COMMUNICATING ABOUT RISKS TO PUBLIC HEALTH:
Pointers to Good Practice

Summary

Communicating about risks to public health can be of vital importance in many different contexts, in government, the NHS, local authorities, and the private and voluntary sectors. Because communication needs to be considered at all stages of risk analysis, it should concern all those dealing with actual or potential public health risks, including managers, administrators, medical staff and scientific and policy advisors.

This document brings two main perspectives to bear. One is that offered by empirical research on reactions to risk. This provides guidance, for example, as to what influences trust, which types of risk are most likely to be seen as unacceptable or outrageous, how information about probabilities may be understood or misunderstood, and why comparisons between different risks are sometimes misleading. This psychological perspective is extended by considering the wider context - for example the role of the media in determining why some risks rather than others become major public “issues”.

The second perspective considers risk communication as a decision process. From this follows the need to consider communication earlier rather than later, to have clear objectives and to keep them under review, to ensure that policy is agreed internally, and to have mechanisms to evaluate outcomes. We also stress the need to guard against taking too narrow a view of the risk issues themselves and hence choosing the wrong message, as distinct from choosing the right message but failing to convey it.

Decisions about communication involve much more than just the choice of words and numbers. The aim is to provide "pointers to good practice" based on well-established research that can be adapted to individual circumstances. There is no recipe for success, but they should help avoid some common pitfalls.

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1: INTRODUCTION

1.1: Aims of the Document

The need to communicate about risks to public health - real, alleged or potential - is widespread throughout Government, the NHS, Local Authorities and.the private sector. Many campaigning groups and charities are also engaged in debates about risk. Obvious policy areas include the safety of foods and medicines, control of infectious diseases, and of risks from pollutants or natural hazards. Transport has its own set of safety issues, as have work-related risks. Then there are the risks arising from crime, and debates over "lifestyle" risks from smoking, poor diet or dangerous sports. Clearly, some issues turn out to be extremely contentious, in ways that can seem unpredictable. Debates about health risks are seldom *only* about communication, but poor communication is very often a factor. From one point of view, the public - egged on by the media - may be accused of ignoring perfectly sensible advice. From the other, those "in charge"may be seen as untrustworthy and secretive, prone to ignoring perfectly reasonable concerns - or "nannying" on the basis of flimsy evidence.

However recent years have also seen progress in understanding the process of risk communication and an emerging consensus on some of the practical lessons. These "pointers to good practice" draw on established research in order to:

- help identify issues likely to raise risk communication challenges, so that effort can be concentrated on those cases likely to need most care;

- provide general guidance about risk communication strategies, and some specific points about the use of words and numbers;

For reasons which will become clear, we take a wide definition of "communication", rather than dealing purely with the preparation and release of announcements. Our emphasis on risks to *public* health implies a need to communicate with substantial numbers of people (if not the *whole* public, perhaps everyone living near some alleged hazard, or suffering from some ailment, or served by a particular hospital). However some of the same principles apply to one-to-one communication in a clinical setting, and some comments on this are offered at various points. In some settings - for example following discovery of some risk of in-hospital infection - public and individual communication become intertwined. Indeed, the course of a public health episode may depend critically on whether the individuals most affected feel they were kept properly informed, and how their feelings are reflected in media coverage.

Communicating about risk can be a challenging task, and there is no step-by-step recipe for success. It is not difficult to find instances in which poor communication has had huge human and financial costs. However there is no justification for presuming that messages will always be misunderstood or disbelieved, *and that nothing can be done to mitigate this*. This booklet aims to combine relevant information with overall principles, in a form that can be adapted to specific circumstances.

1.2 Basic Approach

Public reactions to risk sometimes seem bizarre, at least when compared with scientific estimates. Though risk may technically be defined as "probability times severity of harm", the suggestion that a hazard poses an annual risk of death of "one chance in x" may cause near-panic or virtual indifference. However such reactions are not totally unpredictable - or even *necessarily* unreasonable. Over the last thirty years, an extensive body of research has grown up, and some useful results established. Before going into any detail, it is important to note a progressive change both in the research literature and in the practice of risk communication*:*

- *from* an original emphasis on "public misperceptions of risk", which tended to treat all deviations from expert estimates as products of ignorance or stupidity,
- *via* investigation of what actually does cause concern and why,
- *to* approaches which promote risk communication as a two-way process in which both "expert" and "lay" perspectives should inform each other.

There is thus an increasing recognition of the need to acknowledge and engage with a variety of defensible views on risk. This is not to deny that public misperceptions exist: people may sometimes be most fearful of the "wrong" hazards. Even if the aim is to change such views, however, one needs to understand how they arise. More fundamentally, misperceptions do not affect *only* "the public". There is good evidence to suggest that everyone - public and "expert" alike - is fallible when thinking about risk, and fallible in some predictable directions.

Another key theme is that risk communication is about much more than choice of words and numbers. Of course these remain vitally important - and the source of much angst, confusion and recrimination. So formulating the message and presenting it effectively is still essential, but only as part of a wider process. Effective communication needs to be an integral part of risk assessment and management, not an add-on to be contemplated once the important decisions have been made. Risk policy that overlooks stakeholders' basic concerns cannot usually be saved by good communication techniques late in the day - though much effort can still be brought low by a "killer headline".

We therefore argue for an ideal of *two-way* communication, *throughout* the process of risk assessment and management, both as a way of enhancing trust and as a guard against taking too narrow a view of the issues. Getting close to such an ideal - requiring both openness and a commitment to forward planning - has implications for both organisational culture and design. These are areas beyond the scope of this booklet. But if culture and structures inhibit good risk communication, recent history in both the public and private sector suggests that the price may be high.

1.3 Success and Failure

In seeking to improve practice - just as in specific communications - it is important to be clear about what can be achieved. Better communication is no panacea: it will not

necessarily resolve conflict, guarantee understanding or cause people to behave in ways with which one agrees. However, it can:

- clarify the nature of disagreements, and restrict their scope
- help people to make more considered decisions
- minimise resentment caused by people feeling excluded from decisions that affect them.

Even these limited aims call for long-term efforts across an organisation, rather than being amenable to a "quick PR fix". Nevertheless, there are specific pitfalls to be avoided on a case-by-case basis. Their consequences can be all too clear: warnings that fail to warn (or cause unforseen panic), reassurances that fail to reassure, and advice that is discounted. In addition, there is cumulative damage to institutional credibility.

It is also instructive to distinguish between failures in which a "correct" message is misunderstood or disbelieved and those in which the message itself is flawed. In taking a broad view of risk communication, it is important not to dwell exclusively on success or failure in "getting the message across". Sometimes messages are biassed by wishful thinking, say, or overturned by later scientific information (suggesting a failure to allow for uncertainty in the first place). Or the message may be factually correct, but be based on a misunderstanding of people's values. While there is no way of guaranteeing against such pitfalls, the material presented here provides some suggestions.

