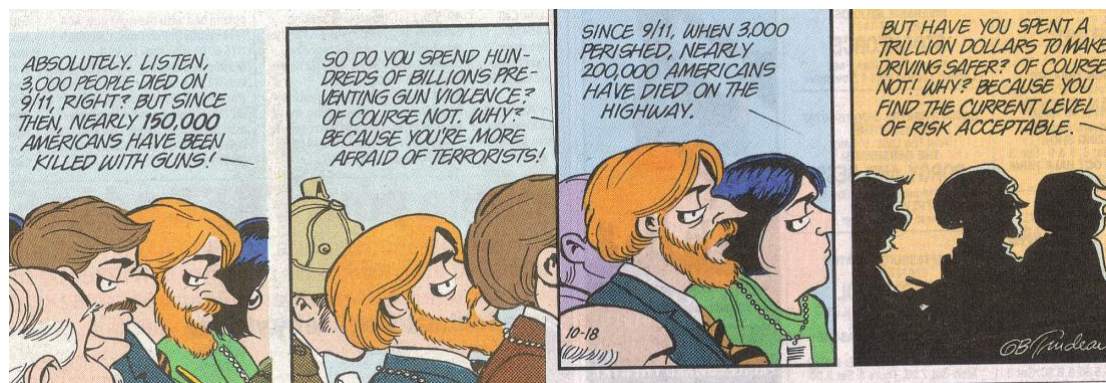


# Understanding Regulation

## The Regulation of Risks to Health and Safety

### 1. Introduction

This Doonesbury cartoon neatly summarises the policy problem.



Nearer home, it is worth remembering that:-

- Every serious train accident encourages further expenditure on automatic train protection, where every £5m will save one life. But the same amount spent on road improvements would save 50 lives.
- Many of us enjoy risky sports, and resent any legislation designed to protect us. (Sport in the UK is associated with 160 deaths and 18 million injuries a year.) Yet the same people can get very upset about what scientists might consider to be small risks - e.g. pesticide residues on fruit.
- If a road is straightened or widened, or seat belt wearing is made compulsory, drivers do not pocket all the increased safety. Instead, they will probably drive faster - probably transferring some of the risk to pedestrians etc.

It is, thank goodness, for politicians to make the key decisions in this area. It is clear that there are no unassailable principles. Ministers must respond to public opinion. However, civil servants can offer advice which is both politically and scientifically aware. In short, Ministers must be presented with advice about all of the following factors:-

- the type of risk - and in particular its familiarity and impact on different parts of society, and on generations to come (see **Part 2** of this note)
- the benefits that will flow from taking the risk, especially to those taking it (see **Part 3** of this note)
- the uncertainties associated with the assessment of the risk (see **Part 4** of this note)
- the unwanted consequences of any Government intervention (see **Part 5** of this note)
- the likely effectiveness of any Government intervention (see **Part 6** of this note), and
- communications issues (see **Part 7** of this note)

## 2. The Type of Risk

The first factor to be considered is the type of risk. The key elements are the familiarity and the distribution of the risk.

People are not illogical when it comes to assessing risk. It is entirely rational for humans to wish to be protected from those risks which:

- are outside their control,
- are hidden and/or
- with which they have little or no personal experience,

even if the scientific assessment is that the risk is fairly low. The following are well known "fright factors":

Any damage will be hidden and/or irreversible e.g. through illness many years after exposure.
The risk might result in a form of death or injury which arouses particular dread.
The risk might lead to a catastrophe, where many die at once
The risk is poorly understood by science and/or experts make contradictory statements (or, even worse, the same expert makes contradictory statements)
The risk sets a possibly unwelcome precedent (e.g. Brent Spar)

The public, reasonably enough, also expect to be protected from risks which appear to fall unevenly or unfairly, even if the scientific case for regulation is fairly weak. Prominent fright factors are that:

The risk is likely to cause particular damage to children, pregnant women, future generations.
Some benefit from the risk whilst others suffer (e.g. polluters and polluted).
The risk will damage identifiable victims, rather than having random, unpredictable victims.
The risk is man-made rather than naturally occurring.

