The event will be hosted by the World Economic Forum in partnership with The Executive Office of Dubai.

Interdependent Security

The Wharton Risk Center is taking an active role to further Interdependent Security (IDS) research on two continents, hosting an interactive workshop, "*Future Research on Interdependent Security*" in January 2008.

Organized by **Dave Krantz** (Columbia University), **Howard Kunreuther**, and Risk Center Fellow **Christian Schade** (Humboldt University, Berlin) and bringing together 20 researchers – faculty and students from Penn, Humboldt, and Columbia – the workshop was an important step in facilitating coordination among researchers at the three institutions.

The purpose of the gathering was to discuss ways to enhance overall research goals, data-collection methods, and data-analytic methods. Conference participants focused on refining field procedures and techniques in order to better achieve the objectives of the IDS experiments, which are a greater understanding of how individual and social goals impact behavior, and how to induce cooperation.

The conference was funded by an NSF CRED grant to Columbia University, an NSF grant to Penn for research on "*Network Structure, Behavioral Considerations and Risk Management in Interdependent Security Games*," undertaken by Kunreuther with Risk Center Fellow and Professor of Computer and Information Science, **Michael Kearns,** and a grant from the Volkswagen Foundation to Humboldt University.

Eric Bradlow, Risk Center Fellow and K.P. Chao Professor of Marketing, Statistics and Education, and **Howard Kunreuther** have developed a new Alfred P. West, Jr. Learning Lab project on **Stochastic Prisoners' Dilemmas** that will be utilized for research purposes and in the classroom at Penn in 2009. The project is the first one undertaken by the Learning Lab to be used for both research and teaching, and will be a model for future projects. The software will be available for use at other universities both in the U.S. and abroad. For information, contact Eric Bradlow at ebradlow@wharton.upenn.edu or Howard Kunreuther at Kunreuther@wharton.upenn.edu.

Food Safety Study Update

The Risk Center is working in collaboration with **Economic Research Services (ERS) of the U.S. Department of Agriculture (USDA)** to study the effectiveness of third party oversight mechanisms with regard to USDA food safety regulations, including the role of third party mechanisms in motivating covered facilities to adopt food safety practices that go beyond USDA minimum requirements. The study is also examining the use of third party mechanisms on financial accounting, low-probability/high-consequence process accidents and boiler safety, in order to develop best practices pertinent to the USDA's food safety responsibilities.

The project, which had been under the direction of Risk Center Fellow **Peter Schmeidler** *(please see page 18)* is being completed by **Irv Rosenthal**.

– For more information, contact Irv Rosenthal at rosentha@wharton.upenn.edu

New Project to Develop Oil Refinery Case-Study

In April 2008, the Wharton Risk Management Center was chosen by the **National Safety Council** to study the success of the **Bahrain Petroleum Company (BAPCO)** in integrating Business Excellence and exemplary Safety, Health, and Environmental Management. The project, which is estimated to take one year to complete, will analyze BAPCO's approaches using the theoretical and applied research techniques developed at the University; and develop an exemplary "case study" to be used in teaching and training on the integration of SH&E practices into business operations.

Warren Seider of Chemical Engineering at Penn, and the Risk Center's **Ulku Oktem** and **Irv Rosenthal** constitute the faculty team responsible for successful execution of the project.

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Climate Change

The Risk Center's interest in climate change focuses on the interaction between uncertainty and insurability in the context of some of the risks associated with climate change. Of particular interest is the impact of development in hazard-prone areas, and of global warming on the potential for catastrophic losses in the future. The Risk Center is involved in several initiatives concerning climate change.

- The Risk Center and **Carnegie Mellon University** are continuing work on their joint research project on climate change and insurance which looks at hurricane risk in the northeast region of the United States. The CMU team is led by **Iris Grossman**, and **Granger Morgan**. The project is supported through a grant from NSF.

