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# ***Lessons from Risk Perception in Other Contexts***

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I will draw inferences from lessons that are associated not with biotechnology, but with how consumers deal with risks in other contexts. I will discuss insights gained from cognitive psychology and research on consumer attitudes. And I will also touch on economics, drawing principally on my own work with colleagues. We have addressed issues associated with how one can use environmental and health risks, both voluntary and involuntary, and the rules of risk communication, to inform the current discussion of GMOs and biotechnology.

Will consumer attitudes, in the United States and elsewhere, substantially retard biotechnological innovations that might ultimately affect the food supply? If that question is meaningful, then we must ask a subsequent one: does the accumulated experience and research in risk communication, and what we know about how to present risk information to consumers, suggest that there are ways to influence the answer? That is, can we, through policy measures, undertaken both in the public and in the private sectors, change the responses that we would otherwise expect if risk information were not presented? And then, ultimately: do we know enough now to take immediate action?

Food-production decisions must be taken in the context that food is a world-wide commodity. Consumers are heterogeneous. They have diverse information bases, and culture is a very important contextual issue in Europe. Price and quality attributes, as well as information, are important for decision making. We have to provide value and change the perceptions of value either directly or indirectly through price, in order to see a consumer response. It is important to understand—not just in the area of GM and biotechnology, but in areas such as the environment—that the production technology used to deliver a food, or any

other product, often becomes a part of the product-attribute set. Consumers have preferences, and understanding them helps determine how information associated with that product should be delivered.

In this country, multiple domestic agencies affect food policy and perceived safety. In the world community we know from sanitary and phytosanitary standards that trading rules are affected by perceptions of risk and efforts to maintain or harmonize the information on, and the treatment of, risk. Also, it is important to understand that the science base of most reporting—not the *New York Times*, but the local and regional newspapers—is extremely limited. Consequently, the ability to explain technical information is also constrained. In delivering a message, it is necessary to recognize that media are the consumers' primary source of information about a whole host of issues.

## **EXPERIMENTS IN RISK PERCEPTION**

I will describe three social-science experiments (not surveys) that provide evidence that consumers' subjective perceptions of risk should be taken seriously. These are matters that are not variable day to day, that do influence behavior, and that can be influenced. Information and its source clearly do modify risk perceptions, and I think we understand enough to provide specific guidance on how to structure that information. Clearly the process is context- and problem-specific. So one needs to understand how consumers see the problem in order to adapt what we know about what is important about the source of risk. The cultural context affects how one delivers a message and provides information.

You cannot consider risk perception in psychology without coming across the names of Paul Slovic, Daniel Kahneman, Amos Tversky, and Sarah Lichtenstein. Their central point is that risk has attributes. You cannot think of probabilities of events in isolation from whether the source of uncertainty is voluntary or involuntary, whether the process is perceived to be known or unknown, and whether the outcomes are dreaded. People do not necessarily behave like the calculating agents that economists and others imagine, but, where the issues are personal, the consumer is likely to behave rationally in acquiring and using information.

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In the area of economics, there has been a lot of research on the effects of labels, for example when the Food and Drug Administration (FDA) changed advertising rules on fiber and cancer. Economists examined the change—the

demands for cereals with fiber before and after—and attempted to infer the consequences of the label. Likewise, we can consider organic and non-organic produce side by side and ask about differences in demand. However, it is hard to go meaningfully backwards from these observations, which is why I am in favor of more social-science experiments.

Tom Hoban’s surveys in 1995 and 1997 in the United States, and in 1998 in Japan (see Table 1), demonstrated that when unprompted American and Japanese consumers were asked what they feel is the greatest threat to food safety, biotechnology was at the bottom of the list. When prompted, biotechnology remained near the bottom of the list.

