

## CONSUMER PERCEPTION OF HEALTH RISKS IN FOOD

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During the 1970s and 80s, the food industry experienced episodes of sales losses from consumer reaction to controversies about health risks from certain chemicals and bacteria in food. As a result, the government, food industry and scientific and educational communities are seeking better ways of responding to consumer concerns about food safety. An understanding of how consumers perceive and judge health risks in food is central to these efforts. To help inform this understanding, this paper reviews the small but growing body of research on consumers' perceptions of health risks in food and their willingness to pay for risk reduction.

### The Nature of Risk Perception

There are two traditions of research on consumer risk perception. The psychometric paradigm (Slovic, et al.) has focused on understanding how people perceive health risks associated with different types of technologies (e.g., nuclear power) and how these perceptions vary given the different characteristics of each technology. The consumer behavior paradigm (Dunn, et al.; Hawes and Lumpkin) has sought an understanding of how product purchases are affected by consumers' perceptions of the financial, physical, performance, social or other risks associated with the purchase or use of a product.

In both sets of literature, risk is generally conceptualized as the *probability* of a *loss* of something of value to an individual in some *context*. The context may be either some exogenous change in the *environment* in which the individual dwells (e.g., the weather) or some *action* chosen by the individual (e.g., the purchase of a product). Thus, obtaining a valid description of people's risk perceptions with respect to some particular context involves accurately describing individuals' perceptions of the context, the probability of a loss in that context, and the nature of the loss. This is extremely difficult to do.

For example, to elicit consumers' perceptions of the probability that they will experience health problems from consuming food, the context in which exposure to the food hazard occurs and the nature of the health effect that results must be specified. Additionally, respondents must be given some kind of scale for indicating their perception of the pro-

bability of occurrence. The few studies that have attempted to do this use very general descriptions of the context, the nature of the health effect, and the notion of probability. Consequently, it is not always clear what is being measured and great care must be taken in interpreting the data.

### **Perceptions of Health Risks from Food**

Over the last decade the Food Marketing Institute (FMI) has conducted nationwide telephone surveys on food safety attitudes. One of the questions they ask is: "How confident are you that the food in your supermarket is safe?" Thus, the context is any food from supermarkets, and the nature of the food and its preparation is left unspecified. The nature of the health effect is, presumably, the presence or absence of any type of ill health. Respondents are given the opportunity to specify whether they are completely or mostly confident or whether they are somewhat or very doubtful. This is a rough indicator of perceived health risk.

FMI results show a surprising consistency of responses over the years. About 15 percent to 20 percent of respondents say they are completely confident, thus indicating they perceive no food risks. About two-thirds say they are mostly confident, indicating they perceive at least some small risks. About 15 percent say they are somewhat doubtful, and thus probably perceive somewhat more risks. Only 2 percent say they are very doubtful.

A telephone survey of a representative sample of Michigan households conducted for the Michigan Department of Agriculture (MDA) in March, 1990, obtained results similar to the FMI study (Atkin). After informing respondents that food safety meant "anything that affects the safety or wholesomeness of food products or creates health risk," the MDA study asked respondents how confident they were that the food in their store was safe. Thirty-seven percent of respondents said they were very confident, 49 percent were somewhat confident, 9 percent were somewhat doubtful, 3 percent were very doubtful, and 2 percent didn't know if the food was safe.

A similar question was asked in two nationwide telephone polls conducted by the Center for Produce Quality (CPQ) in January and March of 1989 (i.e., before and after Alar and at about the same time as the Chilean grape incident in March). CPQ asked respondents how confident they were that fruits and vegetables available to consumers are safe to eat. In January, 1989, 25 percent of respondents were very confident, 56 percent were somewhat confident, 14 percent were not too confident, and 4 percent were not at all confident. In March, 1989, 21 percent reported they were very confident, 49 percent were somewhat confident, 23 percent were not very confident, and 6 percent were not at all confident.

Special polls conducted by FMI in 1989 indicate that consumers revise their perceptions following a change in information about food

risks. Following significant media coverage of the controversy over Alar, a report by the National Resources Defense Council (NRDC) about pesticide residues in the diet of children, and the FDA announcement of recalls of grapes after the discovery of cyanide tampering in early 1989, FMI conducted four telephone polls during the months of April, June and August, 1989. During this period, they found that respondents saying they were very doubtful about food safety increased 4 to 5 percentage points and respondents saying they were somewhat doubtful increased about 10 percentage points. By January, 1990, six months after Alar had been withdrawn from the market by its manufacturer, the percentages had returned to previous levels.

