Risk communication: factors affecting impact

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The impact of risk communication depends upon a complex interaction between the characteristics of the audience, the source of the message, and its content. Audience perception of risk is influenced by demographic factors (e.g., age, gender), personality profile, past experience, and ideological orientation. It is also affected by cognitive biases (e.g., unrealistic optimism) and lay 'mental models' of the hazard. For food hazards, the important dimensions of risk are controllability, novelty, and naturalness. The source must be trusted for a risk message to be effective. Trust is associated with believing the source is expert, unbiased, disinterested, and not sensationalising. To maximise impact, risk communications must have a content which triggers attention, achieves comprehension and can influence decision-making. It must be unambiguous, definitive, and easily interpretable – rarely achievable particularly when risk is shrouded in scientific uncertainty. Risk messages initiate social processes of amplification and attenuation, consequently their ramifications are rarely controllable.

Public concerns about the safety of food have grown enormously in recent years. The average consumer is now faced with a plethora of messages that suggest that food is dangerous. In some cases, it is the natural constituents of the food that are said to be hazardous: fat, sugar, alcohol. In others, it is the unnatural constitution of food that generates anxiety: genetically modified organisms – so-called, Frankenstein foods. Some types of food processing arouse suspicion, for instance, irradiation. Additives (for example, colourings) are claimed to have unanticipated health consequences. Above all, contaminants (like BSE, salmonella, listeria) are feared. Food is now widely recognised to be risky.

Achieving effective risk communication concerning food is consequently becoming increasingly important. ‘Risk communication’ is the label used to refer both to the content of any message concerning a hazard and the means of delivering that message. Typically, risk communication may provide an estimate of the likelihood that a hazard will result in something undesirable happening and/or an estimate of the extent of the damage that may be caused. Risk communication can be considered effective if it alerts the target audience (whether the public in
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general or particular at risk populations) as to what is hazardous, the extent of the danger and what should be done to protect oneself. It should do this without arousing unnecessary anxiety. Some of the factors which determine the efficacy of risk communication efforts have been systematically examined by social scientists and this paper summarises some of their findings.

Risk perception

In order to understand the impact of risk communication, it is useful to know something about the basis for risk perception. In general, judgements about perceived risk and its acceptability are a function of: (i) a variety of qualitative aspects of the hazards, such as levels of perceived control and voluntariness, or catastrophic potential; and (ii) demographic characteristics, individual attitudes, or cultural and institutional affiliations.¹ ²

There is some evidence that these general principles apply to perception of food hazards.³ ⁴ Hazards are typically conceptualised on two key dimensions. The first reflects the level of dread they arouse and is associated with assessments of whether the hazard: (i) is controllable; (ii) involves involuntary exposure; (iii) has impact which is globally catastrophic; (iv) impacts upon future generations; (v) is inequitable in consequences; or (vi) has an increasing probability of occurrence.

The second reflects level of knowledge of those exposed and is associated with whether the hazard: (i) is new; (ii) observable; (iii) known to science; or (iv) has delayed effects.

Fife-Schaw and Rowe⁴ showed that many food hazards were conceptualised by the public in terms of these two dimensions (which they characterised as control and awareness). However, they also found a third dimension was important in the conceptualisation of food hazards: the extent to which the hazard was considered naturally occurring or a product of human interference. Figure 1 illustrates how different food hazards might sit within this three dimensional matrix. Of course, their position in the matrix reflects how they are perceived by the public and not necessarily how they would be located by a technical risk assessment. Since in thinking about food hazards, people focus upon these three dimensions, in constructing risk communication messages it is also necessary to take them into account.

Gender, ethnicity, age, socio-economic status and geographical region are potential sources of demographic variation in risk perception. To date, however, the only established differences in food risk perception are associated with gender. Women perceive most food hazards to entail greater risk than do men. The difference is greatest with regard to
technological hazards (for example, genetic modification). There is also some evidence that older people are more concerned about the risks of food poisoning (perhaps because they are targeted for information about such hazards given their susceptibility).