**TABLE 1. RESEARCH ON CONSUMER ATTITUDES: “WHAT DO YOU FEEL IS THE GREATEST THREAT TO THE SAFETY OF THE FOODS YOU EAT?” (HOBAN, 1999)**

|                            | United States<br>1995, 1997<br>(%) | Japan<br>1998<br>(%) |
|----------------------------|------------------------------------|----------------------|
| <i>Unprompted</i>          |                                    |                      |
| Pesticide residues         | 16                                 | 45                   |
| Additives or preservatives | 2                                  | 34                   |
| Microbial contamination    | 69                                 | 7                    |
| Antibiotics or hormones    | 1                                  | 4                    |
| Irradiated foods           | 0                                  | 1                    |
| <b>Biotechnology</b>       | <b>0</b>                           | <b>1</b>             |
| <i>Prompted</i>            |                                    |                      |
| Pesticide residues         | 66                                 | 80                   |
| Additives or preservatives | 20                                 | 52                   |
| Microbial contamination    | 77                                 | 49                   |
| Antibiotics or hormones    | 42                                 | 62                   |
| Irradiated foods           | 29                                 | 56                   |
| <b>Biotechnology</b>       | <b>16</b>                          | <b>8</b>             |

Hoban adds an important qualifier—and this is the kind of information that comes from consumer-attitude research—we need to consider the fact that people answer these questions spontaneously, typically over the telephone. They have had little time to think about them, yet the responses may form the basis for policy decisions. Therefore, we should consider alternative sources of information in framing the policy debate.

Consumer attitudes alone are not enough. How about surveys and experiments? Economists are fond of surveys that offer stated-choice information, and are fond of trying to mimic natural scientists in conducting controlled

experiments in the laboratory that typically involve students who are offered different choices. And in another category called a simulated market, we sell real products in a control setting and have consumers actually buy them in this limited setting; of course, typically the consumer is told that it is an experiment, therefore, it is harder to accurately draw inferences.

I will describe three real-world, long-term, large-scale, social-science experiments. Two involve radon, which, as a naturally occurring gas associated with lung cancer, has an important attribute: it is an involuntary source of risk. In one of the two experiments, individuals were recruited to have their homes monitored for radon. The objective of our research team—including New York State Energy Research and Development Authority and the United States Environmental Protection Agency (EPA)—was to try to communicate effectively the risk message associated with radon to these homeowners as part of designing what ultimately became, in the mid-1990s, the EPA's *Citizens Guide to Radon*. It was a panel study involving four interviews of 2,300 households, and tracking their behavior over a period of four years, 1986 to 1989. We examined risk-perceptions, and looked for mitigating behavior.

The second study, undertaken by the same team, took place in Maryland, again in the late 1980s. Three thousand households were involved over a period of a year and a half to two years. The objective was to inform households that might not otherwise know anything about the risks of radon and induce them to take action by having their homes tested for it.

The third experiment was finished recently (with support from the Robert Wood Johnson Foundation). It involved approximately 12,600 households, in conjunction with a still-on-going survey—the Health and Retirement Survey—with a demographically matched sample. We examined a voluntary risk: cigarette smoking. Surely everyone knows that cigarettes are harmful. Why then do people of 51 to 61 years of age continue to smoke? What do they believe the consequences will be? What would be salient messages that would change smokers' beliefs?

From each of these experiments I will draw lessons relevant to biotechnology and GMOs.

## **INVOLUNTARY ENVIRONMENTAL RISKS — RADON**

The experimental design for the New York study involved six brochures in specifically designed categories. The categories varied the amount of quantitative information and the amount of specific guidance given to each household about the risk or exposure to radon.