It is interesting to note that some risks (such as from "radiation") fit into most, if not all, of the categories in the above tables. It is therefore hardly surprising or unreasonable that there is intense regulation of the nuclear industry, and that thresholds for the control of radioactive substances are set very low indeed:- to the extent that ground coffee, which contains a small amount of naturally radioactive

potassium, would have to be treated as low level waste if it was produced in a regulated facility. The public also generally accept or even encourage the regulation of other hidden risks though e.g. building regulations, setting very low limits for drinking water impurities, and so on.

There is, on the other hand, very little pressure to reduce the very familiar risks associated with motor vehicles - or even sport, despite the associated 160 UK sports deaths and 18 million injuries a year.

More generally, society has a strong desire to be "better safe than sorry", and this particularly applies to potentially catastrophic new risks. Urgent regulation might therefore be needed whilst a serious new danger is assessed, and experience gained. This is one version of the so-called "precautionary principle" (\*\*see below).

However, such urgent regulations should be "sunsetting":- in other words the need for the regulations should be made subject to a review after a pre-specified period, by which time the risk might seem less scary. (Equally, however, the review might well lead to a strengthening of the regulations. The public might initially be relaxed about longer term risks (e.g. global warming) and more evidence might well increase rather than reduce both public and scientific concern.)

*\*\*The precautionary principle is an over-simplification of the principles summarised in this note. It is the "pseudo application of a pseudo principle", to quote Christopher Hood of Oxford University.*

*The principle is much loved by those seeking reasons to ban imports so as to protect domestic industries and disadvantage their customers*

*But the precautionary approach has its place when the risk is big enough. The international (and mainly business-led) attack on the Y2K 'Millennium Bug' was a very successful example – see for instance <http://eprints.utas.edu.au/8329/> . The subsequent suggestions that the effort had been unnecessary were based – quite illogically – on the fact that few instances of the bug were found once the work to eliminate it had been completed. This is a nice example of the Prevention Paradox:- see [http://www.regulation.org.uk/key\\_issues-regulating\\_larger\\_organisations.html](http://www.regulation.org.uk/key_issues-regulating_larger_organisations.html)*

### **3. The Balance between Risk and Reward**

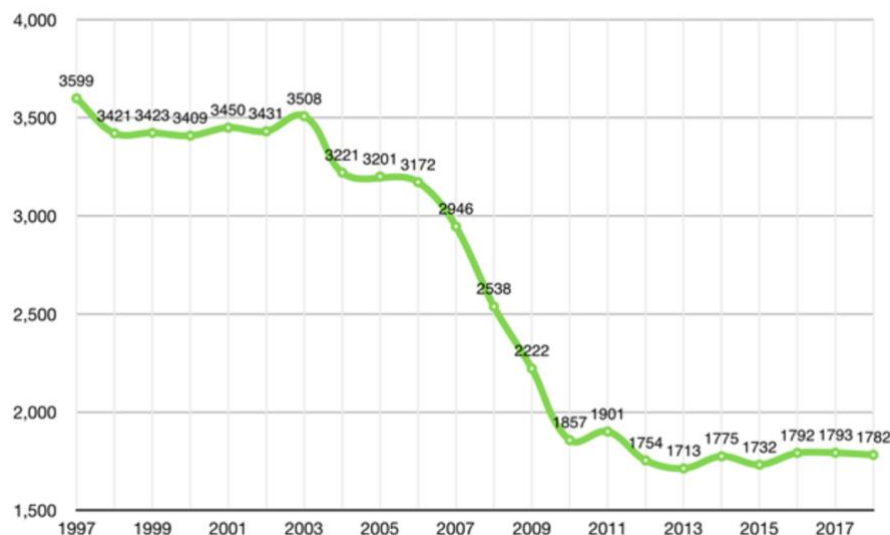
Next, it is necessary to consider the way in which individuals are likely to balance the risk against the benefit that might arise from taking the risk.

It is important to recognise that there can be considerable variation in the way we value the reward from similar experiences. For instance, some of us greatly value the competitive experience associated with physical sports, or the adrenaline surge that accompanies particularly dangerous activities, or the effects of alcohol, nicotine or other drugs. This causes us to take decisions which, to others, appear quite irrational. Some of us are also more willing to accept risks than others. Indeed, whole groups, such as young males, will more readily accept certain risks than the rest of the population. Your Ministers might nevertheless decide that they wish to protect such groups from their own folly but, if so, the protection needs to take careful account of the motivation of those wanting to bear the risk, or it will fail.

