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THE POLITICAL ECONOMY OF RISK COMMUNICATION POLICIES FOR FOOD AND ALCOHOLIC BEVERAGES
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Introduction

The 1980s have witnessed the emergence of hazard warning policies as a major component in efforts to promote product safety and job safety. Government agencies have launched sweeping efforts to label all carcinogenic risks in the workplace as well as to promote labeling for a wide variety of consumer products. In an extreme case, the state of California has promulgated regulations that hazard warnings be given for all significant exposures to carcinogens and reproductive toxicants generated by exposures to food, environmental conditions, and conditions at the workplace. Whereas the regulatory efforts of the 1970s focused primarily on technological solutions and engineering controls to safety problems, in the 1980s there has been a dramatic shift toward the increased use of warnings. The objective has been to augment technological controls with precautionary behavior on the part of the individuals exposed to the risks.

From a theoretical standpoint, hazard warning programs have much to recommend them. One of the
major sources of market failure that has long been cited by economists has been a lack of information in situations in which individuals are making decisions under uncertainty. Because of this lack of information, individuals may buy goods for which they are not fully cognizant of the risks, or they may accept jobs whose implications are not well understood before beginning work on it. Hazard warning efforts can eliminate this source of market failure directly by eliminating the information gap that exists.

In general, if one excludes the role of anxiety, this information will only be useful from an economic standpoint to the extent that it will potentially alter an individual's decisions. Two classes of decisions can be distinguished. The first consists of threshold choices in which an individual chooses whether or not to participate in an activity or purchase a particular good. The second type of behavioral choice pertains to precautionary behavior given that an individual has chosen to engage in a risky activity. Thus, warnings for a consumer product can have a twofold purpose in that they can alert the individual as to whether or not he or she should purchase the product and, if the individual does choose to purchase the good, the hazard warning can provide information regarding its proper use.

In addition to being a policy tool that can potentially remedy some of the market failures that have been noted by economists, hazard warnings raise other economic issues as well. In particular, society's objective with hazard warnings should not be to promote risk reduction at any cost or to interfere with informed decisions. Rather, it should be to provide individuals with information that will enable them to make sound economic decisions that enhance economic efficiency. Many warnings, for example, are not directed at providing risk information but instead are intended to provide
guidance with respect to proper use, such as whether or not one should wear rubber gloves when using drain opener. To the extent that one is advising individuals of appropriate courses of precautionary action, it is important to assess whether the expected benefits associated with these precautions are in excess of the expected costs that are imposed on the individuals taking the precautions. Thus, to the extent that we are providing guidance rather than information, one must ascertain whether this guidance is appropriate from an efficiency standpoint.

Hazard warning programs also raise another class of economic issues pertaining to the appropriate role of informational forms of regulations. The first of these regulatory issues pertains to the circumstances under which it is appropriate to substitute a hazard warnings program for direct forms of government regulation. Any judgment along these lines depends in large part upon the efficacy of hazard warnings in providing information that is needed, and at present our research regarding this efficacy is still in its infancy. Thus, we have selective research results pertaining to particular case studies where warnings have had well identified effects, and we have developed guidelines for the design of hazard warning efforts, but these results are not so specific as to enable us to obtain generalized predictions as to the circumstances in which we can be confident that hazard warnings programs will necessarily be superior to more direct forms of intervention. Any such judgments must still be prepared on an individual basis taking into account the specific factors of the contexts being considered.

The second class of regulatory issues, which will be one of the major concerns for this chapter, is the degree to which the political context influences the structure of regulation. A
considerable literature in regulatory economics has documented the role of various forms of capture theories, as the parties being regulated often influence the structure of regulation to advance their own interests. Similar influences enter in some informational contexts as well. For example, leading chemical and petroleum firms had hazard warnings in place before the advent of the OSHA hazard communication system so that it was in their interest to support national hazard warnings regulations, particularly since the regulations that were promulgated did not require that they alter their existing hazard warning programs.

The more common political context of informational policies is that consumer and public interest influences are at work as well. These political factors affect not only the adoption of hazard warnings programs, but also their content. Thus, the hazard warning language may not be the result of a detailed study to select the most effective risk communication mode but instead may be the result of an effort to satisfy these special interest groups that supported the hazard warning effort. This contamination of informational policies with political overtones has led to serious distortions in the warnings message, as I will document with two of the case studies presented in this chapter: Federally-proposed alcohol beverage warning legislation and food cancer warning efforts in California.

Principles for the Design of Hazard Warning Programs

Ideally, one might wish to embark on a hazard warning effort in which one simply provided the individuals exposed to the risk with complete information pertaining to the hazard as well as appropriate precautions to reduce the risk. In the case of chemical risks in particular, this would be a quite daunting
task. Supporting scientific evidence regarding these hazards is often quite extensive and cannot be easily distilled into a single summary statistic. Even if it could, the recipients of the warnings would lack the scientific expertise to process the information reliably. Thus, the task of the hazard warning program is quite different than simply providing information. Rather, the task is to communicate knowledge in a meaningful manner, and this is quite a different undertaking.

In addition to the lack of scientific expertise in the general population, there are also important cognitive limitations. Two such limitations are most noteworthy. First, individuals have limited information processing capabilities. The amount of information that people can process reliably from a hazard warning message is bounded by the cognitive capabilities that individuals bring to bear to such tasks. Second, there are also a number of inadequacies in the manner in which individuals respond to the risk and more generally to choices under uncertainty. These inadequacies, which have often been designated as forms of "irrationality" in individual choice, govern the context in which hazard warning programs will necessarily operate. As a result, we want to design hazard warning programs that will be effective given the environment in which they will work so that the hazard warning efforts should take such influences into account.

Here I will outline six principles for the establishment of a sound hazard communications system. These principles are by no means exhaustive, but they do highlight many of the most pertinent concerns that should be reflected in the design of a hazard warning effort. In subsequent sections we will assess how particular warnings efforts have failed, in large part because of their violation of these guidelines.
1. To be effective, warnings must convey new information either about risks or precautions.

The first principle for hazard warnings is that to be successful a warning effort must provide new knowledge, not simply reiterate existing knowledge. Until recently, the general view in the literature was that hazard warnings programs were a failure. The early hazard warning efforts were not truly informational in nature, but instead were more forms of persuasion. Policies that simply serve to remind individuals about a risk are reiterating information about the risks apparently in the hope that they will browbeat individuals into changing their behavior. Such efforts have not proven to be successful.

In particular, risk communication efforts that come under the heading of "education campaigns" generally is viewed as having little or no effect, as Adler and Pittle (1984) have demonstrated. The "buckle up for safety, buckle up" seatbelt campaign, for example, is generally viewed as a failure. In addition, even the highly touted cigarette warnings effort has had no statistically identifiable effect on smoking behavior above that which can be associated with other public information activities by the Surgeon General and by the media. Similarly, efforts by the Consumer Product Safety Commission to reduce fire-related death rates through consumer education programs "had no measurable effect on adults' knowledge of burn hazards." Moreover, the burn injury rate among the participants in the policy "did not show significant decreases in frequency and severity." These disappointing results do not imply that all informational efforts are doomed to failure. Hazard warning programs for job risks do have the desired effects when these efforts provide new knowledge about the risks. The major forces that determine the differing efficacy of warning
labels in the job context is the weight that individuals placed on the new information they receive, as compared with their prior information. Thus, individuals act in a Bayesian fashion in that they used their prior information and the new information provided through the hazard warning, and to the extent that the warning gives new information it will have the desired effect. One way to increase this informational weight is to expand the content of the warning message. A study of consumer responses to risk information on household chemical products and pesticide products indicated that precautionary behavior is strongly related to the amount of new risk information provided by the hazard warning. Hazard warning efforts are not doomed to failure, as some of the more pessimistic observers have claimed, but instead can be successful by providing new knowledge in a convincing manner.