2 RESEARCH FINDINGS AND THEIR IMPLICATIONS

2.1 Trust, Emotion and Openness

In most circumstances, messages are judged first and foremost not by content but by source: *who is telling me this, and can I trust them?* If the answer to the second question is "no", *any* message is liable to be disregarded, no matter how well-intentioned and well-delivered. Indeed there is even some evidence that well-presented arguments from distrusted sources actually have a negative effect - as if people conclude that the sender is not only untrustworthy but cunning.

Many recent studies document a decline in trust in scientific expertise. Reliance on scientific credentials *alone* is therefore unlikely to work. There are no known ways of generating instant trust, but the literature does offer some strong clues as to how it is won or lost. Firstly, actions often do speak louder than words: judgements about trust will depend on what is done as well as what is said. This applies not only to the actions actually being taken to deal with a risk, but also to the *manner* adopted. Organisational "body language" is important: appearing to act only under pressure, for example, can be fatal. Also important is *emotional tone* - again often conveyed both by words and actions. To engage with an outraged audience, for example, it is first necessary to acknowledge the outrage. Failure to recognise this commonly exacerbates the problem of trying to

inject"cold, detached" scientific findings into a highly-charged atmosphere.

Though trust is easily lost, building it is a long-term, cumulative process. Short of a reputation for infallibility, the single most important factor is probably *openness*. This involves not only making information available, but giving a candid account of the evidence underlying decisions. If there are genuine reasons for non-disclosure of data, the reasons need to be given both clearly and early on. The point is that there should be a *presumption* in favour of disclosure.[1] There is also a need to consider the openness of the decision *process*. Can outsiders see how decisions are reached? Who gets to contribute, and at what stage? There is a reluctance to trust any system that has the appearance of a "closed shop". People need to know that their own concerns - and their own understandings of the risk in question - can be heard, and be taken seriously.[2] Those who feel belittled, ignored or excluded are liable to react with hostility even to full disclosure of information.

To summarise:

- *Messages are usually judged first by whether their source is trusted.*
- *Intentional communication is often only a minor part of the message actually conveyed.*
- *Responses to messages depend not only on content but also on manner of delivery, especially emotional tone.*
- *Experts no longer command automatic trust, no matter how genuine their expertise*
- *Trust is generally fostered by openness, both in the sense of avoiding secrecy and in being ready to listen.*

It is not hard to find studies featuring distrust of Government. Doctors start with much higher credibility, but reactions to high-profile incidents (e.g. "HIV-positive surgeons") shows how fragile even this can be. However research has also shown trust to be multi-faceted, with relevant factors including perceived competence, objectivity, fairness, consistency and goodwill. Particular sources may score differently on these dimensions. Thus industrial and commercial sources are frequently seen as competent but potentially biassed. Perceptions can also depend on the issue at stake. For example, there is evidence of both the Department of Health and DETR being rather *highly* trusted when it comes to radiological safety - more so than environmental campaigners.[3] Stated level of trust may also fail to match actual effects on behaviour. The overall point is that black-and-white judgements are not inevitable. There are plenty of cases in which a fair degree of trust has been maintained even in difficult circumstances. However there is strong evidence that if trust *is* lost, re-establishing it is a long and uphill task.

2.2 Risk Perceptions: "Fright factors"

Why do some risks trigger so much more alarm, anxiety or outrage than others? This has been the topic of a large volume of research, and some fairly well-established rules of thumb have emerged. These can be summarised by the "fright factors"shown in Box 1, which combines the most significant items from several existing analyses. (Terminology varies somewhat: for example some authors group several factors together under the label "dread", which is used in a narrower sense here.)

Box 1: Fright Factors

Risks are generally more worrying (and less acceptable) if perceived:

1. to be **involuntary** (e.g. exposure to pollution) rather than voluntary (e.g. dangerous sports or smoking)
2. as **inequitably distributed** (some benefit while others suffer the consequences)
3. as **inescapable** by taking personal precautions.
4. to arise from an **unfamiliar or novel** source
5. to result from **man-made, rather than natural** sources
6. to cause **hidden and irreversible** damage, e.g. through onset of illness many years after exposure
7. to pose some particular danger to **small children or pregnant women** or more generally to **future generations**
8. to threaten a form of death (or illness/injury) arousing **particular dread**
9. to damage **identifiable rather than anonymous victims**
10. to be **poorly understood by science**
11. as subject to **contradictory statements** from responsible sources (or, even worse, from the same source).

It should be stressed that these refer to perceptions. What matters here is not (say) whether a risk is "really" involuntary, but whether it is seen that way. Debate remains as to which factors are most important in what circumstances. Strictly speaking, the separate factors are also interdependent rather than additive. For example, if no others are present,

the last two may invite a blasé response "anything *might* be risky, so why worry about this?".

Nevertheless, there is little disagreement that factors of this type are important much of the time. Because perceived risk is multi-dimensional, numerical measures (e.g. annual mortality statistics) will never be all-important. The more positive point is that reactions are far from random. It certainly should not come as a surprise when risks scoring highly against Fright Factors provoke a strong public response. These are the classic ingredients for a "scare". Conversely, it will be difficult to direct attention to low-scoring risks.

To summarise:

- *People see risk as multi-dimensional, rather than being captured in a single numerical measure*
- *Fright Factors provide indicators of which risks cause most alarm.*
- *They can therefore be used to help predict responses and prioritise attention to different issues.*

2.3 Risk and Values

Though Fright Factors may highlight certain types of risk at the expense of others, there is no basis for dismissing them as unreasonable *per se*. They may indeed reflect fundamental *value judgements*. Deaths, for example, are not all the same: it would be perverse to insist that risk of a fatal cancer "should" carry no more dread than the prospect of a sudden heart attack. Similarly, willingness to accept voluntary risks may reflect the value placed on personal autonomy. In this context, risk often has positive attractions: mountaineers and racing drivers take precautions to limit the risks they take, but facing *some* risk is undeniably part of the fun. The general point is that responses to risk are dependent not only on context, but on personal values, political and moral beliefs, attitudes toward technology, and so on. All help determine which fright factors most frighten and what sources (and forms) of information are trusted.

Clearly, people's beliefs and values differ widely. Though quite good indicators of the overall public response to risks, the Fright Factors are therefore only weak predictors of how *any individual* will react. This can depend strongly on approval or disapproval of the source of risk on other grounds. Those who love (or hate) the motor car anyway are usually more (or less) sanguine about its health risks. Similarly, debates about nuclear power are about more than just risk, or even "risk-plus-fright-factors". At the other end of the scale, emphasising the dangers of drug abuse will have no effect on those who relish personal risk - any more than teenagers playing chicken on the railway line will be deterred by the sober revelation that it is dangerous.