Overall, these three studies indicate that most consumers perceive at least some risks in the food they buy at the grocery store, but only a minority (about 10% to 20%) apparently perceive some serious risks. However, analysis of differences among demographic groups done by FMI and CPQ do not suggest any clearly systematic differences by income, education, gender or geographic location.

### Perceptions of Specific Types of Food Risks

The food safety risk consumers most likely have in mind when they indicate their perception of overall food risks is indicated by a second question on the FMI and MDA surveys.

FMI asks respondents; "What, if anything, do you feel are the greatest threats to the safety of the food you eat?" Spoilage or germs, the most frequently given response to this open-ended question, was mentioned by 29 percent of respondents in 1990. The second most frequent response was "pesticides, residues, insecticides, or herbicides" (19%), followed by "improper packaging or canning" (16%), "chemicals" (16%), "tampering" (14%) and "unsanitary handling by supermarket employees" (11%). All of these responses were among the top six volunteered in 1989 as well, although the order and percentages were somewhat different. Less frequently mentioned threats to food safety in 1990 were preservatives (8%), additives (6%), environmental pollutants (4%), antibiotics (2%), and radiation (1%). Similar results were obtained in the 1989 survey as well.

The MDA survey in March, 1990, obtained similar results, too. That survey asked respondents: "What food safety issue concerns you the most?" followed by "What other food safety issue is a primary concern to you?" Freshness or spoilage was the most frequently mentioned issue (30%), followed by use of pesticides or chemicals (27%), packaging (15%), additives or preservatives (13%), tampering (11%), and cleanliness (6%), and shipping or handling (6%). All other categories were mentioned by less than 6 percent of respondents. Thirteen percent said they had no concerns.

The responses to this open-ended question suggest that no one food risk appears to be uppermost in the minds of all consumers. Rather, several different types of food risks are perceived to pose the greatest

threat. However, spoilage or germs and pesticide or chemical residues appear to be the biggest risks for a significant percentage of consumers.

A different picture of consumer perceptions about what source of food risks is the most serious emerges when the FMI and MDA surveys ask respondents if they believed particular "food items" or "factors" were a "serious health hazard, somewhat of a hazard, or not a hazard at all."

About 80 percent of FMI respondents in 1989 and 1990 reported they thought pesticide residues were a serious health hazard. About 60 percent of respondents rated "antibiotics and hormones in poultry and livestock" as a serious health hazard. Additives and preservatives were rated as a serious health hazard by 26 percent of respondents and as something of a health hazard by 62 percent. FMI has obtained roughly similar results going back to 1984.

Similar results were obtained in the MDA survey. Pesticide residues were rated as a serious hazard by 68 percent of respondents. Antibiotics and hormones in poultry and livestock were rated as a serious hazard by 53 percent. Additives and preservatives were rated as a serious health hazard by 23 percent of respondents and as something of a health hazard by 57 percent.

The MDA study also asked respondents to rate "natural toxins or bacteria" and "product tampering." Fifty percent of respondents rated natural toxins and bacteria as a serious hazard and 36 percent rated them as somewhat of a hazard. Product tampering was rated as a serious hazard by 71 percent of respondents.

Only a small percentage of respondents in either survey rated any substance presented to them as "not at all a health hazard." Only eleven percent or fewer of the respondents rated eight potential food contaminants as not being a health hazard (i.e., product tampering, pesticide residues, poor food handling, improper processing, antibiotics and hormones in poultry and/or livestock, natural toxins and bacteria, nitrites or nitrates, and irradiated food). Additives and preservatives were rated as not being a hazard by 9 percent of the FMI respondents and 18 percent of the MDA respondents. Artificial coloring was rated as not being a hazard by 24 percent of the FMI respondents and 36 percent of the MDA respondents.

The contrast in the responses between the open-ended and close-ended approaches to eliciting risk perception illustrates the importance of context. An essential part of the food safety context is how much *exposure* there is to the substance and how *toxic* or hazardous the substance is. Exposure depends on two factors; how much of the substance is in foods and how much those foods are consumed.