2. The most effective warnings indicate to consumers the risks that they face as well as the precautions they must take to alter the risk.

The purpose of hazard warnings is not to dictate behavior but to provide guidance for individuals to make informed decisions. If our objective were to deprive individuals of their choices, then we should be banning products or limiting their use rather than providing risk information. Thus, an element of choice is necessarily involved before warnings can be effective.

The informational requirements are consequently twofold. First, we want to provide information about the risk so that individuals will know the payoff to them of their precautionary actions. In particular, what adverse health outcomes or adverse physical effects will be influenced by the
hazard warning effort? Ideally, we would also like to communicate information regarding the probability that these effects could occur. With the present stage of development of most hazard warning systems, such probability information is at best rudimentary. We often attempt to indicate in a qualitative manner the extent of the risk by, for example, noting that this product "may cause" injury or illness. By changing the wording, we can indicate different degrees of riskiness. With the exception of some warnings provided in pharmaceutical contexts, where the recipient of the warning is a learned intermediary (i.e., the physician), specific quantitative information is generally not provided about risks because it is not believed that individuals have the capability to process the information reliably.

The second component of the hazard warning is to indicate the precautions individuals should take. Informing people of the risks can be helpful in encouraging informed choice with respect to a particular risk. In the more usual circumstance, our objective is not to discourage purchase but rather to either influence the amount of consumption, as would be the case with dosage information for pharmaceutical products, or to affect precautions regarding the use of the product once it is purchased. By providing information with respect to precautions and risks, individuals can link their behavior with the risk reductions that will result from this behavior, thus establishing an economic incentive for them to take the desired course of action. This approach is not only attractive from an economic standpoint, but it also has desirable properties from the standpoint of the psychology of decision making under uncertainty.

3. On-product labels are most effective for limited information transfer.
The major aspect governing the nature of the label is the limitation on the amount of information that individuals can process. A considerable literature in economics is focused on "bounded rationality" in economic decisions, and the psychology and marketing literature has generated similar results as well.\(^7\)

An analogous phenomenon in the warning context is that of "label clutter" and "information overload."\(^8\) From the bounded rationality literature, it would appear likely that labels that with overly extensive risk information would not be effective in communicating an understandable risk message. The importance of this phenomenon remained in question until recently, in large part because the studies examining the role of information overload did not consider a wide range of labeling alternatives and did not utilize representative consumer groups.

A field study that we undertook for EPA (see Magat, Viscusi, and Huber 1988) in which the cluttered label was a pesticides label now in use generated quite striking results. It is an oversimplification to simply conclude that cluttered labels do not work. When we inundate individuals with risk information on a hazard warning label, they do get the message that the product is risky, perhaps in large part because they have adapted to the labeling vocabulary now in place, which often includes extensive and cluttered labels for risky products. The main difficulty from the standpoint of individual decisions is not that they do not regard the product as risky; rather, they do not know which particular precautions to take in response to the risk. The warning message consequently gets garbled as individuals are aware of the general character of the risks but not of the specific precautions that are needed to reduce the hazards.
There is a second inadequacy as well. As we increase the amount of risk information, there is a tradeoff in terms of the amount of other information that is retained. In our study, what we found is that once risk information was increased, there was less recall of the information regarding proper use of the product. These shortcomings were of particular concern since it is generally believed by EPA officials that the main product risk has to do with inappropriate use rather than a failure to take precautions. Household pesticide products have been sufficiently diluted so that if they are used according to the directions they pose very little individual risk. However, if individuals use these pesticide products in the wrong concentration by, for example, not observing the appropriate mixture between the pesticide and water, then the concentrated form of the pesticide will pose potentially substantial risks. Our objective then should be to provide concise and clear risk information, recognizing that some redundancy may be an attractive feature, but that in general we should avoid the tendency to have a label that is so cluttered with risk information that individuals cannot make effective use of the information.

4. Hazard warning programs should take into account individuals' cognitive limitations.

Another form of cognitive limitation that has been identified in a variety of studies both in the psychology literature and economics literature is that individual risk perceptions tend to be biased in a systematic fashion. In particular, individuals show a tendency to overestimate low probability events and underestimate high probability events. For the typical hazard warning that deals with a low probability
event, what this behavioral pattern implies is that individuals will tend to over-react to the risk information by acting as if the true probability associated with some risks is greater than it actually is.

This behavior is not a mysterious form of irrationality, but is exactly what we would predict from a Bayesian perspective. Figure 5-1 illustrates the nature of this updating process. The situation in which individuals assess all risks as being identical is given by the horizontal prior assessment line. If risk perceptions for the various risks coincided with the actual risks of the product, then the risk perceptions would fall on the 45 degree line as indicated. In practice, what we observe is that individual risk perceptions tend to be along

![Figure 5-1](image-url)
the intermediate posterior assessment line indicated on the figure. Thus, individuals over-
assess the low probability events and under-assess the higher probability events. From
a Bayesian perspective, the interpretation of this phenomenon is that individuals learn from their
initial prior assessments, but this learning is incomplete. In particular, whereas individuals
move toward the truth, their posterior assessment line does not coincide with the 45 degree line
except in situations when full information regarding the risks has been given and processed
by the individuals. If the risk information is convincing, the posterior risk assessment line
will lie closer to the 45 degree line associated with perfect risk information. Only when
individuals completely dismiss inaccurate prior beliefs will risk perceptions lie on the 45 degree
line. This failure to learn is not necessarily an inadequacy, but it does indicate that people
bring to bear previous knowledge when forming their probabilistic beliefs. Moreover, a hazard
warning effort must be very persuasive to lead individuals to alter their risk perceptions
since individuals may understandably place substantial weight on their previous experiences
and past knowledge regarding a product.

One implication of this phenomenon is that when we provide people with risk information they will
tend to exaggerate the risk associated with it. Thus, if we tell individuals that a product poses
a risk of one chance in two million, when they process this information it will have a greater
effect on their risk perceptions than it should. This phenomenon is illustrated by the data in
Table 5-1. This table reports on two different studies of the price increases that individuals
would be willing to pay for products that involved a reduced risk of injury. In situations in which
the risk reduction was quite modest (equal to 1/2,000,000 per year) the implicit values of the
Table 5-1

Injury Valuations at Different Risk Levels

Implicit Values for 1/2,000,000 Risk Change

<table>
<thead>
<tr>
<th>Bleach:</th>
<th>$ Value/Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloramine gassing</td>
<td>300,000</td>
</tr>
<tr>
<td>Child poisoning</td>
<td>420,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drain opener:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand burn</td>
<td>120,000</td>
</tr>
<tr>
<td>Child poisoning</td>
<td>360,000</td>
</tr>
</tbody>
</table>

Implicit Values for 5/10,000 Risk Change

<table>
<thead>
<tr>
<th>Toilet Bowl Cleaner:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloramine Gassing</td>
<td>912</td>
</tr>
<tr>
<td>Child Poisoning</td>
<td>1,010</td>
</tr>
<tr>
<td>Eyeburn</td>
<td>610</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insecticide:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Poisoning</td>
<td>1,233</td>
</tr>
<tr>
<td>Inhalation</td>
<td>1,428</td>
</tr>
<tr>
<td>Child Poisoning</td>
<td>2,860</td>
</tr>
</tbody>
</table>

health outcomes were quite substantial—in the hundreds of thousands of dollars. In contrast, for a different and more severe group of risks for which the risk changes were 5/10,000, the implicit valuations per unit risk reduction were several orders of magnitude smaller. In addition, there is one health outcome in common in both sets of experiments—chloramine gassing—and in the case where the risk change was 1/2,000,000 this outcome had an implicit value of $300,000, whereas with the risk change of 5/10,000 the valuation was only $912. Thus, the tendency to respond in an exaggerated economic manner to low probability events was borne out.