- The Risk Center is partnering with the **University of Maryland** and **Resources for the Future** on issues of climate change and insurance. **Howard Kunreuther, Erwann Michel-Kerjan,** and **Richard Thomas, Senior Vice President of AIG**, (a sponsor of the *Wharton Extreme Events Project*) are members of the steering committee of the Climate Extremes and Insurance workshop being organized for Fall of 2008 by UMD and Wharton.

- **Howard Kunreuther, Bob Meyer, Erwann Michel-Kerjan,** and **Harvey Ryland** represented the Risk Center at **Florida State University's** Catastrophic Storm Risk Management Center, which is bringing policy recommendations to Florida state legislators.

Visiting Scholars at the Risk Center

The Risk Center has been pleased to host two Visiting Scholars.

Dr. Paul Raschky of the University of Innsbruck is analyzing the political economy of risk-transfer mechanisms against catastrophic risks. *January-August, 2008.*

Dr. Laure Cabantous of the University of Nottingham is conducting field research on the effects of ambiguity of risk on insurance premiums. *June-August, 2007.*

Risk Regulation Seminar Series Continues

The Risk Regulation Seminar series, coordinated by Risk Center Fellow **Cary Coglianese**, Edward B. Shils Professor of Law, and Director, Penn Program on Regulation, provides a forum where University of Pennsylvania faculty, students, and interested individuals, can interact with the nation's leading scholars and policymakers on issues related to catastrophic risks. Information on upcoming programs can be found at https://www.law.upenn.edu/academics/institutes/regulation/seminars.html. The seminars are free and open to the public.

The Spring 2008 series included talks by **David Kelly,** Economics Department Chair, University of Miami, on "Hurricane Risk Perceptions: A Bayesian Approach," and **Detlof von Winterfeldt,** Director, Homeland Security Center for Risk and Economic Analysis of Terrorism Events (CREATE) on "Decision Analysis for Homeland Security."

The Risk Regulation Seminar series is jointly sponsored by the Penn Program on Regulation, the Program on Law, the Environment and the Economy, the Wharton Risk Management and Decision Processes Center, the Institute for Global Environmental Leadership, and the Fels Institute of Government. Support from the Office of the Provost is gratefully acknowledged.

Erwann Michel-Kerjan Elected Chairman of OECD Advisory Board

In March 2008, **Erwann Michel-Kerjan** was elected as the Chairman of the OECD's *High Level Advisory Board on Financing of Large-Scale Catastrophes*. **Paul Kleindorfer** and **Howard Kunreuther** also serve as members of this Board, which was established by the Secretary-General of the Organization for Economic Cooperation and Development (OECD), **Angel Gurria.**

The Board plays a leading role in identifying and discussing the major policy issues related to the financial management of large-scale catastrophes and makes relevant recommendations to top decision makers of its member countries and to non-OECD countries as well. The OECD is comprised of the world's thirty richest countries.

Risk Center Appoints New Fellows

Stephen Flynn

Jeane J. Kirkpatrick Senior Fellow for National Security Studies, Council on Foreign Relations

Stephen E. Flynn is the author of the critically acclaimed *The Edge of Disaster: Rebuilding a Resilient Nation* (Random House, 2007), and *America the Vulnerable* (HarperCollins, 2004). A former adviser on homeland security for the U.S. Commission on National Security and a retired Coast Guard officer, Dr. Flynn researches and writes on issues related to homeland security.

At the Council on Foreign Relations, Dr. Flynn directs an ongoing private sector working group on homeland security. He was the Director and principal author for the task force report America: *Still Unprepared—Still in Danger* (2002).

Dr. Flynn has served as the principal advisor to the bipartisan Congressional Port Security Caucus and as the lead consultant on the homeland security issue to the U.S. Commission on National Security (Hart-Rudman Commission). He received the M.A.L.D. and Ph.D. degrees in International Politics from the Fletcher School of Law and Diplomacy, Tufts University in 1990 and 1991.