In addition, the boundary between acceptability and unacceptability of risks is always moving - sometimes very quickly. For instance, it is no longer commonplace for parents to lose children, and for children to lose parents, as it was 100 years ago. This has changed our attitude to certain risks and there seems to be an increasing tendency to search for someone to blame, and preferably someone to sue, when something goes wrong. The Government is often a handy target.

Also, once e.g. technology has removed one risk, we often want to tackle the next one (e.g. safety belts led to air bags). On the other hand, greater experience, and hence greater *familiarity* with the risks, can sometimes make us more willing to accept them. The following chart – road deaths pa in the UK – is quite fascinating.

There were around 8,000 deaths a year in 1966 but numerous regulatory and other changes led to steady, significant reductions through to the mid 1990s when the figure plateaued at around 3500. There was then a relatively sudden and rapid drop between 2003 and 2010 when the rate then settled at around 5 a day – a figure which society presumably now found acceptable. Interestingly, a similar post-2000 pattern is to be found in many other European countries



#### **4. Facts, statistics and uncertainties**

Any policy analysis should take account of the *four* key types of uncertainty that are associated with any risk.

The *first* uncertainty is inevitably associated with any scientific advice. Good science acknowledges uncertainties, and makes assumptions explicit, whilst useful science distinguishes between what is true and what is speculative, and presents options.

The *second* type of uncertainty arises out of a simple equation which can be summarised as follows:

$$(\text{How Nasty is it?}) \times (\text{How much am I getting?}) = (\text{Will it Hurt me?})$$

There are always difficulties in measuring the first two of the above quantities and, when they are multiplied together, the uncertainty of the final figure - the size of the risk - is even greater. Even worse, the only way to find out for sure whether a

chemical will harm humans is to expose us to the risk, which can hardly be done once the risk is suspected, although it is sometimes possible to find historical data (e.g. past exposure to asbestos). Experiments on animals can provide information, but high doses are often used and these might have an effect that will not occur at lower doses, and the animals (usually rats and mice) are very different from humans in lots of ways. On the other hand, children and fetuses are likely to be more sensitive to pollutants than are adults.

The *third* type of uncertainty is not inevitable, but it all too frequently arises from the way in which facts and statistics are too often presented. For instance:

- Aggregated death and injury rates can be very misleading:-

Traffic accident statistics generally include young and other accident-prone drivers, as well as injuries to pedestrians and cyclists. Indeed, a middle-aged car driver in good weather will be just as safe, over a journey of 500 km, as if he or she were flying.

Deaths caused by air pollution might include a high proportion of those whose death was already imminent, rather than deaths from amongst an otherwise healthy population.

A 5% cut in airborne soot particles (produced by diesel and other fuels) would extend the lives of the current British population by 200,000 – 500,000 years. Wow! ... But that is only 1½ to 3½ days per person.

It is undeniably frightening that 5,000 people a year die from hospital-acquired infections, but it needs to be borne in mind that there are 8 million admissions to hospital each year, not including visits to A&E and out-patients clinics.

- Isolated statistics can give a misleading impression:

The radioactivity of certain beaches near the nuclear plant at Sellafield is higher than many others, but it is lower than certain beaches in Cornwall, nowhere near a nuclear reactor.

- It is easy to frighten people with "science":

76% of one group of adults, when presented with a number of facts about the chemical di-hydrogen monoxide, concluded that its use should be regulated by Government. The other 24% presumably knew that the chemical's other name is "water".

- Death and injury rates can look very different when presented as a number (e.g. number of children killed in an incident) rather than as a proportion of the exposed population per annum.
- Scientists' terminology can be misleading. Bacon is a Class 1 carcinogen – the same category as cigarettes. But it doesn't cause the same harm as cigarettes. 'Class 1' means that the evidence that it is carcinogenic is as strong as the evidence that cigarettes are carcinogenic.

- Six in 100 people will get bowel cancer, whether they eat bacon or not. If all those 100 people eat a bacon sandwich every day of their lives then seven will get bowel cancer. That's not much of a risk!
- The fact that there have been no accidents does not mean that something is safe. Many fewer children are now killed on our roads, not because they are safer than decades ago, but rather because they are so dangerous that many children are not allowed near them.

It is of course tempting, when faced with a hostile press or one-sided lobby, to assemble your own dodgy statistics that might be used to fight them off. But you will then become seen as prejudiced and/or adversarial by those with whom you are trying to communicate, and you might also then fail to pay insufficient attention to perfectly reasonable arguments from "the other side".