A similar phenomenon capturing related aspects of risk perceptions is presented in Table 5-2.
That table gives the willingness to pay for successive risk reductions of 5/10,000 for different pairs of injury. What is noteworthy is that individual willingness to pay for the risk reductions initially diminishes. The first risk reduction at a base level of risk of 15/10,000 is valued much more greatly than the risk reduction when the starting risk level was 10/10,000, but what is particularly striking is that the last risk reduction that begins at 5/10,000 and which takes the risk to zero is valued at an increasing amount. Rather than having a diminishing risk valuation as the extent of the risk reduction is increased, for the final risk reduction that leads to complete certainty there is a dramatic jump in the valuation. This phenomenon is to be expected since as we see from Table 5-1 the chance of very low probability events will be greatly exaggerated. Once we take the risk to zero there will be an incremental drop in the probability that reflects the character of risk perceptions.

It is also noteworthy that there is a dramatic asymmetry in terms of responses to increases in risk, as opposed to decreases. Whereas the willingness to pay amounts for decreases in risks summarized in Table 5-2 were fairly modest, when respondents were told that the risk would increase, there were widespread alarmist reactions. Risk increases of the same order of magnitude as the risk decreases--5/10,000--led all respondents to indicate that they would not purchase a product at all. When the study design was changed to permit risk increases of 1/10,000 the majority of respondents continued to indicate that they would not purchase a product at any price. In cases where they did express a willingness to purchase and accept a price reduction for that risk, then their rate of tradeoff greatly exceeded their tradeoff rate for risk decreases. What this phenomenon indicates is that there is an important "reference risk"
Table 5-2
Marginal Valuations of Reducing Both Risks by $/10,000

<table>
<thead>
<tr>
<th>Starting Risk (injuries/10,000 bottles)</th>
<th>Inhalation-Skin Poisoning</th>
<th>Inhalation-Child Poisoning</th>
<th>Gassing-Child Eyeburn Poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1.04</td>
<td>1.84</td>
<td>.65</td>
</tr>
<tr>
<td>10</td>
<td>.34</td>
<td>.54</td>
<td>.19</td>
</tr>
<tr>
<td>5</td>
<td>2.41</td>
<td>5.71</td>
<td>.83</td>
</tr>
</tbody>
</table>

Effect as individuals display substantial reluctance to accept any increase in the risk above the level that currently is posed by the product. Thus, when they are told that the product has become riskier and are given information regarding the magnitude of the risk increase, they tend to over-assess the risk increase associated with this information.

5. Use of on-product labels leads consumers to conclude that the product poses a higher risk.

Perhaps the most neglected feature of a hazard warning is that the very act of placing a warning on a product is to designate it as being in a risky class of products. In effect, what we are doing is stamping some products as being high risk and other products as not being of high risk when we make distinctions as to which products merit warnings and which do not. Thus, much of the risk
information conveyed by the label stems from the fact that there is a hazard warning in place rather than the specific content of the warning itself.

A striking illustration of this result occurred when I presented a series of chemical warning labels to several audiences, including one class at Harvard Law School and a National Bureau of Economic Research Conference. In each case I polled the audience regarding the risk that they believe they would face on a job in which they used the chemical "sodium bicarbonate." The hazard warning gave information regarding appropriate precautions to take with respect to this chemical, such as cleaning it up after a spill. Otherwise, the format structure of the hazard warning label was similar to that of hazard warnings for risky products except that the labeling included no specific information indicating the risk; nor did it include any human hazard signal words, such as "danger." I then polled the audience with respect to the risk that they believed they would face if they had to work with this chemical as part of their job, and the great majority of respondents believed that working with the chemical sodium bicarbonate would be an above average risk job in the chemical industry. When informed that this product was in fact simply household baking soda, the almost universal response was that this product should not have been labeled if in fact it was not truly risky. Although other groups of respondents with more experience in the kitchen may be able to make a more knowledgeable assessment of a sodium bicarbonate warning, the essential point of this example is not that individuals were unfamiliar with household products, but rather that in situations in which they did not know the implications of a particular product, a warning may have a substantial effect on their risk perceptions even if we do not provide any specific
risk information as part of the label.

6. Ill-conceived warnings programs are damaging to other warnings efforts.

This principle is simply a generalization of the fourth and fifth principles to the entire warning context. For the same types of reasons that we do not wish to clutter an individual label, we also do not wish to clutter the entire set of risk communication messages that an individual receives. Thus, we want to reserve hazard warnings for the true risks so that individuals can be selective in the information that they acquire about the hazards.

The informational content of labels, which was the essential theme of the fifth guideline given above, will also be jeopardized to the extent that we use labels indiscriminately. If everything in society is labeled, in effect nothing will be labeled since all products will be treated symmetrically. What we want to do is reserve labeling as a means for designating higher risk products and in doing so we should be selective in the manner in which we use the labeling mechanism.

The six principles given above do not provide precise guidelines for writing the text of particular labels, but they do provide an overview of the principles that should be kept in mind when approaching a hazard communication problem. They also provide the conceptual backdrop for assessing which institution is best equipped to handle the hazard communication tasks. Designing a hazard warning program is a non-trivial task that must be done systematically across products, and ideally we would want to select institutions that could accomplish this task in a uniform and effective manner. In this next section we will address these institutional issues in greater detail.
Institutional Context of Hazards Warning Programs

Before considering the performance of particular hazard warnings efforts, it is helpful to provide a brief review of the different institutions that we could utilize to develop society's hazard warnings efforts. The natural starting point for any such discussion is to ask why we do not let private markets assume this function. The incentive to provide risk information associated with products will not be completely non-existent, but will be inadequate for two reasons. First, information by nature tends to be a public good. To the extent that firms are assuming the task of educating the public with respect to more general risks, they will not undertake the needed effort to a degree that is socially optimal. Second, if these firms are providing information that is damaging to the attractiveness of their products, they will not have an economic incentive to do so. Thus, if individuals are unaware of a risk of a product there is an economic disincentive on the part of the manufacturer to call these risks to consumers' attention, particularly given the tendency of individuals to respond in an alarmist manner to risks associated with products.