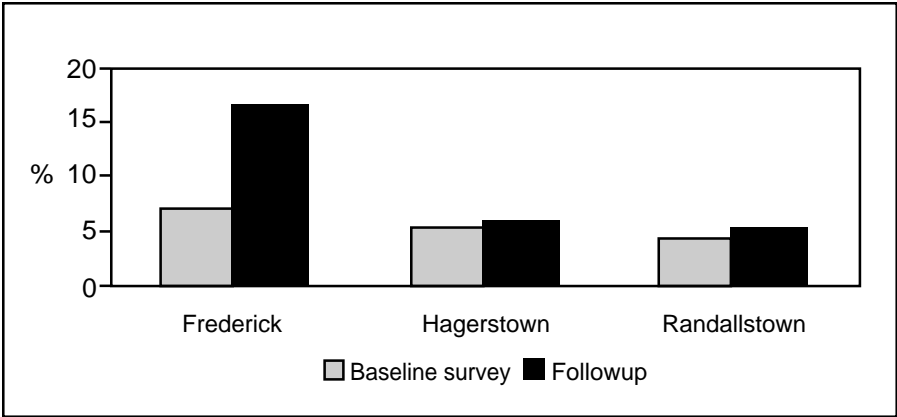
After four interviews and multiple years, we found clearly that an informational message that presented exceptionally clear guidance, that said, "Do 'X' and you will be safe," was the most effective message in communicating the risk. Also, we found that people subscribe to the notion that they can undo

damage they have done to themselves by inaction. Reversibility of the process was extraordinarily important to people's responses. Each brochure was randomly assigned to a different group just as for a field experiment. So, each member of the group during the course of the experiment received only one type of informational source from us.

About 10% more people took some action as a result of receiving the quantitative informational brochure in comparison to those who received a standard government fact sheet. In terms of radon level, an eight-fold increase would have been needed to have the same level of effectiveness as that information booklet.

The second study involved three sets of households in three communities in Maryland: Hagerstown, Frederick, and Randallstown. The experimental design was carefully constructed. Frederick and Hagerstown received different information campaigns, and Randallstown, the control, received nothing. Posters were put up around Frederick, and there was community involvement. We recruited the mayor and the town council to monitor their own homes; they were on television and radio, and were very much involved in the process. In Hagerstown, information was delivered with telephone bills to explain radon, and posters were displayed around the community, but nothing else was done.

The gray bars in Figure 1 show baseline-survey data: percentages of people who monitored their homes for radon, which was our outcome measure. The black bars show the results of the experiment. We saw a 10% increase in monitoring as a result of the intensive involvement in Frederick, and next to nothing in the other two communities. These data show that with close continuous involvement, contributions from community leaders, and a personalized message, positive results are possible.



**Figure 1. Fraction of people in baseline and follow-up surveys who had tested for radon.**

# VOLUNTARY HEALTH RISKS – SMOKING

How do smokers regard the risks from smoking? Advertisements by the American Lung Association and the American Cancer Association are frequent on radio and television, as well as in the print media, suggest that we interpret simple messages in a direct and narrow way. If a smoker quits the habit, then the adverse health effects will be reversed, eventually. Smokers use that message to guide their behavior incorrectly: “I will stop smoking when I am 73, get better in about 18 months, and then play tennis.” Unless they have lost a spouse or parents, or seen someone else with a smoking-related disease, they do not accept the message that there is a risk to them.

Personalization is very important. Every two years since 1992 the same individuals were interviewed for an hour. The question reported here is, “What are the chances that you will live to 75 or more, on a scale of zero to 100?” Because these individuals were followed every two years and complete health records were kept, it was possible to observe the effects of health shocks on their longevity perceptions. We considered all possible health outcomes between two interviews, and classified shocks as either smoking-related—lung cancer, other serious lung diseases, and heart disease—or general. In Table 2 a negative sign implies a revision of the expectation of living to 75 or more as a result either of a general health shock or of a smoking-related health shock. Current smokers did not react to anything but a smoking-related health shock. Those who had never smoked and former smokers reacted to both types of shock equivalently.

|                               | Current smoker     | Former smoker      | Never smoked       |
|-------------------------------|--------------------|--------------------|--------------------|
| Smoking-related health shocks | –0.1237<br>(–3.84) | –0.0692<br>(–3.18) | –0.1095<br>(–3.31) |
| General health shocks         | 0.0076<br>(0.27)   | –0.0665<br>(–3.69) | –0.0551<br>(–2.74) |

Sometimes you have to hit people over the head with a message. And that message should address what is at risk, not necessarily probabilities of the event at risk. In this context, the message should not be the probability of dying from smoking, it should address the mode of transition to death. You have to determine from the people specifically what concerns them. You must communicate with them in that context, and then work from there to develop a message. The bottom line is that perceptions are informative and they do affect behavior.