Michael Haselhuhn

Post-Doctoral Fellow and Lecturer, Department of Operations and Information Management

Michael P. Haselhuhn received his Ph.D. and M.S. in Business Administration from the University of California, Berkeley. His primary teaching and research interests are in the areas of negotiation, motivation, and decision making. His research examines the interplay of cognition, motivation and emotion, and how they jointly affect group and individual judgment and decision making.

Dr. Haselhuhn's current research focuses on beliefs regarding the fixedness of negotiation skill (i.e., believing in the "born negotiator" vs. the belief that anyone can become a better negotiator through hard work), and how these beliefs affect negotiation behavior and performance. In other projects, Dr. Haselhuhn examines how individual differences in anticipated affect influence bargaining behavior and cooperation, and how the decision making styles of venture capital partnerships determine firm investment and performance.

His research has appeared in *Cognitive Brain Research* and *Journal of Personality and Social Psychology,* among others.

Michael Kearns

Professor of Computer and Information Science, National Center Professor of Resource Management and Technology

Michael Kearns joined the Penn faculty in Computer and Information Science in 2002. He is a Fellow of the American Association for Artificial Intelligence (AAAI), and has served on the editorial boards of the *Journal of the ACM, SIAM Journal on Computing, Mathematics of Operations Research, Machine Learning*, and many other journals. He is co-author with U.V. Vazirani of *An Introduction to Computational Learning Theory*, published by MIT Press in 1994.

His main research interests lie in artificial intelligence, machine learning, algorithmic game theory, and theoretical computer science. He has been particularly active in research at the intersection of computer science, economics, and game theory, as well as in topics in computational finance.

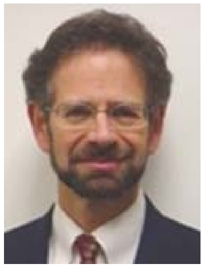
Dr. Kearns received his Ph.D. in Computer Science from Harvard University in 1989. Following postdoctoral fellowships at MIT and the University of California at Berkeley, he spent a decade in basic research at Bell Laboratories and AT&T Laboratories, where he headed the Artificial Intelligence and Machine Learning research department.

***The Risk Center is pleased to have the involvement of thirty-one Research Fellows and Visiting Scholars. More profiles can be found in the Spring 2007 edition of* Risk Management Review *at* http://opim.wharton.upenn.edu/risk/review/Spring2007.pdf.**

***The complete faculty roster is available at* http://opim.wharton.upenn.edu/risk/.**

Robert Lowe

Director, Center for Policy and Research in Emergency Medicine, Oregon Health & Science University (OHSU)



Robert A. Lowe, MD, MPH, is an Associate Professor in the Department of Emergency Medicine, the Department of Public Health and Preventive Medicine, and the Department of Medical Informatics and Outcomes Research at Oregon Health & Science University (OHSU). He is Director of the Center for Policy and Research in Emergency Medicine at OHSU.

Before joining OHSU, he served on the faculty of the University of Pennsylvania Department of Emergency Medicine and Department of Epidemiology and Biostatistics from 1993 through 2001.

Dr. Lowe has performed extensive health services and epidemiologic research with a focus on appropriate use of the emergency department and access to medical care for vulnerable populations. His work has been published in *The New England Journal of Medicine*, *The American Journal of Emergency Medicine, Risk Analysis* and the *Journal of Epidemiology and Community Health,* among others.

Scott Rick

Post-Doctoral Fellow and Lecturer, Department of Operations and Information Management

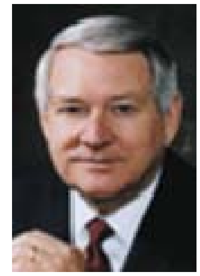
Scott Rick received his PhD in 2007 from Carnegie Mellon University, where he was funded by a Graduate Research Fellowship from the National Science Foundation.