Despite these limitations, private incentives for risk communication are not completely non-existent. If a firm develops a reputation for putting products on the market and not fully informing consumers, leading to a record of substantial accidents, there will be an adverse consumer response to the product. Appropriate precautionary instruction can be viewed as one of the product attributes that consumers are purchasing. When there are apparent risks of the product and consumers are aware that they are not being given the information needed to use the product safely, one would expect there to be a decrease in the attractiveness of the product to
The ideal mechanism for establishing a risk communication system is through a national effort administered by a federal regulatory agency. The warning format as well as the severity and language ideally should be controlled to be uniform across the product, and this can be accomplished through a national regulatory policy. Perhaps the most striking example of a successful warning program is the Pharmaceutical Advertisement Administration. The warning format as well as information regarding proper usage of the product. The warning is given across products. Thus, both the proposed alcohol beverage warnings and the properties of the product. Although not all institutional standpoint a federal regulation approach does have the greatest potential for success.

Another form of Federal intervention could be through the U.S. Congress, which is responsible for the warning labels for cigarettes, saccharin, whereas the FDA primarily uses a team of pharmacologists and other medical experts to design appropriate warning language for prescription drug labeling, congressional efforts are dictated largely by the work of lawyers. This professional orientation is not ideal since the

consumers.
focus is not so much on risk communication but on developing language that will solve an immediate political problem. As I will indicate in the fourth section in my discussion of the alcoholic beverage warning, the proposed warning language stems more from the influence of special interest groups lobbying for particular forms of warnings than it does from any sound consideration of a proper hazard communications system.

A fourth alternative is to have the regulation undertaken by the states rather than by a branch of the Federal Government. The difficulty with state regulation of hazard warnings efforts is that many products are distributed nationally so that state-by-state regulation is infeasible. Such warnings would have to be applied to products at the warehouse. More generally, if we have a warning system that does not adopt a uniform national vocabulary we run the danger of having a distorted mix of messages reaching consumers. The perils of state regulation will be illustrated by the case study of the California food cancer risk regulation, which is the subject of the fifth section.

A final alternative is to rely upon the courts to design hazard warnings. In terms of timing, courts act after the fact so that it is only after injuries have occurred that courts will address the hazard warning issue. Moreover, the hazard warnings policy option tends to be discussed only in situations where there is no other strong basis for establishing fault on the part of the product producer. Thus, in situations where plaintiffs cannot otherwise prove negligence or liability on the part of the producer, it is often shown that the warning is inadequate and as a result there is a design defect in terms of the character of the warning accompanying the product. Situations in which other liability doctrines are operative or in which there are no product accidents that are litigated consequently will not be considered by
the courts.
Moreover, in situations where the courts are considering the warnings there is a danger that the procedure will be very myopic. Expert witnesses typically testify that if only there had been a prominent warning for the particular accident in question then it never would have occurred. Considering risks on a piecemeal basis such as this is not appropriate, however. Our task is not to develop a hazard warning for a particular risk, but rather to develop a sound hazard communication system for the whole cluster of risks involved with a particular product. Although a particular issue may loom large in a specific court case, it may not be of substantial consequence when considered within the entire context of all the risks posed by a product.

One highly litigated class of risk concerns that exemplifies this phenomenon is the tipover risk associated with forklift trucks. It has often been suggested that if firms had a more prominent warning on the truck regarding the tipover hazard, then these accidents would not have occurred. More careful examination of the training manuals accompanying these trucks indicates that there are roughly 30 to 40 major sources of risk that can lead to fatalities, so that if we were to carry this warnings approach to the extreme then we would have a product that was, in effect, covered with labels.

In lieu of labels, firms could adopt other forms of risk communication that are more appropriate to the particular context, which in the case of lift trucks has been done in terms of training manuals, training video tapes, as well as formal training programs for lift truck operators. Despite these efforts, courts have not displayed as much of a willingness to consider the entire set of hazard communication activities as well as the need for balance in a hazard communication system since the court's perspective
tends to be distorted by the risk at hand.

More generally, one difficulty with court decisions is that they often lead to anticipatory labeling actions on the part of firms in an effort to protect themselves against prospective liability rather than to truly communicate the risks to consumers. The existing warnings for pesticide products are a case in point, as the warnings are, in effect, detailed booklets that are unlikely to be read and, if read, would not be understood. These warnings nevertheless do provide printed documentation of the product risks and appropriate use so that in the event of a court case the defendant will have concrete evidence to point to as evidence of an appropriate hazard warnings program. If anything, the net effect of court actions has been deleterious rather than helpful in promoting a national warnings vocabulary and a sound hazard communication system across all products.

Analysis of Proposed Alcohol Beverage Warnings

A particularly prominent case study of hazard warnings is the proposed 1988 Senate bill (S.2047) that would mandate on-product labels for alcoholic beverages. This effort is of interest for two reasons. First, consideration of the content of the warning is particularly instructive since it illustrates the potential pitfalls that can be encountered if one does not heed the six principles for the development of a sound hazard warnings policy that were outlined in the second section of the chapter. In addition, the structure of the warnings that have been proposed illustrates the potentially deleterious influence of special interests groups as, in effect, the warnings language has been adopted to maximize this political appeal rather than to convey new information that might be helpful in improving decisions.
Table 5-3 summarizes the proposed warning language, which consists of five specific warnings to appear on alcoholic beverages in a rotating fashion. Although modifications of this warning language have since been proposed, this set of warnings is nevertheless of interest since it reflects the general character of the entire warnings effort in the alcohol area. States such as Massachusetts, for example, are considering warnings efforts of this type.

What is particularly noteworthy about the warnings is that each of the warnings components has its own particular constituency. Indeed, the congressional hearings that were held on this issue included a variety of special interest groups, each of which testified on behalf of its particular warning as being an important component of the hazard communication system.\footnote{12}

One group of participants is the medical community. A variety of medical groups have endorsed the general principle of hazard warnings for alcohol, and researchers on fetal alcohol syndrome were present to support the first warning pertaining to the pregnancy risks of alcohol.\footnote{13} There was, however, no specific advocacy by the medical community of the particular language used in the other warnings appearing in the group in Table 5-3.

A second constituency for hazard warnings consists of religious groups that oppose the use of alcohol. These views may have influenced in part the position taken by Senator Strom Thurmond, who represents South Carolina. Coverage in the Washington Post on the day of the hearing indicated that some observers believed that individuals with prohibitionist leanings were playing an important role in advocating the legislation.\footnote{14}

A third constituency was the set of consumer groups that opposed drunken driving. Warning no. 2 is directed at their interests.
Finally, a fourth constituency consists of those opposing alcoholism. This group supported the entire set of warnings, but particularly warning no. 5.

The result has been a politically determined grab bag of warnings for a very large variety of potential risks associated with the use of alcohol, which is one of the most widely consumed and well understood products in the United States. It is helpful to consider each of the warnings to assess whether or not they are potentially desirable. The most useful framework for doing so is to follow the six principles that were established in the second section.

The first principle is that a hazard warning system should convey new information to the individuals receiving the warning. Warning no. 2 (which indicates that drinking can impair one's driving ability) and warning no. 5 (which in
effect indicates that too much drinking can make one an alcoholic) do not provide new knowledge to consumers and as a consequence would not be effective warnings. The health risk warning no. 4 also overlaps with a the variety of recent public information efforts, and it is unclear what this warning would add to existing public knowledge.