Though the last may be an extreme example, all highlight the further point that perceived *benefits* matter. Possible negative outcomes are, after all, usually only half of the

equation. Benefits need not be material goods - "intangible" examples include convenience (open-platform buses are popular, despite the acknowledged risks). Indeed, there is evidence that people often respond to safety measures (e.g. more effective brakes on cars) by taking benefits that return their risk to its previous level (driving faster).[4] Value judgements pervade both risk and benefits, the more so since *purely* personal risks, literally affecting nobody else, are a rarity. Decision-makers, beneficiaries and potential victims are typically all different, making social and political value-judgements unavoidable. For some people, "involuntary, inequitable and inescapable" are not *just* fright factors, but characteristics of unacceptable behaviour.

To summarise so far:

- *Responses to risk are intimately bound up with wider values*
- *Isolated "facts" about risks may therefore have little impact on debates about their acceptability.*
- *Attitudes to risk depend critically on perceived benefits - or lack of them.*
- *Where risks are seen to be under personal control, reduction may not be wanted: people may prefer to take other benefits, or even welcome risk.*

The recognition of individual values also threads through recent thinking on clinical risks. There is ample evidence both of patients wanting more open discussion, and of massive differences in values. Some may be absorbed by the risks inherent in their disease, others more by side-effects of treatment, possible medical errors, or simply being in the care of strangers. Specific risks may be weighted quite differently against each other and against potential benefits. Hence increasing support for shared decision-making, with doctors providing factual information and patients applying their own values. However individuals also differ in their beliefs about responsibility for choice. Some still see this as part of the professional's duty, while others wish to become "expert" in their own disease and feel frustrated if not helped to do so. Communication about basic values is needed to clarify the sort of relationship needed.

The public health sphere presents the additional difficulty of communicating with many people at once. Rather than simply considering "the public" as a homogeneous mass, there is a need to consider the possible values held by key stakeholders or audiences. One attempt to categorise overall attitudes to risk is that of *Cultural Theory.* This distinguishes:

- *egalitarians*, who tend to see the balance of nature as fragile, to distrust expertise and strongly favour public participation in decisions,
- *individualists* who want to make their own decisions and see nature as robust,
- *hierarchists* who want well-established rules and procedures to regulate risks and tend to see nature as "robust within limits", and

- *fatalists* who see such life as capricious and attempts at control as futile.

Such views are also confirmed and reinforced through social interactions, whether between egalitarian members of a campaigning group, hierarchists working as risk regulators or fatalists seeking mutual sympathy at the pub. The theory is not without its critics: as more recent versions recognise, people seldom conform *consistently* to any of the four ideal types. They are also usually members of varied social groups, as any CV will show ("professional librarian, occasional environmental activist, keen rock climber....."). Most people are capable of putting on individualist, hierarchist, egalitarian or fatalist "spectacles". However, it is not always clear what triggers particular ways of looking at an issue.

Predicting individual responses to specific issues therefore remains elusive. The same can be true even of organisations: for example a consumer group might take a view stressing freedom of individual choice or the need for protective regulation. Despite such caveats, Cultural Theory may provide a useful heuristic: for example it may be worth considering how a strong individualist (or egalitarian, say) would react to a proposed message, and seeking arguments to counter major objections.

To summarise:

- *"The public" is not a single entity. It is essential to consider different possible ways of seeing risks.*
- *The categories suggested by Cultural Theory can be useful in this role, though not as rigid classifications of individuals.*
- *Wide acceptance may need a portfolio of messages with conclusions supported by different lines of argument - as well as styles of delivery.*

2.4 Risk Comparisons: Use and Misuse

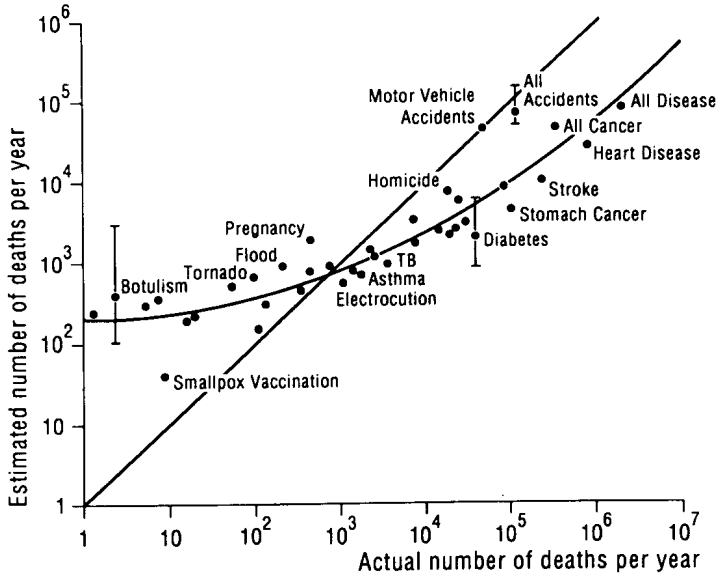
One popular communication tactic is to juxtapose data on different risks, for example that of death from an air pollutant, from smoking a single cigarette, driving 100 miles, and so on. A typical example is shown in Box 2. Sometimes comparisons have been put together to make risk "scales" or "ladders". The rationale is two-fold:

> Firstly, small probabilities are difficult to conceptualise: just how small, really, is "1 in 10^6, or "a probability of 0.00015"? Numerical comparisons might help.
>
> Secondly and more controversially, comparisons have been seen as a means of *correcting* perceptions. This has been partly prompted by psychological research to "calibrate" public perceptions of risk against real mortality statistics. As shown in Box 3, this reveals a general *over-estimation* of death due to unusual or dramatic causes (floods, tornados) and *under-estimation* of common killers such as heart disease.

Box 2:
Risks "Estimated to Increase the Annual Chance of Death by 1 in one Million"
(Source: Wilson, 1979)

Activity	Cause of Death
Smoking 1.4 cigarettes	Cancer, heart disease
Spending 1 hour in a coal mine	Black lung disease
Living 2 days in New York or Boston	Air Pollution
Travelling 10 miles by bicycle	Accident
Flying 1,000 miles by jet	Accident
Living 2 months in Denver (rather than New York)	Cancer (cosmic radiation)
One chest X-ray in a good hospital	Cancer (from radiation)
Eating 40 tbs. of peanut butter	Liver cancer (aflatoxin B)
Drinking 30 12-oz cans of diet soda	Cancer (from saccharin)
Living 150 years within 20 miles of nuclear power plant	Cancer (from radiation)

Box 3: Estimated and actual frequency* of deaths from various causes
(Source: Fischhoff *et al,* 1981)



* Note: *Data points show the averaged responses of a sample of US population. If estimated and actual frequencies agreed, the data would lie on the straight line shown, rather than roughly following the curve. Note that both scales on the graph are logarithmic: i.e. each division makes the risk ten times greater or smaller.*

Although the latter findings are well-established, their implications have been hotly debated. Some writers have used them to "prove" the public's inability to make sensible judgements about risks, an interpretation now largely discredited. By the same token, risk comparisons have acquired a very checkered reputation as practical aids to communication. Because they typically omit both the effects of Fright Factors and the values of the audience, they often "miss the point". They are also open to other criticisms. Returning to the table in Box 2 - which is still widely-cited - the common yardstick of a one-in-a-million chance of death is thought-provoking, but the table juxtaposes voluntary and involuntary risks and wildly different forms of death (accident, cancer). Furthermore, the numbers can give a false impression of precision. There is no indication that the figures may be highly uncertain, hotly-contested or both. Where, the sceptic may ask, do the numbers come from, and why should I trust them? Such concerns have led one leading source of data[5] to carry a repeated "health warning": USE OF THESE COMPARISONS CAN SERIOUSLY DAMAGE YOUR CREDIBILITY.