In the open-ended question, the respondent supplies the context, and, thus, makes his or her own assumptions about exposure and toxicity. In the close-ended question the respondent is asked to rate how toxic or hazardous the *substance* is, not the hazard posed by *current levels of the substance* in the food *the respondent eats*. Thus, even though

a respondent may believe that pesticide residues are not present in any significant amounts in food, he or she might rate them as a serious hazard *if they were*.

Unfortunately, there are few studies which have tried to get more specific estimates of consumers' risk perceptions within each of the major food safety policy areas of bacteria, animal drugs, pesticides, environmental contaminants and food additives. The two studies that have been done are both on pesticide residues.

In studying the impact of the Alar controversy on fresh apple demand, van Ravenswaay and Hoehn developed estimates of consumer perceptions of lifetime cancer death risks from Alar in fresh apples. A range of estimates of willingness to pay for risk reduction were taken from the literature (Fisher, et al.). Assuming these estimates were true, the level of risk perception that would explain the observed change in consumer expenditures on fresh apples due to Alar was calculated. For 1989, they estimated that, on average, consumers acted as if they believed the lifetime risks of cancer death from Alar in fresh apples were between 2 in 100,000 and 11 in 100,000. Surprisingly, these risk perceptions are very similar to EPA's 1985 estimate of risk from fresh apples of 1.7 in 100,000 and the NRDC 1989 estimate of 4 in 100,000.

In 1986, Hammitt conducted focus groups with 20 organic food buyers and 23 conventional food buyers to elicit their perceptions of the "risks of eventually dying from cancer or other disease caused by the pesticides and other residues and toxins" contained in the produce they would typically eat in one year. They were asked to rate the risks for conventionally grown fruits and vegetables and organically grown ones.

Large differences in risk perceptions were observed between the two groups of respondents. Most (61%) of the conventional food buyers rated the risks from eating conventional food as being less than 1 in a million and the remainder thought they were less than 5 in 100,000. In contrast only 1 of the organic food buyers thought the risks were less than 1 in a million and only a quarter thought risks were below 5 in a 100,000. One half of the organic food purchasers rated the risks as being between 1 in 1,000 and 3 in 1,000.

Surveys done by *The Packer* (Zind, p. 40), the MDA (Atkin), and Jolly, et al. suggest that less than 10 percent of consumers seek organically grown produce on a regular basis. If these organic food consumers are like the ones in Hammitt's study, they perceive very high risks from pesticide residues in food. Likewise, if Hammitt's findings apply to today's consumer, conventional food consumers may perceive risks to be lower than EPA's own worst case estimate of 6,000 extra cases of cancer per year, or 2 in every 100,000 people.

### Willingness to Pay for Food Safety

Surveys by MDA (Atkin); Ott and Maligaya; and Ott, et al. suggest that more than half of consumers are willing to pay more for pesticide

free food, but not much more than 5 percent to 10 percent. Unfortunately, none of these studies simultaneously account for the level of consumer risk perceptions. Thus, the reported willingness to pay for food safety improvements may be due to a perception that risks are very high or to a perception that the risks are very low, but still unacceptable.

The van Ravenswaay and Hoehn study of the impact of Alar on fresh apple demand found that consumers would have been willing to pay over 30 percent (or 21 cents) more for Alar-free fresh apples in 1989. Thus, additional annual per capita expenditures for fresh apples without Alar would have been \$2.35 more that year. Unfortunately, consumers' actual perceptions of the annual cancer death risks avoided from Alar were unknown. However, assuming that consumers believed the risks to be similar to what the NRDC reported them to be in 1989, the resulting estimate of \$4 (in 1983 dollars) for willingness to pay for a one in a million reduction in cancer death risk is very similar to estimates obtained in other studies. Those studies — which examine consumer response to occupational risks, seat belt use, and smoke detectors — estimate that people are willing to pay between \$1.6 and \$8.5 million (in 1986 dollars) to save a statistical life (Fisher, et al.). This implies that annual willingness to pay for a one in a million reduction in the annual risk of death would be between \$1.6 and \$8.5 in 1986 dollars, which is the same as \$1.44 and \$7.65 in 1983 dollars. This similarity in willingness-to-pay estimates suggests that consumers reacted to Alar much as they do to other risks.