At present, alcohol risks are among the most highly publicized and well known risks in our society. When Americans are asked to cite major problems facing our nation, eighty one percent list alcohol abuse as a major national problem, and only two percent of all respondents do not view it as a national problem.\(^5\)

The drunken driving risks covered by warning no. 2 have long been a target of public education campaigns. The risks of driving and drinking are well known, obvious, and receive substantial publicity. Newspaper coverage of these risks has increased by a factor of more than thirty (Nexis count of AP stories) in the past decade. This press coverage has included the health risks captured in warning no. 4 as well. The number of AP articles per year on fitness and alcohol, diet and alcohol, or alcohol abuse has increased more than ten-fold in the past decade. The effect of these efforts has been so great that more teenagers now tend to view alcohol as a greater risk than cigarette smoking.\(^6\) More to the point than these factual quiz questions is that the risks and dangers of alcoholism are universally understood. What will warning no. 5 add to this knowledge? Do we want people to believe that "moderate" heroin use carries no more risk than moderate alcohol use?

Even warning no. 1 for alcohol risks to pregnant women may have little informational content. Although many people cannot define "fetal alcohol syndrome," nitpicking over medical definitions is not the issue. There is already a widespread belief that drinking can be harmful to
a fetus. A 1985 Gallup Poll indicated that 90% of the population agree strongly or somewhat that "the use of alcohol by pregnant women can cause birth defects." This response reflects substantial awareness of the risks, particularly given the wording of the question. If this survey had dealt with alcohol abuse rather than including moderate drinking as well, no doubt a greater fraction of the population would have expressed awareness. In addition, over three-fourths of all women of childbearing age list alcohol as a substance they should avoid. Based on my past experience with running open-ended memory recall studies such as this, I view this result as a very striking response given the unprompted nature of the survey.

Although there is clearly a potential need for continued media coverage and public education regarding the diverse risks posed by misuse of alcohol, the series of one sentence statements regarding these risks that appears in the proposed warning language offers little by way of new information that will augment the knowledge that individuals already have. Rather, the warnings are more in the form of reminders and attempted persuasion, which is a warnings mode that has not been shown to be effective.

The second guideline articulated in the second section is that we should provide both risk and precaution information as part of the hazard warning. As the review of the warnings in Table 5-3 indicates, these warnings consist merely of risks that are brought to consumers' attention, but there is generally no discussion of precautions. In effect, one could most likely characterize these warnings as being in the form: "Don't buy this product since..." Such a warning policy is not completely non-informative, but I do not believe it is credible. The warnings are overly broad and seem to indicate that any quantity
of the product whatsoever is harmful, whereas the main societal concern is with abuse, not use. Such indiscriminating warnings do not convey accurate information. Although pregnant women are urged not to drink at all because the safe level of consumption has not been determined, moderate drinking in the general population has not been associated with the risks to be communicated by the proposed labels. Indeed, the recent Surgeon General's Report on Nutrition and Health concludes "consumption of one to two drinks per day has not been associated with disease among healthy male and non-pregnant female adults." The risks related to alcohol accelerate at high alcohol consumption levels, and the warnings do not make this clear. Thus, the warnings convey inadequate information that will either misinform consumers or fail to be credible.

The warning with respect to combining alcohol and drugs seems to be particularly inappropriate. Alerting consumers to a general link does not enable them to make the distinction with respect to specific adverse interactions. Combining alcohol with barbiturates poses a quite different risk than combining alcohol with aspirin. A more sensible approach, which we now have, is to provide warnings for the drugs that pose particularly large risks when associated with alcohol. In addition, physicians bear responsibility for instructing patients in the proper use of products that they prescribe, and it is these prescription drugs that pose the greatest interactive danger. The pharmaceutical industry and the medical profession should not be permitted to shift their responsibilities to an all-purpose warning that is not well designed for enabling consumers to make decisions on specific drugs.

The third guideline is that on-product labels are most effective only for limited information transfer. Labels are most useful as a warning device in situations in which reading the label is
an essential part of using the product. Consumers need not read the beer, wine, or liquor warning in order to drink the product. In many cases, they do not even see the container during their use of the product.

In situations in which one wishes to convey a fairly complex message, a label is not the best alternative. I would characterize S. 2047 warnings 1, 3, and 4 as being complex. Ideally, one would like to tell individuals much more than the simple statements indicated, such as linking alcohol to birth defects and cancer. One might want to educate people regarding the amount of alcohol that is involved in such causal links, the duration and frequency of such risk exposures and how they affect the risks, etc. Such information is too lengthy and complex to be suitable for a short alcohol beverage label.

More generally, it would seem that there are other information transfer mechanisms that are more appropriate for conveying this message. In the case of the warning to pregnant women, physicians can provide a much more capable and credible mechanism for conveying the warning. In the case of the broader health risks of alcohol, longer treatments of the issue in the media would be much more effective, as would education programs in our schools. Health and welfare agencies at both the state and federal level can contribute to this discussion, and some alcohol producers have done so as well. Adverse combinations of alcohol and drugs should be handled through physician advice and the warning labels on the drugs for which there are potentially dangerous interactions. The dissemination of information is important, but labels on alcohol are not the most appropriate means for accomplishing this task.

The fourth concern is that labeling alcohol as being risky is overly simplistic. Introduction of an alcohol warnings label system, particularly one
that places alcohol in the same class as addictive drugs such as heroin, would convey to consumers that alcoholic beverages pose a very high risk to all the consumers of the product, irrespective of its use. The main difficulty with this warning is that it fails to indicate that the main risk stems from abuse of the product not from use so that the product is not always risky. Except for the qualifiers regarding risks to pregnant women and drug interaction, the warnings listed in Table 5-3 are indiscriminate in terms of their coverage.

The specific form of warnings that was adopted—a rotating warnings policy—runs counter to the general principle of providing a comprehensive warning message. The support for the rotation policies stems largely from the Madison Avenue approach to advertising for which the advertising message is altered to avoid boredom by consumers. Our intent, however, is to convey risks in a systematic manner, not to capture the imagination of a supposedly irrational consumer who is looking for the hazard warning equivalent of a catchy product slogan. To date, there is no evidence in the literature that supports the fragmentation of warnings policies in this manner.

The main deficiency of the warnings system developed by Congress is that the objective of informing consumers and developing a sound hazard communication system has not been advanced. Rather than focusing on new information regarding risks and precautions that conveys in a concise manner the information needed by consumers to make sound decisions, what we have instead is a diverse set of warnings about risks, with no indication regarding the precautions and also no refined information indicating the linkage of these risks to the abuse of alcohol. In some cases, the basic warning message is so well known that any hazard communication effort would seem to demand a
much more subtle and detailed approach than can be afforded through the use of labels. For the risks posed to pregnant women, a more appropriate and effective means for conveying information beyond what women already know about these hazards, which is a great deal, would be to rely on the medical community and physicians rather than a one sentence statement on a warning label. In a situation in which the warning must be compressed into a single sentence, one runs the danger of having an inaccurate warning, which could threaten the credibility of the entire warnings effort. In particular, in the case of fetal alcohol syndrome risks, there is no evidence that links these risks to alcohol use of under two drinks per day, as the Surgeon General simply advises women to avoid use at such low levels so that they can err on the side of conservatism given the uncertainty of our scientific knowledge. A more appropriate risk information program would be to convey the entire richness of the Surgeon General's message rather than trying to distill it into a more dictatorial form that at present does not have scientific support. A major danger for any risk communication effort is that we should not jeopardize its credibility since doing so may lead individuals to dismiss other warnings now and in the future.