Clearly, comparisons are most relevant when they refer directly to alternative choices (nobody has to choose between going down a mine and living in Denver). Otherwise, caution is advisable. There is little solid evidence to show when comparisons might work well.[6] However a clear distinction should be made between simply providing a sense of perspective and using comparisons to imply acceptability - "you are irrational to worry about *this* risk when you happily accept *that* greater one." The latter is likely to backfire, especially if involuntary and voluntary risks are juxtaposed. (One employer assured women that occupational exposure to chemicals carried "no more risk to your unborn baby than a large gin and tonic". The ensuing outrage apparently came as a surprise.) Such comparisons seem both to trivialise the risk and patronise the audience.

One cannot stop people searching out figures to prove a point. But responsible use of comparative figures requires careful thought. If the aim is to give a rough idea of orders of magnitude, familiar comparators such as "about one person in a small town" for "1 in 10,000"may avoid some pitfalls of comparing different risks directly. These and other measures[7] have recently been developed into a "community risk scale" (Box 4): early trials suggest a favourable public response to this.

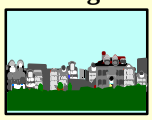
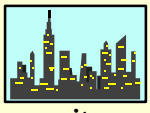
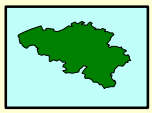
BOX 4 - See next page

On balance, it seems fair to conclude as follows:

- *Given a general tendency to exaggerate the risk of rare events, comparisons may help provide a sense of perspective.*

- *If comparisons do not directly relate to alternative options, they should however be treated with caution, especially if like is not compared to like.*

Box 4: Community Risk Scale

Risk Magnitude	Expect about one adverse event per	Examples: deaths in Britain per year from:
10 *(1 in 1)*	 person	–
9 *(1 in 10)*	 family	–
8 *(1 in 100)*	 street	Any cause
7 *(1 in 1 thousand)*	 village	Any cause, age 40
6 *(1 in 10 thousand)*	 small town	Road accident
5 *(1 in 100 thousand)*	 large town	Murder
4 *(1 in 1 million)*	 city	Oral contraceptives
3 *(1 in 10 million)*	 province/country	Lightning
2 *(1 in 100 million)*	 large country	Measles
1 *(1 in 1 billion)*	 continent	–
0 *(1 in 10 billion)*	 world	–

Source: Calman & Royston (1997)

- *Using comparisons to imply acceptability is dangerous. At all costs, flippant comparisons are to be avoided.*

- *The "community" scale may help set probabilities in context.*

2.5 Understanding Probability

Heuristics and Biases

Risk is essentially to do with chance - the likelihood of an unpleasant outcome. The accepted measure of likelihood is probability, and probabilities obey well-known mathematical laws. However the brain tends to manipulate them in ways that can ignore this logic. The problem is that simplified ways of managing information (or *heuristics*) serve well enough in most situations, but give misleading results in others. Left unchecked, they lead to various common biases in dealing with probabilities. Some of the most relevant are as follows.

- *Availability bias*: events are perceived to be more frequent if examples are easily brought to mind, so - as already noted - memorable events seem more common.

- *Confirmation bias*: once a view has been formed, new evidence is generally made to fit: contrary information is filtered out, ambiguous data interpreted as confirmation, and consistent information seen as "proof positive". One's own actions can also make expectations self-fulfilling.

- *Overconfidence*: we think our predictions or estimates are more likely to be correct than they really are. This bias appears to affect almost all professions, scientific or otherwise, as well as the lay public. The few exceptions are those who - like weather forecasters - receive constant feedback on the accuracy of their predictions.

There are also problems with combining separate probabilities. One of particular importance is illustrated in Box 5. Given the information presented, most people seriously overestimate the chance of the individual having the disease - the correct answer being about 17%, or just over a *one-in-six chance*.[1] The pitfall is to put too much weight on the

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[1] The mathematics of combining probabilities is governed by Bayes' Theorem. More simply, the answer in this case can be explained as follows:

> Consider 1000 people taking the test. On average 20 of them will actually have Blenkinsop's Syndrome, and all will test positive for it. Of the other 980, we should expect 10% also to test positive but without having the disease. There will thus be 98 false positives. Is someone testing positive one of the 20 true positives, rather than one of the 98 false ones? The chance is 20 in 118, or 16.9%.

An additional problem is worth mentioning. In the example, it was supposed that the base probability is actually known (by some independent measure such as the number of people eventually developing

reliability of the test (the 90%) and not enough to the small prevalence of the disease - the "prior" or baseline probability of 2%.

Box 5: Diagnosing Blenkinsop's

Blenkinsop's Syndrome is a particularly nasty disease affecting 2% of the population. Once symptoms have developed, it is generally too late for effective treatment, and death can be slow and painful. If caught early, there is an effective cure - but at that stage there are no warning symptoms.

Fortunately a test for Blenkinsop's has been developed, and a screening programme is in place. The test is a good one, in that anyone with the disease will test positive (there are no "false negatives"), while 90% of those without the disease will test negative.

Someone has just tested positive for Blenkinsop's. What is the chance that they actually have the disease?

Overcoming this pitfall is particularly important when communicating about increases or decreases in risk. The perceived message can depend critically on whether probabilities are given in *absolute* terms ("the chance was 2% and is now 4%") or *relative* terms (as in "the chance has doubled" or "this group suffers twice the normal risk of...."). The latter can be seriously misleading. To illustrate, suppose 10 million people are exposed to two fatal risks. News that Risk A has doubled may sound much more alarming than B increasing by 10%. But if the baseline probabilities of death from A and B are 1 in 10^8 and 1 in 10^4 respectively, doubling A produces one extra fatality, while the "smaller" increase in B kills 100.

- *Both experts and public are prone to biases in assessing probabilities (e.g. availability, confirmation, overconfidence).*
- *On getting new information, there is a tendency to forget about baseline probabilities.*
- *Relative risks sound newsworthy, but can be seriously misleading if the baseline risk is not clear.*

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clinical symptoms). In reality, this may not be the case. Repeated "supposed-positive" results might convince people that the disease is actually quite common. One would therefore have an exaggerated idea of the base rate, making subsequent positive tests look even more convincing.