Dr. Rick's research applies insights from neuroscience, social psychology, and personality psychology to the study of consumer behavior. Specifically, his research focuses on the emotions people experience in response to the prospect of spending money, and the influence of those emotions on decision making and on the extent to which people enjoy what they consume.

Dr. Rick has published articles in leading marketing, psychology, neuroscience, and economics journals, including the *Journal of Consumer Research*, the *Annual Review of Psychology*, *Neuron*, and *Experimental Economics*. He is on the editorial board of the *Journal of Neuroscience, Psychology, and Economics*, a new multidisciplinary journal.

Harvey Ryland

Former President and CEO of the Institute for Business & Home Safety (IBHS)



Mr. Ryland is the former CEO of IBHS, a national not-for-profit corporation dedicated to reducing injuries, deaths, property damage, economic losses and human suffering caused by natural disasters and structural events.

Prior to joining IBHS, Mr. Ryland was nominated by President Clinton, and confirmed by the U.S. Senate as Deputy Director of the Federal Emergency Management Agency (FEMA). While there, he worked closely with James Lee Witt, then the director of FEMA, to develop a new strategy for emergency management in the United States, emphasizing loss reduction through property protection.

Previously, Mr. Ryland was Executive Director of the Central United States Earthquake Consortium, the project engineer for the development of the Incident Command System, the Uniform Fire Incident Reporting System, the Community Fire Protection Master Planning manuals, and numerous fire, law enforcement, and emergency management communications-dispatch systems.

In order to meet a growing interest in research on catastrophe risk management and decision making, the Risk Center continues to appoint new Research Fellows, typically experts from academia, or former practitioners from industry and government. For information on becoming a Risk Center Fellow, please contact the Risk Center.

Russell Ackoff Doctoral Student Fellowships Announced

The Center is pleased to announce the recipients of the **Wharton Risk Center Russell Ackoff Doctoral Student Fellowships** for 2008.

The Ackoff Fellowship Fund enables University of Pennsylvania PhD students interested in decision processes and choice under risk and uncertainty to pursue research in these areas. The fellowships take the form of research awards in the $1,000-$3,000 range to support data collection, travel, and other research-related expenses.

The Fund awarded 25 fellowships in 2008. Recipients represent various departments within Wharton as well as other departments at Penn. In January, the Ackoff Fellows reported on their research to students and faculty interested in decision process and risk management.

The 2008 Ackoff Fellowships were awarded to:

RECIPIENT	*DEPARTMENT*	*PROPOSAL TITLE*
Nitin Bakshi	OPIM	Predicting Business Interruption Losses from Natural Disasters: Lessons from Hurricane Katrina
Rajesh Bhargave	Marketing	The Role of Resolution of Emotional Goals in Memory for Discrete Emotions
Amit Bhattacharjee	Marketing	Research on Human Decision Processes and Risk Management
Jeonghye Choi	Marketing	Are Consumers Independent or Interdependent? Firm-Driven Advertising versus Consumer-Initiated Word-of-Mouth
Felipe Csaszar	Management	Implications of Organization Design on Industry Dynamics
Brett Danaher	Business and Public Policy	Does Level of Risk Effect Individual Computer Security Decisions?
Xiaoyan Deng	Marketing	Associative and Rule-Based Processing of Product Location on Package Facade
Pnina Feldman	OPIM	Getting to NO: Theory and Evidence of Instrumental Negotiations
Stephanie Finnel	Marketing	Human Decision Processes and Risk Management
Daniel Fleder	OPIM	Mechanism for Information Sharing: Recommender Systems and their Effects on Diversity
Katherine Glac	Legal Studies & Business Ethics	Explaining Socially Responsible Investing: Toward a Unifying Framework of the Investment Decision Process
Yanliu Huang	Marketing	Trade-offs in the Dark: Exemplar-Based Learning and Extrapolated Preference Functions

The Fellowships, which are provided to the Wharton School from funding by the Anheuser-Busch Charitable Trust, are named in honor of **Dr. Russell Ackoff**, Professor Emeritus of Management Science. Professor Ackoff is a well-known and distinguished member of the University of Pennsylvania faculty, whose work has been dedicated to furthering our understanding of human behavior in organizations.