Food Cancer Warnings

The principles for developing a sound warning system can also be illustrated by examining what may be the most far-reaching warnings effort in the 1980s. In 1986, California voters passed a referendum known as Proposition 65, which was entitled the Safe Drinking Water and Toxic Enforcement Act of 1986. Although this statute has a number of major policy ramifications, including job and environmental warnings requirements, the focus of my discussion will be
on the food cancer warning requirements. In particular, by February 1988 all food products containing chemicals that pose significant risks of cancer had to be accompanied by a warning that would be effective in communicating these risks. Although most products were granted a temporary exemption while the risks were being assessed, others such as tobacco and alcoholic beverages have been actively involved in the warnings controversy and litigation efforts.

Overall, the idea of instituting a food cancer warning policy is long overdue. In principle a warnings policy is a good idea. Federal regulatory policies have not and should not eliminate all cancer risks, however small they might be. For those risks that remain after Federal regulation, individuals may have quite different attitudes toward their willingness to bear the risks and toward their commitment to particular products in view of these risks. By providing individuals with risk information so that they can make decisions that reflect their preferences, a hazard warnings policy can take advantage of the ability of market forces to establish an efficient match-up between individuals and the risks they face.

To reap these benefits, however, a warnings policy must provide risk information in a manner that will enable consumers to make these risk distinctions. Unfortunately, the implementation of the California policy will not provide either accurate information or sufficiently refined information to foster more informed decisions. The basic difficulty with the California initiative is that it failed to reflect an understanding of how individuals process risk information and how the policy should be designed to foster improved risk-averting decisions. The main missing ingredient has been a lack of concern with individuals' decision processes. Since a right-to-know policy will only be
effective if it engages individual actions in the desired manner, this was a critical oversight.

The Case for Food CancerWarnings

The existing panoply of governmental regulations eliminates the most severe hazards in our food chain. Many nonzero risks will remain since some risks cannot be reduced at all (e.g., the estragole in basil), and others may be quite costly to eliminate so that it is not desirable to do so (e.g., chloroform in tap water). The consumer outcry after the attempt to ban saccharin is perhaps the most notable recent example of a desire to have certain products available even though they may not be risk-free.

In the absence of a hazard warnings policy, society essentially has two options. Either we could ban a particular product altogether, or we could permit it to be sold with no policy restrictions whatsoever. Having such a limited and extreme set of policy choices may lead to compromises in policy stringency that are undesirable, such as banning substances posing minimal risks or taking no action whatsoever against product risks that are not serious enough to warrant a ban. The absence of a diversity of policy options will also lead to a failure to reflect differences in consumer preferences with respect to such risks.

Food cancer warning policies can potentially address these risks falling in the intermediate range by providing information to consumers so that individuals who wish to avoid cancer risks can do so. At present, such information is not readily accessible. It is easy for consumers to monitor whether produce is fresh or has been bruised, but whether this produce has also been drenched in pesticides cannot be ascertained upon inspection at the grocery store. Indeed, such produce may look particularly healthy. Similarly, even for products with a listing of
chemical ingredients, such information is often not helpful unless one has chosen to adopt an overly conservative "no additives" diet. Not all chemicals are carcinogenic, and many carcinogens occur naturally or within the course of food storage and processing so that the "no additives" approach will rule out many harmless substances and include many naturally occurring carcinogens. The policy objective is simple. What we need is a more targeted form of information that will enable consumers to make meaningful distinctions with respect to cancer risks.

We can expect an effective food cancer warning policy to influence the behavior of some, but not necessarily all consumers. Indeed, if it were our objective to eliminate consumption of a product then we should not be relying on a hazard warning program. Rather, we should be pursuing an attempt to ban the product altogether. The objective for food cancer warnings should not necessarily be to discourage consumption of these products. For much the same reason, the Surgeon General's objective of a "smoke-free society" is misguided. Rather, the objective should be informed consumer choice. Individuals should be given sufficient risk information so that they can make meaningful cancer risk decisions.

This objective does not presuppose fully rational behavior on the part of consumers. Risky choices impose notoriously difficult demands on individual rationality. The existence of these departures from rationality does not doom informational policies to failure, but they do suggest a need or taking these characteristics of individual decision making into account when designing the warnings program. For example, it is not generally effective to tell people that a product poses a specific cancer risk such as .00001. Through appropriate design of the content and format of the warning, we can, however, convey
a comparable risk message that will lead to the desired behavior. The existence of shortcomings in individual decision making does not imply that hazard warnings efforts are doomed to failure, but it does suggest that the government should design hazard warnings efforts taking individuals' cognitive limitations into account.

Perhaps the major achievement of Proposition 65 is that it put the food cancer warning policy issue on the national risk regulation agenda. The specific features of the regulation as it has been implemented are less laudable.

The basic mission of Proposition 65 in the food cancer area is to warn consumers of all risks judged to be "significant." Determination of significance involves substantial scientific input, in particular with respect to determining levels of carcinogenicity of different substances. Unfortunately, the scientific basis for the Proposition 65 warnings policy is basically dishonest. The policy follows the usual "conservatism" practices that are widely used in the federal government by focusing on results for the most sensitive animal species, focusing on the upper end of the 95% confidence interval for the risk rather than the mean estimate of the risk, reliance on a linear does-response relationships, and similar conservatism biases. The net effect of these practices is to overstate the risks by an uncertain magnitude rather than to provide unbiased estimates of the true risk posed to consumers.

Such "conservatism" is inappropriate within the context of an informational policy. The basic objective of an information program is to provide accurate knowledge to consumers. If we base these policies on fundamentally distorted scientific evidence, with biases that may vary greatly from substance to substance, then we run the risk of jeopardizing the credibility of such programs as well as of misleading consumers regarding the
true risks that are posed.

Even if we were to base policies on unbiased risk assessments, we must then select what particular level of risk is "significant." Determination of significance within the context of an information program is essentially a policy question rather than a scientific question. The number of digits attached to a risk is not a true test of significance. What we really want to know is whether these risks will be of sufficient magnitude that consumers should take them into account when making their decisions. Thus, significance must be defined within an operational context based on its effect on informed decisions rather than viewed as an abstract notion linked to the number of zeros in the risk probability statistic.

A decision-oriented approach to significance is the following. The California regulation requires warnings for all products posing a "significant" lifetime risk, where a lifetime is defined to be 70 years. If a consumer were to purchase a product weekly for each of those 70 years, and if this consumer had an attitude toward risk similar to that of the typical worker when facing risks on the job (e.g., an implicit value per statistical life lost of $4,000,000-$5,000,000), then a lifetime risk of 1/100,000 would alter his weekly purchase decisions for the product by under a penny. Thus, one might view the lifetime risk of the product of 1/100,000 as being a de minimis risk level that can serve as a threshold for all risk policies. It is the lowest risk that conceivably might make a difference economically, which is an essential ingredient for the program to have any effect. After originally focusing on a 1/1,000,000 threshold, California selected the 1/100,000 threshold level, but in their case this threshold is the significant risk threshold rather than a de minimis threshold.