A *fourth* set of uncertainties arises when considering cost-benefit and other economic analyses. These can be interesting but can seldom be conclusive because, in seeking to attach cash values to health or the environment, they attempt the impossible. Costs based on "willingness to accept compensation", for instance, have limited value, because someone will always say that no amount of money will compensate them for a particular harm. But the alternative approach, based on "willingness to pay" can understate the damage, placing a negligible value on harm to those who are poor.

## **5. Unwanted Consequences**

Great care must be taken, when assessing the options, to avoid unwanted consequences. Well meaning attempts to reduce risk can all too often lead to perverse and undesirable results. These need to be identified and taken into account before reaching policy decisions. For instance:

- a risk-free food chain might raise costs (to the detriment of the poor), restrict imports (to the detriment of the third world) or sacrifice taste and texture for the monotonous security of the can.  
*Recent draft EC legislation, aimed at reducing the presence of aflatoxins in imported foods, might have wiped out the food exports of 9 of the poorest African countries in order to save 1 life pa in Europe.*
- a decision not to licence a drug (because of side effects) must be balanced against the lost health of untreated patients if the drug is not approved,
- attempts to reduce sports injuries might well generate poor health as a result of reduced physical activity,  
*The cost of registering with the newly formed Adventure Activities Licensing Authority caused 600 child activity centres to close out of a total of 1500. (Only 13 licences were refused.)*
- expensive railway safety might increase fares and charges and so divert traffic to possibly more dangerous roads,
- attempts to create risk-free child-care might reduce the availability of such care,
- the risk to a child living with inadequate parents needs to be balanced against the risk of the damage that would arise from enforced separation,
- UK-only regulation might, if it were to increase the price of UK goods, lead to cheap unregulated goods coming in from abroad.

Also, because we each seek to arrive at our personal balance between cost and benefit, we will intuitively adjust our behaviour to avoid, or mitigate the effect of, an increased risk, and vice versa for a reduced risk. The observed effect of an increased or reduced risk is therefore often unpredictable. This particularly applies where (e.g. in the case of road safety) most of us have intuitively established the level of risk with which we feel comfortable.

- If a road is straightened or widened, or seat belt wearing is made compulsory, drivers will not pocket all the increased safety. Instead, they will probably drive faster - probably transferring some of the risk to pedestrians etc. Indeed, the German Government allows coaches to travel at higher speeds if they are fitted with seat belts.
- The road accident rate fell when the Swedes switched from driving on the left to driving on the right as they over-compensated for a clear increase in risk.
- The death of Ayrton Senna led Formula 1 to introduce rule changes which reduced the effectiveness of tyres and brakes. This was because drivers then drove more cautiously, thus increasing their net safety.
- Similarly, the introduction of seat belts led to fewer lives being saved than had been hoped, for drivers subsequently drove very slightly less carefully.
- There is evidence that “naked streets” (no traffic lights, road signs etc.) both reduce accidents and journey times.

Similarly, someone who enjoys taking risks will find a way of doing so.

- A ban on motor-cycling would reduce the number of directly related deaths, but might well increase death rates associated with other adrenaline-producing activities.

The Wikipedia page on ‘Risk Compensation’ and the Pelzman Effect links to other interesting writing on this subject.

## **6. Will the intervention be effective?**

It is vital that compliance and enforcement issues are considered before any decisions are made about the scope and nature of any regulations. Regulation should be designed so as to encourage compliance, for it will quickly fall into disrepute if it has to be policed in an obtrusive way, or if the cost of its enforcement is out of proportion to its benefit. Regulations should always be transparent, targeted, consistent, and in proportion to the risk, and the regulator must be publicly accountable.

Compliance is often best assured by providing incentives to encourage those causing the risk to change their behaviour. Where possible, therefore, the cost or impact of the regulation should fall upon the person causing the risk, not the person suffering it. If that is not possible then any targets (e.g. for local enforcement bodies) should be concerned with reductions in the occurrence in the risk (e.g. fewer outbreaks of food poisoning) rather than increases in enforcement action (e.g. numbers of prosecutions).

Licensing is sometimes a useful tool, but it can too often give the public a false sense of security, for they will not realise that the authorities will have assessed only certain matters and may well not have looked into e.g. the background or the financial standing of the proprietor.