Framing effects

Any situation involving risk can be "framed" in different ways, in terms of how the available information is mentally arranged. This can have a major - and often unrealised - effect on the conclusions reached.

A common example is that outcomes may be measured against different reference points - as with the bottle half-full or half-empty. The possible impact on decisions can be demonstrated experimentally by presenting the same choice in different ways. A typical study[8] presented people with a hypothetical choice between two cancer therapies with different probabilities of success and failure. Half were told about the relative chances of dying while the rest had the *same* information presented in terms of survival rates. This more than doubled the numbers choosing one alternative. Neither way of looking at the problem is *wrong*, but the results are strikingly different. Perhaps most strikingly, the effect was just as great for physicians as for the general public. Similar studies show consistent results. One specific point is that - like with gamblers who bet more wildly to recoup losses - people tend to make riskier choices if all alternatives are framed in terms of possible losses, but "play safe" if choosing between alternative gains.

More generally, it is worth reiterating the point that people can approach risks from completely different frames of reference. If a regulator sets some allowable maximum level for a pollutant, is it protecting the public from a risk, or legitimising one? Are we engaged in a negotiation, or a search for the best technical solution?

In risk communication, there are thus at least two variables: the framing of one's own messages, and recipients' existing framing of the issue. The former is, at least in principle, open to choice. The latter may not even be known, and will almost certainly vary between different stakeholders. One possible approach is to manipulate framing - as in many an advertising campaign. In the present context, outright manipulation is arguably unethical and, given the general distrust of "official" sources of information, probably impractical. Rather, the need is to avoid accidental mismatches in framing, either because the possibility has not been considered, or because too little is known. Ways of avoiding this include consultation exercises, small-scale piloting of messages, workshops to promote "assumption-busting", and direct research on public beliefs. An open communication process should also ensure exposure to alternative ways of framing an issue.

- *There are always alternative ways of framing situations involving risk, and it is dangerous to assume that one's own framework is shared by others.*

- *Responses to communication can be highly dependent on how the message itself is framed - e.g. "lives lost" versus "lives saved". This should certainly not be left to chance.*

- *In addition to specific investigation of how issues may be framed, greater awareness should result from consultation and two-way communication.*

2.6 Scientific and Lay Perspectives

One set of differences in framing that bedevils risk communication is that between a "natural science" perspective and that typically held by a lay audience. Overcoming this is not merely a matter of explaining the science in lay terms - important though this is. Arguably the most important difference (in clinical as well as public communication) is that scientists usually define risk in terms of effects on populations, while the lay audience is concerned with individuals.[9] Though both may be couched in terms of probability, this can disguise very different uses of the term. On the one hand lie statements about the incidence of a disease, and questions about the significance of any variation. On the other is the stark question "what is the chance of this making *me* ill?". Some will deny the difference by arguing that the latter question can only be answered in statistical terms. The communication problem then becomes one of educating the populace. However, there are logical - not just psychological - difficulties here. It is *not* necessarily valid to make a direct inference from group statistics to individual risks. To do so is to assume both that the individual is entirely representative of the population - has *no* relevant distinguishing features - and that the distribution of risk is truly random. Neither will be literally true, though they may be fair approximations.

The lay perspective is more likely to start from the presumption that "the average person does not exist". If the statistics can be broken down to show how a risk depends on age, sex, place of work, lifestyle and so on, the gap narrows. Even so, individuals may feel they escape such classifications. For example, personal experience may suggest that one is very sensitive to certain pollutants, and hence at greater risk.[10] Given that sensitivity can indeed vary widely, it would be rash to dismiss such beliefs. The problem is that science necessarily deals with reproducible effects and controlled conditions: from the opposite perspective this can look merely artificial - a problem often exacerbated by mismatches in emotional tone.

Two quite different notions of probability have some currency even within science.[11] The traditional definition in terms of *relative frequency* has increasingly been challenged by "subjective" (or "Bayesian") methods in which probability means *degree of belief* - an idea perhaps closer to the lay concept. In most circumstances - though not all - the two approaches give the same numerical results. Even so, different interpretations can cause confusion. A researcher might refer to a "one in a million" chance of suffering an illness from exposure to a pollutant, having in mind an estimate of about one extra case per million population, and meaning to imply nothing about the certainty of the estimate. The message may be heard as expressing confidence - near certainty - that the pollutant could not have caused an individual's illness. This would be a very different claim.

Finally, there can also be differences in the assumed onus of proof for cause and effect. Most of the time - though not invariably - scientists will accept the existence of a causal link only once there is good evidence for it. Until then, links are "provisionally rejected". The lay view is much more likely to entertain a link that seems intuitively plausible, and reject it - if at all - only if there is strong evidence against. The difference is partly one of values: is it worse to accept an erroneous link or reject a real one? In risk communication, the issue cannot be resolved simply by insisting that scientific viewpoint

is the correct one. In particular, public concerns are unlikely to be assuaged simply by reassurance couched in terms of there being "no evidence for" a causal link. To engage seriously with its alleged existence may require one, first, to acknowledge the face plausibility of a link, secondly to set out what evidence one would expect to find if it existed, and finally to show how serious investigation has not found such evidence. If the last two steps cannot both be provided, then a "no evidence" argument is anyway of little value. Even if they can, face plausibility often still beats absence of evidence.

- *Science usually defines risk in relation to large populations, but people seldom see such probabilities as applying directly to themselves.*
- *If there is evidence on how risk is spread, this should be given - whether it shows the spread to be even or uneven.*
- *Attention to different concepts of probability will help avoid misunderstanding.*
- *Scientists tend to reject causal links for which there is no positive evidence. The public will require strong proof against an intuitively-plausible link.*

2.7 Indirect Effects and the "Social Amplification" of risk

Events to do with risk can be likened to a stone dropping in a pool. Sometimes there is little more than the initial splash. Sometimes the *indirect effects* - caused, as it were, by the distant ripples - can far exceed the direct ones. This is most obvious with events such as accidents: it has been remarked that although "no-one died" at Three Mile Island, the nuclear malfunction there had huge indirect effects on the industry worldwide. An event gains significance not so much because of what has happened, but because of what it seems to portend. A classic example is seen in the *New Yorker*'s editorial of Feb 18th 1985 on the Bhopal disaster:

> "What truly grips us... is not so much the numbers as the spectacle of suddenly vanishing competence, of men utterly routed by technology, of fail-safe systems failing with a logic as inexorable as it was once - indeed, right up to that very moment - unforeseeable. And the spectacle haunts us because it seems to carry allegorical import, like the whispery omen of a hovering future."