As for influencing the demand for cigarettes, we found that people do not passively accept information from experts. The information must be personal and tangible. Risk communication requires listening first.

## **SPECIFIC LESSONS**

Consumers generally want complete protection and not complex trade-offs. It is fruitless to tell them that they can do X, Y, and Z and reduce their marginal risk by a defined amount, although, as an economist, I wish it were otherwise. Unfortunately, they do not want to hear it. Honest, full disclosure is central to building trust. Trust can be very difficult to earn, and very quickly lost. Perceived irreversible choices—and the key issue is irreversibility—are central when concerns are serious.

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## **REFERENCE**

Hoban T (1999) Consumer acceptance of biotechnology in the United States and Japan. *Food Technology* 53 50–53.

**Q:** On one of the overheads you had a Japan/United States comparison on perceived risks associated with food. There was a tremendous difference. Microbial contamination was high in the US, and pesticides and other additives were important in Japan. What do you think the basis for those differences might be?

**A:** A considerable amount of research has been done by economists, psychologists, and sociologists on the role of culture in perception of what's safe. Sheila Jasanoff, a lawyer with a background in political science and sociology at the Kennedy School, suggests that it is important to understand the context associated with how risky activities are regulated in different countries, and how information is delivered as a starting point for understanding differences in perceptions. So it is not simply a question that Japanese and Europeans are different from Americans, it is the policy infrastructure that builds trust—that which delivers information, that which delivers process and product safety to consumers, that which monitors the sources of involuntary risk. That context builds up a set of prior expectations as to what comes from outside the market and inside the market. And that context is central to how they respond to different sources of risk.

Q: How do you go about defining a risk-communications strategy for perceived risk in the case of GMOs as opposed to real risk, for example, radon?

A: At the time we were doing this in the 1980s, there was very little public information on radon. The individuals involved in those studies, both in Maryland and New York, did not realize that they faced this risk. So there is a parallel. I don't mean that to be defensive. I am simply saying that in many situations, when risks are real, people will not know about them. The beginning point is listening and trying to understand from individuals what is important about the choices they made with respect to voluntary risks. This can be achieved via a series of activities: focus groups, cognitive interviews, and a whole series of other one-on-one interactions with consumers to identify a template of attributes that are important to the typical person. Then match that template with the attributes that are associated with the product or process that might be the source of a perceived risk. An economist will also tell you that you have to identify a set of choices that are consequential from a financial perspective to consumers and identify how they respond in those consequential choices to different information sets. That gives you the beginnings of a template for a risk-communication program. You have seen people take an action that means something to them with consequences in response to different kinds of information sets: you have an "if check," if you will, on the importance of the information process. It is hard to give you a blueprint for every single problem, because each one has a different attribute set to start with. What I have described is the process of developing a communication program.

Q: You mentioned that consumers prefer complete protection over trade-offs. Are you saying that they want to be assured of absolute safety?

A: I am not saying that they want to be assured of absolute safety. But they want a very clear message that says, if they do something there will be a response. Let's take a tangible example. In the case of radon, at the time we were presenting the information associated with mitigation, there was really no experience with the production technologies that were associated with removing radon from basements. So, we were, in effect, stating: if you ventilate your basement it will *probably* work, if you seal up the floor on the underside of the first floor, it might reduce radon. If you install a \$3,000 ventilator in your basement, we know it will work but we don't know by how much. Those sorts of messages are not very effective. If, on the other hand, you can say that if you reduce your consumption of cigarettes by X packs in the course of a typical month, you'll reduce your chances of walking around with an oxygen tank from five out of ten to two out of ten—that's a salient, direct message. And they prefer the latter to the former. It's not complete protection. They don't want uncertainty over the mechanism that is going to protect them. They want to know what will work.