Dr. Russell Ackoff

Potential initiatives to receive funding include Insurability and Risk Management, Managing Environmental, Health and Safety Risks, and Decision Processes.

More information can be found at http://opim.wharton.upenn.edu/risk/ackoff.html.

RECIPIENT	*DEPARTMENT*	*PROPOSAL TITLE*
Shawnika Hull	Annenberg School of Communication	Selfish or Selfless? Self-interested Versus Benevolent Framed Messages in HIV-Antibody Test Promotion
Adam Isen	Business and Public Policy	Using Special Events to Estimate the Effect of Police on Crime in the Short Run
Srividya Jandhyala	Management	De Jue & De Facto Protection and Impact on MNC Location Choices
Kinshuk Jerath	OPIM	Customer-Base Analysis Using Repeated Cross-Sectional Summary (RCSS) Data
Eric Keuffel	Health Care Systems	Pharmaceutical R&D Response to Shifts in Direct-to-Consumer Advertising Policy
Sang-Hyun Kim	OPIM	Incentive Contracting to Manage Low-Probability, High-Consequence Events
Ka Lok Lee	Marketing	Know Your Patients: A Model for Medication Adherence Behavior
Shimul Melwani	Management	Sticks and Stones Will Break My Bones and Words Will Hurt Me: Effects of Contempt in the Workplace
Ashwin Patel	Health Care Systems	Who Do Patients Listen To? The Case of Report Cards and HMO Advertising
Nicole Ruedy	OPIM	Taking the High Road: Self-Concept Maintenance and Ethical Decision-Making
Neela Saldanha	Marketing	Mixed Indulgence: How Pleasure and Sin Interact in Perceptions and Choices of Mixed Indulgence
Monica Stallings	Management	Gender Differences in Informal Network Composition and Usage
Nicole Verrochi	Marketing	Cross-Race Emotional Contagion and Helping Behaviors

WHARTON RISK CENTER *IN THE MEDIA*

***Risk & Insurance Magazine,* 6/1/08 –** The **Wharton Risk Center's** study on "Managing Large-Scale Risks in a New Era of Catastrophes" was the subject of an article "Rethinking Strategies to Solving Risks in the MegaCat Age."

***Newsweek,* 5/9/08 – Erwann Michel-Kerjan**, Managing Director, Risk Management and Decision Processes Center, was quoted about food shortages in an article "The Biggest Crisis of All."

***BizRadio,* Houston TX, 4/11/08 – Erwann Michel-Kerjan** was interviewed on-air in connection with the Risk Center's study on "Managing Large-Scale Risks in a New Era of Catastrophes."

***Brokers Weekly,* New York, 4/2/08 – Howard Kunreuther**, Co-Director, Risk Management and Decision Processes Center, and Cecilia Yen Koo Professor of Decision Sciences and Business and Public Policy, was interviewed on-air in connection with the Risk Center's study on "Managing Large-Scale Risks in a New Era of Catastrophes."

***Boston Globe*, 3/28/08 – Stephen Flynn,** Risk Center Research Fellow and Jeane J. Kirkpatrick Senior Fellow for National Security Studies, Council on Foreign Relations, co-authored an op-ed, "Misguided missile defense," marking the 25th anniversary of President Reagan's 'Star Wars' speech.

***Financial Times.com*, 3/15/08 –** Research by **Deborah Small**, Risk Center Research Fellow and Assistant Professor of Marketing and Psychology, was cited in an article about the relationship between empathy and philanthropy.

***Federal Times*, 3/30/08 – Cary Coglianese**, Risk Center Research Fellow and Edward B. Shils Professor of Law and Professor of Political Science; Director, Penn Program on Regulation, was quoted in an article about the FDA's capacity to inspect products from overseas facilities.