The event thus becomes a *signal* - a warning that assurances are always untrustworthy, or that technology is out of control. What is less clear is why some events acquire such significance, out of all those that *could* do so. Risk *communication* can itself have its own indirect effects. If a health warning is issued on a prominent variety of cheese or wine, rival producers may rejoice at first. But their glee is typically cut short as they find that consumers also - unfairly! - shun *their* products. They may be forced to close or to lay off staff, with further indirect effects. Then there may be expensive attempts to restore confidence, political recriminations - perhaps international in scope - and so on. The social system has reacted in a way that *amplifies* the impact of the original risk.[12]

As to when these effects are most pronounced, the Fright Factors noted before will again be relevant. However additional features come into play once we consider the social system rather than only individual perceptions. The mass media clearly play a major role Reportage affects both perceptions of risk in general and how specific issues are initially framed. Then as an episode develops, reports of people's reactions to the original risk feed the indirect effects. However the mass media are not *all-important*. Professional (e.g. medical) networks are often also significant, as are informal networks of friends and acquaintances - the classic "grapevine". People typically trust the goodwill of family and friends more than any institutional source, while access to decentralised media such as the Internet increases the influence of self-organised networks. In any case, to blame "sensationalist reporting" for exaggerated fears is largely to miss the point. Media coverage may well amplify the public's interest in dramatic forms of mishap, but it does not *create* it. A "good story" is one in which public and media interest reinforce each other. It is difficult to see how this could be otherwise.

Research continues on why some particular stories about health risks "take off" spectacularly. Alongside the previous Fright Factors, the Media Triggers shown in Box 6 provide additional (though less thoroughly-researched) indicators.

Of the triggers listed, there is some evidence that the single most important is *blame*, particularly in keeping a story running for a long period. However each case may be affected by many factors, including chance (e.g. a shortage or glut of competing stories). Once a "story" is established, the very fact that there is interest in the topic becomes a related story. The result can be that reportage "snowballs" as media compete for coverage. Stories also sometimes have an "incubation period": interest can erupt some time after the actual event, catching out the unwary.

Box 6: Media Triggers

A possible risk to public health is more likely to become a major story if the following are prominent or can readily be made to become so:

1. Questions of **blame**
2. Alleged **secrets and attempted "cover-ups"**
3. **"Human interest"** through identifiable heroes, villains, dupes, etc. (as well as victims)
4. Links with **existing high-profile issues or personalities**
5. **Conflict**
6. **Signal value**: the story as a portent of further ills *("What next?")*
7. **Many people exposed** to the risk, even if at low levels *("It could be you!")*.
8. Strong **visual impact** (e.g. pictures of suffering)
9. Links to **sex** and/or **crime**

To summarise the lessons for communication:

- *Messages are not only picked up by their intended audiences.*
- *The behaviour of those influenced by the message will impact on others and modify their behaviour in turn*
- *There are identifiable triggers that tend to make media stories about risk "run" - especially controversies over blame.*
- *This may leave open several different ways of framing a "good story".*

The last point is of particular importance. Put crudely, a good story may require villains and heroes. But the casting need not be fixed in advance.

3. RISK COMMUNICATION AS A DECISION PROCESS

Risk communication involves making choices, whether in deciding what priority to give an issue, who to consult, or what words to use. Usually all possible options themselves carry risks - e.g. failing to warn, causing a panic. The need is to be aware of the (broadly-defined) risks and opportunities of different ways forward and to devise a coherent strategy on that basis. This requires attention to two interlinked processes:

- the *internal* process of identifying issues, planning how to deal with them, taking action, and monitoring results, and

- that of managing *external* relations - setting up consultation, engaging with other interested parties, etc.

3.1 Scanning, Prioritising and Preparation

Crisis conditions - combining time pressure, unexpectedness, and high levels of threat - almost always militate against effective decision-making. A key defence against crisis is to spot possible difficulties in advance. Where possible then, the aim should be to scan ahead, identifying possible risk communication challenges. In some cases, the timing may be reasonably certain (for example, a report on a particular issue may be due to appear two months hence), in others much less so. Effective scanning will usually identify many potential issues, not all of which can - or should - be given equal attention. "Fright Factors" and "Media Triggers" can be to set priorities.

At minimum, this process should provide greater opportunity for *internal* consultation between policy leads, managers, administrators, technical experts, medical staff, communications professionals and others.[13] The list will vary, but a variety of perspectives can be guaranteed. Differences in viewpoint can be used constructively to foster a broader view of the issues. Mismanaged, they provide sources both of resentment and of confusing and contradictory public messages from different sources within the oganisation. The damage done to external credibility by poor internal coordination is difficult to overstate Forward thinking will also be required in deciding when and how to engage with *external* stakeholders, and ensuring that the necessary resources will be available. Deciding in favour of "openness" will not make it simply happen.

One can never hope to spot all the relevant issues in advance: there will always be a need to "firefight". But in that context too, it should be possible to provide a rough-but-rapid diagnosis of *which* events carry the greatest danger of spiralling out of control. Even if precise predictions are not possible, there is no need to be routinely surprised by responses to messages about risks.

- *Communication should be routinely considered within risk analysis rather than waiting for an obvious "communication" issue to arise.*

- *Particular attention should be paid to risks scoring highly on Fright Factors and/or Media Triggers.*

- *Scanning ahead provides opportunities for internal discussion, lessening the risk of sending confusing and contradictory messages.*

- *If other stakeholders are to be involved, an early approach is generally most effective. Bear in mind that openness will need resourcing.*

3.2 Aims and Stakeholders

A decision-based perspective should highlight one key question: w*hat are we trying to achieve?* Answering it requires a clear view of who the relevant *stakeholders* are - those both affected by the issue and having some possible effect on it. The very exercise of listing stakeholders and how they might react can be highly informative in clarifying one's own aims. For example, these might include reassuring some sections of the public, persuade others to take certain actions and securing support from other influential bodies. One way or another, communication should relate to decisions - one's own, other actors' or both. Otherwise a quite natural response to being told about a risk is "so what?" - what are you doing about it, and what am I supposed to do?

The term "stakeholder" is used to direct attention beyond the intended *audience* for communication. Though tailoring messages to audiences is important, communication can have impacts on all those affected by the risk itself or by other people's responses to it. Politicians and the media are inevitably stakeholders in any major public health issue. So too are the public - though seldom as a homogeneous mass. Specific stakeholders might include different medical professions, charities and campaigning groups, various government departments and agencies, specific businesses, local authorities, and so on. Many issues also have strong international or European dimensions. It is therefore essential to consider, *as early as possible*, what other stakeholders could do and what might influence them. Is consultation or negotiation appropriate? If not, how can one guard against hostile responses - e.g. the last-minute legal objection to a proposed message?

Taking the above points into account may well complicate the picture: complexity can again be controlled by the art of prioritisation. At any given point - and certainly prior to major public announcements - a useful discipline is to formulate the *main* intended message, stated in simple terms. This provides a definition of success: if this message is not understood and accepted, the communication must be counted as a failure. Some practitioners refer to this as a SOCHO - Single, Over-riding Communication Health Objective.[14] Delivery may vary between audiences, there can also be subsidiary messages, fuller versions of arguments and evidence made available and so on. But a clear priority has been chosen. Particularly where there is some complex science in the background, formulating a SOCHO will be difficult. The alternative, however, is much worse. If it is difficult to simplify, the answer cannot be to leave it to others and then accuse them of distortion! Emphasising that the key message is a matter for decision should also signpost

the need to keep it under review as the situation develops. The most inflexible choices are often those assumed to be "obvious".