## **7. Communications Issues**

"Risk" is one of those subjects which touches us all, and about which we are all an expert. But it is a complex subject, because of the variety and unpredictability of human response to statistically similar risks. Also, to complicate matters further, some scientists accept or seek media exposure, for personal reasons. This all leads to intense media interest in risk. The standard form of debate is adversarial, and this is unfortunately ill suited to discussion of this particular subject. Questions such as

- "How can you put a price on safety?"
- "How can you put a price on life?",
- "What is the worst possible outcome?", and
- "Would you let your child ...?"

are not easily answered by even the most experienced interviewee. And it does not help that "the Government" is generally regarded as a very unreliable source of advice about risk.

There are no simple answers to these problems, but those with experience in this area generally offer the following advice.

- Nothing is entirely "safe" - the Government's job is to ensure that everything is "safe enough".
- Actions speak louder than words. The vast majority of your audience will respond wholly or mainly to the way in which you deliver your message. "Organisational body language" is important. Do you act and sound patronising, worried and harassed? Or do you act and sound calm, sympathetic and in control? Do not say that the response to the risk would be "too expensive". Who are you to say that? And do not say that action would harm industry, for this will reinforce any concern and risk is brought transferred from those who are benefiting from it onto those who are not.
- A small but crucial minority in your audience will be opinion formers who will want to understand the underlying issues and will analyse your response very carefully. Get the majority of them to accept your credibility, and respect your openness, and they will sustain you against much unfair comment.
- Do not dismiss concerns, however silly you think they sound. If it appears that you do not respect basic human concerns, how can you then be trusted to come up with sensible policies?
- Instead, listen carefully and emphasise your own concern. Then commit to making speedy enquiries, taking proper advice and reaching an early sensible conclusion on the best way forward. Stress that the process will be participative and open, and that you will publish e.g. scientific advice and the assumptions upon which it is based. Remember that the public will trust you much more if you admit to uncertainty, and that the public may well be less concerned about the problem than the media.
- Explain the benefits of your proposed approach. Your reaction is not "knee-jerk", and you will not patronise or nanny the public. If regulation might be needed, explain how this will protect the public and why other options would not work. If regulation is likely to be unnecessary, stress that you believe it right that the public should be allowed to make their own assessment of the risk, and the associated benefits, and reject it or take it as they wish.
- Membership of advisory groups should be broadly based, and not confined to scientists and other professionals.



Finally, remember that there is a crucial difference between *releasing information* and *informing* the public. The wholesale release of vast amounts of data does not of itself inform anyone. There should of course be no question of hiding or distorting information, but care should be taken to ensure that the overall effect of the release of information is to improve recipients' understanding of the issues (and the uncertainties) rather than simply to add confusion.

## 8. Summary

Much of the advice in this note can be summarised in the following table:

The Type of Risk	There is a strong case for action if the risk is hidden, unfamiliar, affects the vulnerable and is imposed by one group on another.	There is no case for action if the risk is obvious, familiar, and is evenly distributed amongst the population.
The Facts	There is a strong case for action if the probability of damage is high and the scale of any damage will be catastrophic.	There is no case for action if the probability of damage is low and the scale of any damage will be limited.
Effectiveness of Intervention	There is a strong case for action if the intervention will be effective and will not lead to unwanted consequences.	There is no case for action if the intervention will be ineffective and will lead to unwanted consequences.

And the advice about communications can be summarised as follows:

- Do not dismiss concerns, however silly they think they sound.
- Listen carefully and emphasise your own concern.
- Do not say that the response to the risk would be "too expensive" or would "harm industry".
- Do admit to uncertainty, and commit to making speedy enquiries, taking proper advice and reaching an early sensible conclusion on the best way forward, stressing that the process will be participative and open.
- Do stress that nothing is absolutely "safe" - the Government's job is to ensure that everything is "safe enough".

### Notes

This is one of a number of web pages that examine the UK governments' approach to regulation. Follow this link to access the other pages:-

<http://www.regulation.org.uk> - including ...

- an interesting review of "Risk Case Studies", and
- more detailed communications advice.

*Many of the thoughts in this paper were suggested in conversations with John Adams of London University and Lord Haskins, then Chair of the Better Regulation Task Force. I am most grateful to them both.*

**Martin Stanley**

*<http://www.regulation.org.uk/library/risk.pdf>*