Using a random telephone survey, Zellner estimated consumer willingness to pay for reductions in bacteria risks in chicken. He found that survey respondents were willing to pay about 12 cents a pound more for chicken that was described as eliminating a 2 in 100 risk of suffering nonfatal symptoms of food poisoning. Unfortunately, Zellner did not specify to respondents if this level of risk was daily, weekly, monthly or annually. Furthermore, since individual risk depends on individual exposure (i.e., on level of chicken consumption and methods of preparation), we cannot be certain that individuals believed that this risk level applied to *them*. However, if we assume that respondents treated the risk they were given as the true annual risk, and if we assume that those consumers purchased an average of 44.5 pounds of chicken each year (USDA, p. 497), a rough estimate of annual willingness to pay to reduce risks of food poisoning by 2 in 100 per year would be \$5.34. That would mean that average willingness to pay to avoid a case of (nonfatal) food poisoning during the current year would be \$267.

In a telephone survey of the willingness to purchase irradiated foods, Malone estimated consumer willingness to pay for 50 percent and 90 percent reductions in a "food borne disease such as salmonellosis" in beef, chicken, pork and fish. For 50 percent reductions, he found that consumers were willing to pay 20 cents more per pound for beef, 16 cents for chicken, 16 cents for pork, and 18 cents for fish. For 90 percent reductions, he found that consumers were willing to pay 22 cents more per pound for beef, 19 cents more for chicken, 19 cents more for

pork and 21 cents more for fish. However, consumer perceptions of risks from food borne illness were not assessed, so general estimates of willingness to pay for food borne disease cannot be calculated from these findings.

Both the Zellner and Malone studies found that consumers were willing to pay modest amounts for significant food safety improvements. They also found that consumers were sensitive to the method used to achieve the improvements. If consumers perceived risks from the use of chemicals or irradiation to achieve reductions in bacteria risks, they were not willing to pay more for the products.

### **Consumer Response to Changes in Food Risk Information**

The special surveys that FMI and CPQ conducted during 1989 indicate that consumers revise their risk perceptions when given new information about risks. At the same time, the willingness-to-pay studies suggest that consumers are willing to pay a modest amount for improvements in food safety. Thus, we would expect that consumers would curtail their purchases of a food if they learned it posed higher risks than they had previously believed.

The extent to which we would expect consumers to alter their purchases would not only depend on the extent of the risks perceived. It would also depend on the cost of risk avoidance. This cost, in turn, would depend on the availability of close substitutes for the food product and for how long a period the switch would be required. The greater the number of close substitutes, the lower the cost to the consumer of altering purchases. Thus, if one brand of a particular type of food were reported to have higher risks, it would be easy to switch to another brand. If one type of food within a large food category were involved, such as a particular fresh fruit, it would again be easy to switch. It would be much more costly to switch if many foods were involved over a long period of time.

There have been several incidents involving "food scares" in which dramatic sales losses have been observed. In cases involving particular brands of products, such as a particular brand of canned soup contaminated with botulism or particular brand of dairy product contaminated with salmonella or listeria, the product maker may be forced into bankruptcy. Even when risks are perceived to be small, it is still rational for a consumer to switch brands because the cost of doing so is extremely small.

In cases involving all brands of a particular food product, sales losses are not as steep but can be very dramatic. For example, Brown estimated that sales of cranberries fell by 26 percent in 1959 following an announcement prior to Thanksgiving that they were contaminated with the herbicide aminotriazole. Johnson estimated that sales of dessert, bread, and roll mixes fell between 4 percent and 6 percent in the early months of 1984 after the EPA announced that the widely used grain fumigant, EDB, was a carcinogen and should be banned. Smith,

et al. estimated that sales of milk dropped by 29 percent because of consumer reluctance to purchase milk following recalls of milk contaminated with the pesticide heptachlor. The study of Alar described above (van Ravenswaay and Hoehn) estimated that sales of fresh apples in the New York/Newark market fell by 30 percent due to the Alar controversy.

Results of a recent study of the likely impact of BST use on milk consumption (Preston, et al.) are consistent with the finding of the studies of food scares. In a mail survey of Virginia households, it was found that only 20 percent had heard of BST. After being given a description of BST and conclusions of scientists about its safety, respondents were asked if they thought that BST will make milk unsafe to drink. Only 19 percent thought that it would be unsafe, 44 percent thought it would be safe, and 37 percent didn't know. Consistent with this level of risk perception, the study found that most respondents (82%) would not change their purchases of milk if it were produced with BST and the price remained unchanged. However, 85 percent also believed that milk from BST-treated cows should be labeled. Clearly, this would give them option to switch if BST risks were found.