Formulating the key message should also prompt one further check - that of whether the organisation's behaviour is actually compatible with it. For example, if the intended message is of "urgent investigation", is this demonstrably happening? Is the message "don't panic" being delivered by an organisation taking what look like desperate measures?

- *Risk communication is significant to the extent that it relates to decisions.*
- *Clarify aims early on, identify relevant stakeholders and consider their likely beliefs and agendas.*
- *Early engagement should maximise the potential for cooperation. Failing that, prior planning can identify ways to defuse opposition*

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- *The "first priority" message (SOCHO), should be clearly chosen, kept under review and actual behaviour checked against it.*

3.3 Contingency Planning and "Assumption Busting"

Research on public perceptions of risk is neatly complemented by studies of its organisational mismanagement. Large-scale failures have been studied in contexts as diverse as warfare, corporate policy and engineering. A common pattern of failure is of able decision-makers (and their advisers) becoming fixed on a particular set of assumptions. Uncertainties are assumed away and alternative views ignored - even in private. Lack of evidence for some effect into may be translated into "proof" of its non-existence, or possible responses to risk simply dismissed as unthinkable. Problems may be defined in ways that simply omit significant public concerns. Caveats in relating laboratory to field conditions may get assumed away. People may even be presumed always to understand and follow safety instructions. Overconfidence and wishful thinking can be amplified when working in highly-cohesive groups. By the time doubts finally surface, commitments have already been made, no contingency plans are in place, and crisis ensues. In the context of risk communication, the pattern can be seen in cases where the "wrong" message is repeated despite evidence that should have given pause for thought, eventually to be abandoned with maximum loss of credibility - and in some cases real damage to public health.

If an initial public position has to be modified, preparedness will limit the damage by allowing change to be both prompt and convincingly explained. There is therefore a need for determined "assumption-busting"early on. In the case of scientific assumptions, clues as to which assumptions to vary can be found by looking critically at the "pedigree" of key evidence - how it was generated and by whom.[15] But sometimes even the highest-pedigree assumptions turn out to be mistaken, and there is often a need to look at non-orthodox views. The argument is *not* that all views should somehow be accorded equal

weight. Despite the attractions of a romantic view of science, most dissident views remain just that. But that should not stop one asking *what if* the accepted view is mistaken. How can a clear message be given now, without giving too many hostages to fortune? A useful concept here is that of *robustness*. A robust communication strategy is one that satisfies two criteria. Firstly, initial statements and actions should appear sensible in a wide variety of possible scenarios. (This may well rule out doing nothing, or issuing completely anodyne statements.) Secondly, they should as far as possible leave future options open, to be taken as more becomes known.

This leaves open the question of how public a process all this should be. Certainly there is sometimes a need to consider dramatic but unlikely scenarios without the risk of "scare" headlines. Nevertheless, there are strong arguments for at least acknowledging uncertainty in public. Doing so - it will be objected - risks flying in the face of demands for certainty from public, media and policy-makers alike. While not denying that there can be massive pressure for premature closure of debate, there is some evidence that the public is more tolerant of *uncertainty honestly admitted* than is often supposed.[16] Indeed, a plethora of supposedly-certain statements may only fuel the cynical belief that anything can be "proven". The risks of appearing closed-minded can also be great. On balance, acknowledging uncertainty often carries fewer dangers, even if it is not a route to instant popularity.

These are questions that can only be resolved in detail on a case-by-case basis. Nevertheless the arguments again support a *presumption* in favour of openness, so ensuring wider scrutiny of assumptions. Extending this to consider "openness of process" as well as "openness with information" offers further potential benefits. As well as being conducive to trust, two-way communication provides some chance of hearing something worthwhile. At minimum, one may find out more as to why others are concerned (or not) about particular risks. But beyond that, they may have significant contributions to make toward dealing with the issue in hand. Those coming to the situation with a different perspective - particularly one involving experience on the ground - can prevent a too-easy consensus and may raise the "obvious question" that turns out not to be so obvious.[17] Open discussion also makes it easier to avoid acrimonious public debate as to whose "fault" uncertainty is.

- *Overcommitment to a given line often inhibits preparedness for any change, as well as making the change itself more dramatic.*

- *There is therefore a need to uncover(scientific and other) uncertainties and generate alternative scenarios, so as to devise robust communication strategies.*

- *Though scenario-building can be done in private, there should be a presumption in favour of admitting uncertainty.*

- *An open, two-way process will help ensure that the key issues are raised in good time.*

3.4 Monitoring and Review

Each communication episode - successful or otherwise - represents an opportunity for organisational learning. Very often these opportunities are missed as busy staff move on to other issues. Consequently lessons are re-learnt from scratch, and at greater long-term cost. The ideal is for review to be written into normal procedure, so as to work with as little additional effort as possible. At least in broad terms, there should be a record of the reasons for decisions - noted *at the time* - what was actually done, and what the outcomes were. Review should then be undertaken as a matter of course - rather than *post mortems* being triggered only by perceived failures. This is essential if review is not to be seen as an exercise to apportion blame. The main aim should be to identify and share learning points. The results should then feed into routine analysis of new issues. In this way, collective experience may be put to best use.

- *Monitoring and review of risk communication should be part of organisational routine.*

4: FINAL COMMENTS: EMBEDDING BETTER PRACTICE

What, finally, can organisations *do* to improve risk communication at a "systemic" level - as distinct from just managing a specific episode better? The answers are many and various - not least because organisations vary in structure and culture, have different responsibilities and start with different problems. However there are two broad ways of fostering better practice.

One is simply to bring knowledge more fully to bear. There is no shortage of empirical research on risk. Its findings can be available in an accessible form, tailored to the needs of one's particular organisation. This booklet may provide one starting-point. Existing knowledge can be augmented either by small-scale exercises to "test-run" specific messages quickly, or (if time and resources permit) primary research on topics of long-term interest.

In tandem with this, one can seek improvement in the decision *process*. One approach is to use checklists, and these can be helpful provided they are used to provoke thought rather than as a substitute for it. One is provided overleaf, and can again be adapted to particular needs. In more depth, disciplines such as Operational Research and Systems Science offer various problem-structuring methods - for example scenario-building, stakeholder analysis, classification of uncertainties - that can be used in

- scanning exercises to identify and prioritise forthcoming issues,
- decision support workshops to help manage specific cases,
- staff development exercises using past cases or hypothetical scenarios.

In each case, the format can be more or less elaborate. The aim should be to include those with expertise in different fields - for example on scientific topics or in dealing with the media. Indeed, the sharing of perspectives is often a significant by-product.