***New York Times,* 4/17/08*; Science Daily*, 3/17/08; *WebMD*, 3/18/08; *The Globe and Mail*, 3/19/08; *The Washington Times*, 3/20/08; *CBC News*, 3/24/08; *Newsweek*, 3/24/08 –** Media coverage of a study co-authored by Risk Center Research Fellow **Scott Rick**, exploring the different thought processes of "tightwads" and "spendthrifts."

***The Economist*, 2/18/08** – **Cary Coglianese** is quoted in an article about the effect of e-technology on the democratic process.

***Forbes*, 2/11/08** – **Howard Kunreuther**, authored an op-ed on how long-term insurance can help homeowners in hurricane zones save money and protect themselves at the same time.

***The New York Times*, 2/10/08** published an article about the study co-authored by **Eric Bradlow**, Risk Center Research Fellow and K.P. Chao Professor of Marketing, Statistics, and Education, "A Statistical Look at Roger Clemens' Career."

***ESPN.com*, 1/28/08 – Patti Williams**, Risk Center Research Fellow and Associate Professor of Marketing is quoted in an article on advertisers' Super Bowl spending.

***The New York Times*, 1/27/08** – **Robert Meyer**, Co-Director, Risk Management and Decision Processes Center, and Gayfryd Steinberg Professor of Marketing was quoted in a story about high income consumers and the relationship between their cost-cutting decisions and emotional health.

The Financial Times, AP Forbes, Business Report, The Times, Reuters, CNN, Bloomberg, CNBC, Al Jazeera,* 1/8/08 –** Media coverage of the World Economic Forum's *Global Risks Report 2008,** a project involving the **Wharton Risk Center,** along with Citigroup, Marsh & McLennan, Swiss Re, and Zurich Financial Services.

***The Baltimore Sun*, 12/26/07** – **Mark Pauly**, Risk Center Research Fellow and Bendheim Professor of Health Care Systems, Business and Public Policy, Insurance and Risk Management, and Economics, was quoted in an article about health care coverage proposals by the presidential candidates.

***The Philadelphia Inquirer*, 9/23/07** – **Mark Pauly** was quoted in an article about pay-for-performance, an approach taking root in area hospitals to tie payment to the quality of care that patients receive.

***NPR*, 9/18/07** – **Mark Pauly** was interviewed in a story about proposed changes in health care.

***The New York Times,* 8/25/07** – **Howard Kunreuther** authored an op-ed about how to finance the costs of natural disasters and encourage individuals in hazard-prone areas to undertake mitigation measures.

***The Economist,* 8/23/07** – **Mark Pauly** was quoted in an article about genetic testing, its promise for healthcare, and the challenges it poses to the insurance industry.

***Newsweek*, 8/17/07,** and ***CBC*, 8/09/07 – Patti Williams** was interviewed on her research into why impulsive shoppers continue to make spur-of-the moment purchases despite experiencing guilt and regret.

***Economist Intelligence Unit*, 8/15/07** – **Erwann Michel-Kerjan** was interviewed regarding his views on why the private sector must take a leadership role in assuring a safer environment, and how the world's increasing interconnectedness breeds risk.

***NBC Nightly News*, 8/8/07** – Media coverage of a study co-authored by **Scott Rick**, exploring the different thought processes of "tightwads" and "spendthrifts."

***Inside Green Business Weekly Report*, 5/9/07** – A book review of *Leveraging the Private Sector: Management-Based Strategies for Improving Environmental Performance* cited the section authored by **Paul R. Kleindorfer**, Risk Center Research Fellow and Anheuser-Busch Professor Emeritus of Management Science at Wharton.

***Times-Picayune* (New Orleans), 5/1/07** – **Howard Kunreuther** was quoted in an article regarding insurance risk in relation to premium rates.