### Conclusions About Food Consumers' Perceptions of Risk

While most consumers perceive at least some food risks, most consumers think they are small. However, a sizeable percentage — roughly 10 percent to 20 percent — perceive large risks in food. No one food contaminant is perceived as being the most serious threat to food safety. Different types of contaminants are perceived as posing the greatest threat by different consumers. However, a significant percentage of consumers view spoilage or germs and pesticide or chemical residues as the most serious threats.

There is little data on consumer perception of the current level of risk posed by the particular food contaminants that regulatory programs have traditionally focused on (i.e., bacteria, environmental contaminants, pesticide residues, animal drug residues, and food additives). Unfortunately, most surveys have asked consumers to rate how hazardous a particular *contaminant* is rather than how likely it is that the contaminant is at *hazardous levels* in the food supply. This survey approach has left many observers with the possibly erroneous impression that consumers see huge risks from pesticide residues. What the surveys more likely tell us is that virtually all food contaminants are perceived as *potential* risks to at least some degree by the majority of consumers. Thus, if there were reports in the press of problems concerning any of these items, it is likely that consumers would pay attention.

The data on perceptions of pesticide residues, while still limited, are more detailed than for other food contaminants. They suggest that most consumers perceive the risks from pesticide residues to be fairly low, but consumers who currently purchase organic foods perceive very large



risks from pesticide residues. This may be as much as 10 percent of consumers.

We know very little about why these different perceptions of food risks occur. The marketing literature suggests the individuals' perceptions of risks may vary because of differences in situational or individual characteristics (Blaylock). Situational characteristics could include differences in access to information sources or familiarity with decisions involving food risks and diet. Individuals vary in terms of the types and amounts of foods they consume, where they obtain their food and how that food is prepared. They also vary in terms of personality traits (e.g., risk aversion) and cognitive style. Research on these possible factors affecting perceptions of risks in food does not presently exist.

The data on perceptions of food risks indicate that consumers adjust their perceptions of risks in the face of new information about risks. Given that consumers also perceive most food contaminants as being potentially very hazardous, we should expect that many consumers will pay attention when new risks involving these substances are reported. Likewise, we can also expect that the news media will continue to express keen interest in the new health risk data being generated as old and new technologies for controlling plant and animal growth, pests and diseases are scrutinized by regulators.

Willingness-to-pay studies suggest that consumers are willing to pay modest amounts to reduce currently perceived food risks. It is difficult to judge why consumers are willing to pay the amounts observed because we know little about what consumers perceive the risks to be, and, thus, what it is they are paying for. There is some evidence that consumer willingness to pay for food risk reduction is similar to their willingness to pay for reductions in risks from other hazards. However, the current literature on willingness to pay focuses on mortality risks. Many of the risks posed by food contaminants are nonfatal, so much more research is needed.

It is important to understand that the magnitude of consumer reaction to past food scares (e.g., Alar and EDB) reflects both consumer risk perceptions and the cost of risk avoidance. In most of these cases, the consumer cost of risk avoidance was relatively low because close substitutes to the food perceived to contain new risks almost always existed. Thus, these cases do not necessarily imply that consumers thought the food risks involved were extremely high.

Another lesson to be learned from these cases is that they do not necessarily imply that an increased demand for food safety has suddenly materialized. What they do illustrate is that consumers are willing to incur modest costs in order to avoid small food risks. Thus, future discoveries of new health risks involving particular food products can be expected to be very costly to the food industry and efforts to avoid them are likely to be a good investment.

Knowledge of how and why consumers perceive risks is important in evaluating how well our educational programs are working and for

understanding consumers' policy preferences. If consumers perceive risks to be larger than they actually are, then they must believe that government programs are not working in their interest. If consumers perceive risks to be smaller than they actually are, then they must not be taking prudent actions to reduce those risks. We cannot know which is the case and for whom unless we do the research needed to understand perceptions of food risks.

Consumers could perceive risks accurately, but still believe that government programs are not working in their interest. This would occur if consumers were willing to pay the additional cost required to reduce risks even further than is now being done. In other words, they may believe the current level of risk in some cases is unacceptable.

Estimates of willingness to pay for risk reduction are useful because they help guide judgments on whether consumers would be willing to pay the cost of improved public safety programs or new food products. They are also useful for predicting how much consumers might reduce their purchases of foods if they learn or fear that risks have increased. More research is needed on both risk perception and willingness to pay for risk reduction before we can answer the question of what food safety improvements consumers really want.

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