Other types of individual differences have been found to be tied to risk perception. For instance, there is a relationship between the personality trait of venturesomeness, past experience of specific hazards and perceived characteristics of certain voluntary and involuntary hazardous activities. Involuntary risks are more likely to be perceived as more unfamiliar and uncontrollable by those who have greater personal experience of hazardous activity. Greater venturesomeness is associated with perceiving involuntary risk activities as having delayed effects and being unfamiliar. Adherence to particular belief systems also affects risk perception. Not surprisingly perhaps, individuals who have ‘green’ environmentalist beliefs are more likely to perceive environmental hazards to be more serious and uncontrollable. Anthropological work has suggested a series of five ‘world views’ or social orientations characteristic of different cultures that will predispose individuals to have differing perceptions of risks: hierarchical, egalitarian, individualist, fatalist and hermit. Differences in personality type, past experience, general attitudes and world views, and adherence to particular belief systems also influence risk perception.
view may need to be taken into account in designing risk communications which have optimal impact.

However, the relationship between risk perception and personal involvement with a hazard is not simple. For instance, if the object which is jeopardized is of great personal importance and the risk cannot be controlled by the individual, under-estimation of the degree of risk will often result. This suggests that denial (or motivated reconstrual) may play a part in risk perception. A well-documented bias in risk perception supports this suggestion. Weinstein summarises evidence that people display unrealistic optimism (labelled optimistic bias) about their personal risk levels. Essentially, most people consider themselves less likely to suffer from any particular hazard than other similar people. Optimistic biases are prevalent in life-style food hazards (such as high fat diets and domestic food poisoning). This and other cognitive biases in personal risk perception are important since they may seriously hinder efforts to communicate about risks and to promote risk-reducing behaviours.

The structure of risk communication

There is an extensive body of social psychological research which examines the factors that affect the persuasiveness of any communication. The effectiveness of a message is a function of the interaction of: (i) characteristics of the audience; (ii) characteristics of the source of the message (most importantly its perceived competence and trustworthiness); and (iii) content of the message. This interaction is complex. With regard to risk communication, some aspects of the interaction have been analysed.

Mental models of hazards

Some characteristics of the audience that are likely to be important in risk communication have been summarised above. In addition, considerable work has been done to develop methods which allow examination of the ‘mental models’ which individuals use in their appreciation of hazards. The ‘mental models’ approach seeks to identify for a particular hazard both accurate and inaccurate beliefs that are held by a target population. These are then used as the basis for developing risk communication material that will correct misunderstandings. In this approach, the object is to bridge the gap between lay and expert models of the risk by adding missing concepts, correcting mistakes, strengthening correct beliefs and minimising peripheral ones. The approach is claimed to adhere to three tenets: (ii) the audience needs to be offered a basic understanding of the exposure, effects, and mitigation processes relevant to making decisions.
about the hazard; (ii) the existing beliefs of the audience are assumed to affect and interpret any new information; and (iii) new information must be presented in a such a way as to be consistent with the levels of understanding (textual or other) that is manifest in the audience.

Essentially, the mental models approach argues that people have an intuitive understanding of risks and that they can be helped to a better appreciation, and consequently be placed in a position to make more informed decisions, if they are given new information in a format that is consistent with their initial belief system. The mapping of the initial belief system about the hazard that is the target for risk communication is thus crucial\textsuperscript{14,15}. There are now several publications which describe in detail how mental models may be corrected\textsuperscript{16,17}.

The particular value of the mental models approach for risk communication is that it requires one to think in terms of a complex interacting system of beliefs which underpins risk appreciation. In order to have its desired impact, any information provided by a risk communication must be designed so as to take account of the way in which the entire system of beliefs will respond. Successfully shifting one belief in the system may not ultimately bring about the desired outcome because other elements in the system dampen any impact of movement in one. Figure 2 depicts a very basic lay mental model of the perceived risk of food poisoning associated with eating chicken. It should be noted that this is not a simple causal model that links the food source to exposure to illness. It recognises that exposure can be controlled by certain hygienic and preparative precautions. It also recognises that failure in hygiene precautions can result in exposure without direct consumption of the food source (e.g. through transmission via cutting boards, unwashed hands, or

\begin{figure}[h]
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\caption{Simplified mental model of a food hazard.}
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dish-cloths). Most importantly, it has as an integral part of the model subjective assessments of the costs of taking precautions and assumptions about personal immunity from illness caused in this fashion. Assessments of subjective immunity may even result in re-interpretation of apparent symptoms of food poisoning. If the person harbours expectations of immunity, symptoms can be re-interpreted as the product of over-eating or drinking too much. Any effort at risk communication directed at the person who held a mental model of high subjective immunity would need to take account of the motivational as well as the informational elements it entails.