It is instructive to compare this risk
threshold with risks regulated by the government. The 1/100,000 risk in a lifetime threshold is at the low end of risks regulated by the Federal government. Almost all risks that have been regulated are significantly greater, such as the cancer risks facing asbestos workers and individuals exposed to arsenic emissions in the environment. Indeed, the only smaller lifetime risks among recently proposed major Federal regulations are those covered by proposed EPA land disposal requirements and FAA airplane safety regulations, if one assumes that people fly an average of only once per year. Similarly, lifetime cancer risks from saccharin or cigarette smoking are believed to be several orders of magnitude greater than the Proposition 65 cut off. In short, a lifetime risk of 1/100,000, which translates into an annual risk of 1/7,000,000, is very low indeed. The risk threshold for a warnings policy should be relatively low since direct controls and bans are used for more substantial hazards. The small nature of the risk is not necessarily reason for inaction, but it does suggest that whatever policy we do pursue should be commensurate with the risk level.

The implications of Proposition 65 are still not fully apparent since California is still in the process of designating the chemicals that merit consideration when determining significant risk levels. A prominent recent action was the addition of alcohol to the list of potential carcinogens. Based on scientific evidence on potential carcinogenicity, an effective food cancer warning policy would include, among others, the following products: natural root beer, mushrooms, basil, brown mustard, and bacon. California's exemption of "naturally occurring" carcinogens, such as those present in fish, reduces the scope of Proposition 65's coverage and also diminishes its informational value in making
across-product comparisons.

Once a product has passed this threshold, consumers must be given a warning regarding the risks posed by the product. It is in this area that the California policymakers are perhaps most remiss. They appear to have interpreted their objective of providing effective warnings as tantamount to providing the strongest warning possible. Instead, they should have selected warnings that convey the risk most accurately. Thus, they have confused impact with effectiveness.

The wording that they have chosen parallels quite closely the recent hazard warnings for cigarettes:

WARNING: This Product Contains a Chemical Known to the State of California to Cause Cancer.

This is a strong warning indeed that states a well-defined link to cancer in a clear and concise manner. Such a warning seems particularly inappropriate given the low risks involved. In addition, any such warning will be filtered by the limited cognitive capabilities of individuals. Since individuals tend to overestimate low probability risks that are called to their attention, any such warning runs the risk of excessive alarm.

Although there are a variety of studies in the literature that enable one to make judgments on such issues, a more reliable basis for assessing the implications of the warning is to test its actual effect on consumers. This is particularly important since there is a broad range of conceivable effects that the warning might have. Although we can be confident that the warning appears to be excessive, we do not know specifically how much the warning errs in terms of exaggerations in the implied risk level.
To pin this implied risk level down more precisely, I undertook a small scale study with 99 participants in a continuing education program held at Northwestern University. These adult students were told that their breakfast cereal had a hazard warning on it. The experimental manipulations included a warning identical to the California Proposition 65 warning, except that I replaced "California" with "Illinois" in the warning language. Consumers were then asked a series of questions with respect to the risk. Table 5-4 reports a ranking of this particular warning with respect to other warning wordings, where these results are based on a series of pairwise warning comparisons. The first warning wording listed in Table 5-4 is the present warning for saccharin products. The second warning wording is a variant of the 1969 cigarette warning, and the third warning is the 1965 cigarette warning.

Table 5-4
Comparisons of California Warning with Other Wordings

<table>
<thead>
<tr>
<th>Fraction Who Regard as</th>
<th>Fraction Who Regard as</th>
<th>Fraction Who Regard as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Risky</td>
<td>Equally Risky</td>
<td>More Risky</td>
</tr>
<tr>
<td>1. Use of this product may be hazardous to your health. This product contains a chemical that has been determined to cause cancer in laboratory animals.</td>
<td>.56</td>
<td>.18</td>
</tr>
<tr>
<td>2. Warning: The State of Illinois has determined that this product is dangerous to your health.</td>
<td>.36</td>
<td>.48</td>
</tr>
<tr>
<td>3. Caution: Use of this product may be hazardous to your health.</td>
<td>.14</td>
<td>.69</td>
</tr>
</tbody>
</table>
Consider first the comparison with the saccharin warning. The majority of consumers regarded the saccharin warning as implying a lower risk than the cereal that included the Proposition 65 warning, and only one-fourth of the respondents viewed the saccharin warning as being riskier. The result is particularly striking since the same kinds of scientific studies that will generate the 1/100,000 risk threshold for products covered by Proposition 65 have led to a lifetime risk estimate of 1/2500 for saccharin. The saccharin risks are consequently much more substantial, but are covered with a warning that is viewed as less stringent.

The cigarette warnings are viewed as comparable to the Proposition 65 warnings by a substantial portion of the consumers. Thus, Proposition 65 will be providing warnings that have roughly the same impact as those placed on cigarettes, which the Surgeon General claims pose a lifetime cancer risk that is much greater.

The difficulty is that consumers will be using these reference points for products that have warnings already to assess where the products covered by the Proposition 65 warning lie in this consumer product risk continuum. If the only information we give consumers is a warning that pegs the product at the high end of the risk range, then we have not provided them with information, but have instead led to excessive alarm.

A second test that I utilize to assess consumers' response to the warnings is to ask them to rate the risks associated with the Proposition 65 warning. Consumers had to pick a particular risk range for the product, where the three risk ranges are summarized in Table 5-5. The first risk range was from zero risk to the risk posed by one twelve ounce cola containing saccharin. The second risk range was from one saccharin cola to one pack of cigarettes, and the third risk range
Table 5-5
Risk Assessment for Proposition 65 Warning

<table>
<thead>
<tr>
<th>Risk Range</th>
<th>Fraction Who Put Product in Range</th>
<th>Score within Range on a 10 pt. Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero Risk - 1 12 oz. Saccharin Cola</td>
<td>.21</td>
<td>4.86</td>
</tr>
<tr>
<td>2. 1 Saccharin Cola - 1 Pack of Cigarettes</td>
<td>.44</td>
<td>4.27</td>
</tr>
<tr>
<td>3. 1 Pack of Cigarettes - 5 Packs of Cigarettes</td>
<td>.35</td>
<td>2.25</td>
</tr>
</tbody>
</table>

was from one pack of cigarettes to five packs of cigarettes.

About 1/5 of the consumers rated the risk as being midway between zero and that posed by one twelve ounce soft drink containing saccharin. Forty-four percent of the consumers rated the risk as being midway between one saccharin cola and one pack of cigarettes, and 35% of the consumers rated the risk as being between one and five packs of cigarettes, with an average risk assessment in this group of about two packs of cigarettes per day. The overall average for these responses is that even if we view the risk of saccharin colas as being zero, consumers view products containing the Proposition 65 warning as posing the same risk as smoking .58 packs of cigarettes per day.

As a third test of the effect of the warning, I then asked the consumers how many of 11,000,000 Illinois residents would be likely to die from a product bearing a Proposition 65 warning if they were to consume it daily throughout their lives. The average response was that 1,316,729 consumers would die, or that the lifetime risk of cancer was
.12. This response is roughly 10,000 times greater than what the Proposition 65 risk threshold would be even if there were no conservatism used in establishing the underlying scientific basis for the regulation. It is also noteworthy that these results imply that consumers estimated the lifetime cancer risk of a daily pack of cigarettes as being .21, which implies a lifetime risk for the typical smoker of 0.33. The cigarette risk assessment value greatly exceeds current estimates of the hazards posed by cigarettes. These results are not surprising given the substantial literature documenting individual over-assessment of low probability events.