In Memoriam
Peter J. Schmeidler

With deep sorrow, the Wharton Risk Management and Decision Processes Center marks the passing of Senior Research Fellow **Peter J. Schmeidler** on April 14, 2008 at age 69.

Peter joined the Wharton Risk Center in 2001, following forty years of service at Rohm and Haas. At Wharton, he led studies on the role of ISO 14001 in reducing and managing environmental risks, and on the role of third party inspections for improving food safety, and collaborated with Risk Center faculty on a variety of other projects. He served as the editor of this newsletter since 2002.

Peter earned his master's degree in Chemical Engineering from Columbia in 1961 and received an MBA from Rutgers in 1982. He had been an industrial consultant to the University of Pennsylvania's Chemical Engineering department's senior class design project since 1977.

He is greatly missed by his wife, Lois, four children, three grandchildren, and faculty and staff of the Risk Center

Our Research Sponsors and Corporate Associates are a vital part of the Wharton Risk Center's operations.

In addition to providing crucial support for the Center's operations, ***Corporate Associates*** participate in roundtable discussions and offer insight into the value, direction and timing of research projects. ***Research Sponsors*** provide funding for specific research initiatives of mutual interest and regularly interact with Risk Center directors, faculty and fellows to discuss updates on these initiatives. Associates and Sponsors attend our workshops and conferences at no cost. These meetings offer an opportunity to consult with experts and policy makers from research institutions, industry and government agencies from the U.S. and abroad.

Beginning in 2008, the Risk Center is inviting select organizations to become **Strategic Partners**. With a multi-year commitment, Strategic Partners will sit on the Center's newly reformed Advisory Committee, and play a key role in shaping the Center's future research agenda. Strategic partnership with the Risk Center will enable these companies to impact the future of their industry, as well as best practices, market innovations and future regulations. Strategic Partners will also benefit from greater visibility and customized relationships across Wharton through membership in the Wharton Partnership, Wharton's primary vehicle for fostering industry-academic collaboration.

We invite your involvement in the Center's leading research.

Corporate Associate, Research Sponsorship, and Strategic Partnership contributions to the Risk Management and Decision Processes Center at the Wharton School are tax-deductible.

We thank our Research Sponsors and Corporate Associates for their support and involvement.

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Or visit our website at **http://opim.wharton.upenn.edu/risk/sponsors.php**

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WHARTON RISK MANAGEMENT AND DECISION PROCESSES CENTER

Established in 1984, the mission of the Wharton Risk Management and Decision Processes Center has been to carry out a program of basic and applied research to promote effective corporate and public policies for low-probability events with potentially catastrophic consequences. The Risk Center has focused on natural and technological hazards through the integration of risk assessment and risk perception with risk management strategies. After 9/11, research activities have extended to include national security issues (e.g., terrorism risk insurance, protection of critical infrastructure).

Building on the disciplines of economics, finance, insurance, marketing, psychology and decision sciences, the Center's research program is oriented around descriptive and prescriptive analyses. Descriptive research focuses on how individuals and organizations interact and make decisions regarding the management of risk under existing institutional arrangements. Prescriptive analyses propose ways that individuals and organizations, both private and governmental, can make better decisions regarding risk. The Center supports and undertakes field and experimental studies of risk and uncertainty to better understand the linkage between descriptive and prescriptive approaches under various regulatory and market conditions. In the past two years, the Center has significantly increased its size so that it can undertake large-scale initiatives.

Providing expertise and a neutral environment for discussion, Risk Center research investigates the effectiveness of strategies such as incentive systems, risk communication, insurance and regulation in the context of extreme events. The Center is also concerned with training decision makers and promoting a dialogue among industry, government, interest groups and academics through its research and policy publications and through sponsored seminars, roundtables and forums. Our Newsletter and Project Snapshots provide updates of Center activities and publications.

Risk Center on the World Wide Web

Visit the Wharton Risk Management and Decision Processes Center on the World Wide Web at: **http://opim.wharton.upenn.edu/risk/**