**The source of the risk communication**

Impact of the characteristics of the source of risk communication have also been examined. The source of a risk message must be trusted if the communication is to have its desired impact. Trust is associated with believing that the source is expert, knowledgeable, unbiased, has no vested interest in the hazard and is not seeking to sensationalise the hazard. The public have been shown to hold quite strong opinions about the level of trust they attribute to different sources of information about food hazards. Some hazards aroused greater distrust than others irrespective of the source, notably natural toxins, genetic engineering and pesticide residues (it should be noted that the data quoted here were collected prior to recent upsurges in concern about organophosphates and GM crops). Nevertheless, across the overall range of hazards, university scientists proved the most trusted source, with medical doctors a close second and consumer organisations third. The least trusted source was tabloid newspapers, followed by MPs and government ministers and then government ministries. However, trust in sources did vary across hazard types. Distrust increased when, for particular hazards, sources were expected to have vested interests or less knowledge. Medical sources were more trusted in medically-related areas, less so in technological risk assessment. This suggests that the choice of source for risk communication should be carefully matched to the nature of the hazard. Such information suggests that the public clearly has a sophisticated understanding of the motives that may predispose sources to bias their risk communication.

**Content of the message**

The impact of the content of the risk communication message has been studied. Much empirical research has focused upon the design of hazard
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warnings, and particularly upon product warning labels. There is now a large literature upon the manner in which information should be presented in order to have maximum intelligibility. This work has in the main used an information processing paradigm. Information processing conceptualisations make the assumption that, when new information is given to an individual, it must trigger attention, then achieve comprehension and can only then influence decision making (though the nature of this influence will depend upon a subjective evaluation of the costs and benefits of any change). Given these assumptions, the information processing paradigm has resulted in much research which has catalogued the design features of messages which may increase the likelihood that they gain the audience’s attention. This work has highlighted the significance of novelty, font size, icons, signal words, colour, contrast and location in designing hazards warnings. However, the attention grabbing power of any single characteristic has been found to be dependent upon both physical and social context. There appear to be no foolproof design features that will inevitably work to galvanise attention. Turning to issues of comprehensibility, in many respects, the conclusions drawn are unremarkable: information needs to be unambiguous, definitive and easily interpreted by those who need to attend to it. This tends to argue again for the need to pay attention to the mental models of the hazard held by the target audience. Evidence about what must be done in order to motivate individuals to change their behaviour once they have attended to and comprehended risk information is less conclusive. Changes in levels of knowledge about a hazard are not found to correlate simply with modifications in behaviour. Familiarity with and habituation to a hazard are particularly likely to reduce the effectiveness of hazard warnings. This is particularly important in relation to food safety hazards since the source of danger is such an ordinary part of everyday life.

Recent research has focused specifically upon the effect that admissions of uncertainty have upon the reception of risk information. This is obviously of considerable importance since for many types of hazard the actual risks are uncertain. The health risks associated with various meat products following the identification of BSE have not been completely determined. There is still great scientific controversy about what is safe and what is not. In such a situation, the risk communicator has to decide how to express uncertainty. Decisions must be taken in the knowledge that the public in general wants certitude when dealing with hazards. Studies thus far suggest that the impact of admissions of uncertainty may result either in the information offered being taken more seriously and trusted or in the information being ignored or rejected. The way that an admission of uncertainty is interpreted depends on who is making the admission. A trusted source that admits uncertainty may lose absolute authority but enhance credibility. An untrusted source that admits
uncertainty may become more suspected since the expression of uncertainty may be interpreted as a desire to hide the full facts\textsuperscript{20}. The impact of admissions of uncertainty also appears to depend upon how the admission emerges. If it is freely given, it is more likely to enhance trust. If given only after unexpected disclosures by other sources or under duress, it is likely to damage trust. The dilemmas facing risk communicators when they admit uncertainty cannot be eliminated. Yet neither can the need to acknowledge uncertainty. Much more research is needed that will examine how and when uncertainty should be explained.