The rather striking nature of these alarmist responses to the Proposition 65 warning suggests the need for a more thoughtful and careful approach toward warning design. We cannot simply replicate hazard warnings from other contexts and hope that they will convey what might be quite different risk levels. In addition it is irresponsible from a policy standpoint to launch a major warnings initiative without doing detailed pretesting to ascertain that the information we are providing will lead to more informed decisions.

How we provide the information is also of substantial consequence. In particular, risks will not be communicated to consumers if they do not receive the information. Ideally, one would like to have a warnings mode that provided information to consumers in a systematic fashion to enable them to make their purchase and consumption decisions.

What we have instead is an open-ended grab bag of options from which firms are permitted to choose. On-product labels are one possibility, but this is an unattractive option for producers who will find it difficult to place separate labels on products targeted for the California market. A second option is the use of shelf
labels and in-store displays, but this approach shifts the nuisance and burdens associated with the warnings to grocery manufacturers, who not unexpectedly have opposed this means of compliance. Alcoholic beverage warnings are, however, handled through such a display since the commonality of the risks across products makes such a collective warning feasible. Other modes of compliance include the use of cash register receipts containing hazard warning information as well as the use of a toll-free telephone number, which has been a very popular compliance mode. The toll free number faces a court challenge by environmentalists, who refer to this policy option as 1-800-BALONEY.

What is clear is that the variety of different modes of compliance makes it difficult for consumers to ascertain how they should go about getting the warning information. The nature of the warning in terms of the manner it is communicated may differ from product to product, imposing substantial information acquisition costs. In this particular policy context, choice and flexibility in terms of the mode of compliance is not desirable. Rather, we want a system that promotes commonality in approach and warning format both to ensure comparability and to improve the ease with which consumers can acquire the needed information. The 800 number approach that has been adopted on a widespread basis satisfies this consistency requirement.

Moreover, the mode of the warning must be commensurate with the risk. The very act of requiring an on-product label has informational content. Society has designated this product as being at the high end of the risk range. We should reserve the use of such warnings for situations in which the risks are truly consequential. Below I outline a policy proposal that incorporates a differential warnings approach so that the hazard warning can be altered
depending on the severity of the risk.

California Proposition 65 has played a constructive role in highlighting the need for a food cancer warning policy. However, this policy should be Federal rather than state. Because of the division of Federal authority over food-related products (i.e., the U.S. Department of the Treasury has responsibility for alcohol, the U.S. Department of Agriculture has responsibility for meat, the Food and Drug Administration (FDA) has responsibility for other food products, and the Environmental Protection Agency (EPA) has responsibility for drinking water), there is a need for a coordinated rulemaking effort by these agencies. These issues would not be entirely new to the agencies' agendas. EPA, for example, has elaborate pesticide label requirements and has been considering drinking water warnings in recent years.

The usual arguments for state rather than Federal regulation is that such policies can reflect differences in preferences across states. Consumers in California may be more concerned with carcinogens than those in Kentucky. With an informational policy, however, there is no requirement that individuals take a particular course of action. Rather, we are only ensuring that they have the information that is required to make a knowledgeable risk-avoiding decision. If avoiding cancer risks is not highly valued, they need not alter their consumption pattern.

Any food warning effort should treat cancer risks from all sources. The California exemptions for naturally occurring carcinogens, additives regulated by the FDA, and meat subject to Federal regulation should be eliminated. The warnings policy should inform consumers of cancer risks from all sources so that meaningful comparisons across products can be made in assessing the overall degree of riskiness, from
whatever cause.

Perhaps the most important component of any such policy should be to make more distinctions in terms of the level of risk conveyed. The on-off designation of products as being carcinogenic is too simplistic. In addition, if we were to include very low risks in any hazard warning effort, then we should not be using on-product labels, which should be reserved for the truly serious risks posed in our society.

As a result, I recommend as a first effort a two-tiered warning system. Products posing low levels of risks could be listed in a binder available at the store so that individuals who are particularly sensitive to cancer risks can obtain the needed information. Organizations such as Consumers Union also could publish this information. The current 800 number approach might be an analogous alternative. The small group of products posing more serious risks should be given on-product warnings that will indicate to consumers in a visible and readily communicated manner the more significant risks that these products pose. The threshold for dividing these risk groups will depend in part on the distribution of risks in society, which should be explored in a comprehensive manner before implementing the warnings policy. One cannot, for example, grade eggs as being "jumbo" without knowing the size distribution of eggs. Such a policy would convey the differing degrees of riskiness in a more effective manner, while at the same time making available to consumers the information about very low risks should they wish to utilize it in their purchase decisions.

In each case, the wording of the warning cannot be determined in the abstract. Although we know that the California wording is too stringent for an on-product label, the ideal approach would be to test a variety of different warnings with consumers and assess their reactions to them.
before embarking on such a major change in our food risk policies. The cognitive limitations of individuals in processing information about low probability events require that we make such an understanding a fundamental portion of any such policy development rather than being treated simply as a minor implementation issue. How we provide the information and what we tell consumers lies at the heart of the informational approach and cannot be viewed as an incidental task.

Perhaps the most important guiding principle is that our objective is to inform consumers and to enable them to make better decisions. If we keep this objective in mind, we will avoid the distortions created by overly conservative interpretations of scientific evidence as well as excessively alarmist warnings that are intended to jolt consumers into action. The California initiative has created an opportunity for a truly major national advance in food risk policy. To take advantage of this opportunity we must develop a policy that better reflects an understanding of how individuals make decisions under uncertainty.

Conclusion

Examination of the principles for hazard warning policy designs and the alcohol and food cancer risks case studies indicates that the task of developing an effective risk communication is not a trivial undertaking. When engaged in such an effort, one should be cognizant of the underlying economic problems that individuals are attempting to solve. People are making choices under uncertainty regarding precautionary actions that they can take to reduce these risks, where one could include among these precautions a decision not to use a product at all. Warnings will play a constructive role to the extent that they provide new information regarding risks and precautions in a manner that recognizes the
cognitive limitations that individuals have both in terms of processing risk information and making subsequent decisions.

Although it is straightforward to develop sound guidelines for designing hazard warnings systems, two major efforts along these lines in the food and alcohol area have failed to serve as models for sound warnings efforts. Their major deficiency is that the structure of the warnings efforts were not dictated by recognition of the economic and psychological contexts of the risk-reducing decisions of consumers. Rather, the warnings language tended to be dictated by particular constituency that had lobbied to secure the initial warnings policy. This intrusion of political factors on warnings language represents a major danger that has not yet been generally recognized in the hazard warnings literature.

It should also be noted that our knowledge of the manner in which individuals can process information reliably is still in its nascent stages. There have been a variety of studies in recent years documenting inadequacies in risk perception and shortcomings in individuals' information processing capabilities. What is needed is a better understanding of this intervening cognitive black box to assist in designing hazard warnings efforts that will remedy the informational shortcomings that have been identified.

Notes

1. For an introduction to these issues see Viscusi and Magat (1987).
2. The classic work in this area is by Stigler (1975).
4. Ibid.
5. Ibid.
10. For a broader discussion, see Fischhoff et al. (1981).
11. A more detailed analysis of this issue appears as W. Kip

12. See Hearings before the Subcommittee on the Consumer, op.cit.
13. Ibid.
15. 1985 Gallup Poll.
16. Ibid.

References