If further help is required, external advisors or analysts can bring fresh ideas to bear. A good many academic departments (and commercial consultancies) have interests in some or all of the topics set out here and may be worth approaching: relevant general disciplines include Psychology, Media Studies, Policy and Government, Management Science, Operational Research and Decision Analysis. Some centres specialise in specific areas such as the perception of environmental or food-related risks. Conversely, the sensitivity of some issues may make internal assistance more attractive. Staff will also start with greater knowledge of procedures and may be more immediately available. Within the NHS there is significant expertise at Regional level, coordinated nationally.[18]

The relevance of these various ideas obviously depends on one's starting-point. Success is likely to need a combination of measures designed to suit particular circumstances. However an ideal end-point can be suggested. It is for awareness of risk communication issues to become widely ingrained, and attention to them an automatic part of the organisational routine. Good practice can then be the rule rather than the exception.

CHECKLIST OF KEY POINTS

Scanning and reacting

1 This checklist can be used:

- for **scanning** to help identify difficult cases and prioritise attention
- to guide reaction to **unforseen incidents**.

In both cases, communication should be considered as early as possible, as an integral part of risk assessment and management.

Anticipating public impact

2 Public responses to risks will be influenced by:

- **fright factors** *(see Box 1, p.5)*
- **media triggers** *(see Box 2, p.17)*

A high score on either list indicates a need for particular care. A high score on *both* should alert you to a possible high-profile scare. Conversely, it will be difficult to direct public attention to low-scoring risks.

3 **"Indirect" effects** are commonly caused by people's responses to the original risk. Have possible economic, social and political consequences been considered?

Planning a communication strategy

4 Are the **aims** of communicating clear? Note that objectives should be:

- **agreed internally** between relevant staff with different responsibilities (e.g. technical advisors, press staff)
- **prioritised**, so that the *most* important aim is agreed

5 Have the **key stakeholders** been identified? These will usually include both *intended* audiences and others who may react.

6 What is known (or is being assumed) about **how different stakeholders perceive the issue**? Does this require further investigation? What are the likely levels of **trust**, and what can be done to influence this?

7 Can the proposed message be seen as **inconsistent with previous messages** or with other policies? How can this be avoided or, failing that, explained?

8 Are mechanisms in place for keeping all the above **under review?**

The process of communication

9 Is there a checklist of **who to involve** at each stage of information release? If so, is it in use?

10 In deciding how and when to involve external stakeholders:

- are decisions being considered as early as possible, and taken **on a consistent and defensible basis**?
- are any **decisions against openness** both necessary and clearly-explained?
- have mechanisms for involvement been **made clear to others**?

11 **What other actions are being taken** to deal with the risk in question? Do these support or undermine the intended communication? What overall impression is being conveyed?

Content of communication

12 Do statements attend to likely **values of the audiences** (e.g. perceived fairness, or need to vent anger), as well as providing factual information? Is the emotional tone appropriate to this?

13 Have **uncertainties** in scientific assessments been acknowledged?

14 In any statements about **probabilities**:

- if **relative risks** are given, is the"baseline" risk made clear?
- do **risk comparisons** serve to illuminate alternative options? Could any comparisons appear unfair or flippant?

15 Have **framing effects** of wording (e.g."lives lost" versus "lives saved") been considered?

Monitoring of decisions and outcomes

16 Are procedures in place to **monitor** actions and results?

17 Are there mechanisms for **reviewing** strategy and outcomes, and **disseminating** lessons for future practice?

Further analysis

18 Might **further analysis** be appropriate? If so, has assistance been sought?

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1. See also guidance issued by the Office of Science and Technology on the use of scientific advice in general (OST, 1997)

2. Similarly in the clinical setting: as Richards (1990) reports, the commonest complaint by patients and the public is that *doctors do not listen to them*."

3. Hunt, Frewer and Shepherd (1998)

4. This phenomenon of "risk compensation" is extensively discussed by Adams (1995). However its plausible existence in some contexts should not be taken to imply that all safety measures are necessarily ineffective - even for voluntary risks. For example, people may inadvertently place themselves at greater risk than they realise. Nevertheless, risk compensation appears to warrant recognition and further research.

5. Covello, Sandman & Slovic (1988): see also Roth *et al* (1990)

6. see e.g. Roth (1990). In addition one might expect hierarchists and indvidualists to rather like risk comparisons - albeit for different reasons - egalitarians to distrust them and fatalists to see them as irrelevant.

7. Calman & Royston (1997)

8. McNeil *et al* (1982)

9. Another frequently-cited difference is that the public is scared by the possibility of catastrophe, while scientists are more reassured by low probabilities. This has some plausibility in the context of hostile responses to the siting of power stations and other "LULUs" (Locally Unwanted Land Uses). But in other contexts people may be *unduly* reassured by long odds - for example, in ignoring advice on "safe sex". Such apparent contradictions may again be understood if people have other reasons for antagonism or enthusiasm toward the source of the risk.

10. Conversely, health promotion efforts (e.g. on smoking) may be undermined by an "optimistic bias", in which individuals deny that the statistics apply to them. However the empirical evidence on this less clear-cut than is often supposed, and it may be more helpful to consider how responses to advice differ between individuals.

11. For further discussion and arguments in favour of the "Bayesian" approach, see Lilford & Braunholtz (1996). This may also be relevant to the often-noted failure of basic medical research (e.g. clinical trials) to impact on immediate practice. Specifically, Dowie (1996) suggests a gap between "truth-seeking" research a highly-structured setting and "decision-driven" practice that must work in unstructured settings. The former focuses on the symptoms associated with a *given disease,* and hence the *performance rate* of a diagnostic test (likelihood that a given condition will be correctly diagnosed). The latter is more concerned with the person presenting with *given symptoms* and hence with *predictive value* (likelihood that a given diagnosis turns out to be correct). Dowie suggests (Bayesian) decision analysis as a framework to help bridge the gap.

12. Conversely, risks may be "socially attenuated" and have little public impact. Both Social Amplification and Risk Perception research have been criticised for allegedly assuming that some "objective" measure of risk exists, which is then amplified, attenuated or distorted. The alternative view is of risk as a social construct, not an objective reality. Though interesting, this debate is not of direct relevance here. We are simply observing that risks with certain properties tend to be seen as more frightening, and/or have greater social impact.

13. It is also helpful to have prepared lists of the actors liable to be involved in specific types of issue, and actions needed to engage with them. A good example within the Department of Health is the *CMO's Checklist on Public Health Alerts*

14. c.f. Murphy (1997)

15. Funtowicz & Ravetz (1990)

16. e.g. Frewer *et al* (1996)

17. This, for example, has been one reported effect of starting to open-up the governmental advisory committees (Burke, 1998)

18. Across Government, experience can be shared through fora such as the Interdepartmental Liaison Group on Risk Assessment (ILGRA).