**Social amplification of risk**

The major obstacles to anticipating and controlling the impact of any risk communication arise because it does not occur in a social vacuum. Once public, information about a hazard is subject to all of the normal social influence processes. The Social Amplification of Risk Framework (SARF) was devised in 1988\textsuperscript{21} to provide a more comprehensive and systematic approach to analysing how risk and risk events interact with psychological, social, institutional, and cultural processes in ways which intensify or attenuate risk perceptions and concerns and, thereby, shape risk behaviour, influence institutional processes and affect risk consequences. Examples of hazards which have been subject to social attenuation of risk might include naturally occurring radon gas, automobile accidents, and smoking. Social amplification of risk perceptions appears to have occurred in relation BSE/CJD and GM foods.

Figure 3 provides a simplified schematic representation of the elements considered to interact within the SARF. In the SARF, a hazard or risk event is said to become known either through direct experience or, more frequently, through communication via others (whether informal social networks or institutional information providers, such as the media or education systems). These sources of communication create the risk representation. In generating the representation of the risk they enhance, filter and reconfigure information. Once available, this initial risk representation will be subject to further processes of refinement, reinterpretation and elaboration both at the level of the individual (psychological filters) and of the cultural or social group (social filters). These processes of psychological and social filtration are not independent; they interact, sometimes reinforcing, sometimes counteracting each other. The revised risk representations they produce may stimulate changes in behaviour at both the individual and societal levels. Individuals may cease some activities, organisations may change their structures or alter commercial plans, governments may introduce political or legislative...
change. Each type of behavioural response may have secondary impacts (ripple effects). Changes in individual patterns of consumption may cause major disruption of markets, legislative revision may encourage up-swing in litigation, new political policies may engender social disorder. These ripple effects mean that changes in risk representations can have substantial geographical and temporal extension impacts. The system is also reflexive. Secondary impacts may modify the nature of the original hazard or significantly modify the way it is represented subsequently. Individual and societal responses may serve to shift how psychological and social filters are operating to mediate risk representation.

The SARF is a useful analytical tool when considering how risk communication messages may need to work. At first sight, it suggests that risk communication is not a controllable process. The originators of a message may feel that they can rarely do much more than set it adrift on a sea of social amplification and attenuation. However, there is no reason for complete despair. In relation to specific hazards, it may be possible to identify how the risk representation will be modified as it is transmitted on by various social agents. For instance, the role of the media in risk amplification already has been reasonably well-documented for some hazards. Interestingly, it has been shown that the extent of media coverage is not related, in any simple manner, to increases in public
Concern about a hazard. Trust in the media concerned may be mediating the tendency for public anxiety to grow. If this type of analysis can be done systematically for other parties in the process, it may be possible to use SARF to improve the design of risk communication. The SARF currently includes no predictive model of the relationships between different mediators of risk representations or how they influence each other. It does not incorporate any of the many theories that try to explain how social influence occurs. Development of SARF to explain the processes underlying amplification/attenuation so as to allow causal pathways to be tested is overdue.

The SARF is useful in emphasising that risk communication is not a one-way process. It is not even a just two-way process. It is a multi-dimensional process. In the so-called ‘information society’ the choice of sources for risk representations is virtually infinite. The opportunities for individuals or relatively powerless groups to respond to risk representations and to be heard by others is growing as the channels of communication become more diverse (particularly through the internet). This suggests that official sources of risk communication may expect even less control in the future than they have currently. It also suggests that instead of regarding amplification and attenuation processes as aberrations that need to be eliminated, official sources of risk communication will need to position their messages carefully within the system, capitalising upon processes they recognise to be inevitable.

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