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Risk Communication

An overlooked tool for improving public health

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1,018 more Americans died in motor vehicle crashes October through December 2001 than in those three months the year before, according to researchers at the University of Michigan's Transportation Research Institute. As those researchers observe "…the increased fear of flying following September 11 may have resulted in a modal shift from flying to driving for some of the fearful." 1,018 people dead, more than one third the number of people killed in the attacks of September 11, in large part because they perceived flying to be more dangerous and driving less so, despite overwhelming evidence to the contrary.

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In 1971, President Richard Nixon signed the National Cancer Act and declared "War on Cancer". In 2004 the National Cancer Institute had a budget of $4.7 billion. In 2002, cancer killed 557,271 Americans.

That same year, heart disease killed 696,947. Yet the National Heart, Lung, and Blood Institute spent approximately $1.8 billion on cardiovascular diseases, including heart disease, in 2004. And there is no National Heart Disease Act, nor a national "War on Heart Disease", despite the fact that heart disease kills roughly 25% more Americans each year than cancer, roughly 140,000 more deaths in 2002 alone.

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Chronically elevated stress is known to weaken the immune system, contribute to cardiovascular and gastrointestinal damage, interfere with fertility, impair the formation of new bone cells, impede the creation of long-term memory, and contribute to a greater likelihood and severity of clinical depression.

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What do these three fact sets have in common? They demonstrate the threats to public health caused by gaps between risk perception, informed by the intuitive reasoning by which humans gauge the hazards they face, and risk realities as calculated by the sciences. And the examples above demonstrate the vital role risk communication can play in advancing public health, by helping to narrow those gaps.

Risk Communication Defined.

Ask any number of different experts in risk communication to define it and you will get as many different definitions. Most embody the basic idea that by providing people with more information, they will be able to make smarter choices about their health.

But that was not always true. The term "risk communication" arose largely as a result of environmental controversies in the 70's, when public concern was high about some relatively lower threats to human and environmental health. Scientists, regulators, and the regulated community described people as irrational, and their frustration gave rise to efforts to educate the public and defuse those controversies.

Early risk communication was thought of as a one-way process in which experts would explain the facts to the ill-informed lay public in ways that would help people behave more rationally (as defined by those experts), especially about such issues as air and water pollution, nuclear power, industrial chemicals, hazardous waste, and other environmental hazards. The goal of early risk communication was not always to enlighten people so they might improve their health. It was frequently a tool to reduce conflict and controversy, and often it was simply an effort to talk people out of opposing some product or technology or facility siting proposal of which they were afraid. One researcher defined risk communication as "a code {word} for brainwashing by experts or industry."

But risk communication has evolved. This article will use the following definition:

"*Risk communication is a combination of actions, words, and other messages responsive to the concerns and values of the information recipients, intended to help people make more informed decisions about threats to their health and safety."*

That definition attempts to embody the ways that risk communication has evolved and matured over the past 15 years or so. Most importantly, the consensus among experts in the field now rejects the one-way "We'll each them what they need to know" approach. A National Research Council committee effort to move the field forward produced this definition in 1989. *"Risk communication is an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management."* In other words, risk communication should be considered a dynamic two-way street. Both sides get to talk, and both sides have to listen, and respond, to input from the other.

Perhaps even more fundamentally, and intrinsic to the idea of the two-way street, is the growing acceptance among risk communication experts that risk means something inherently different to the lay public than what it means to scientists and regulators. When laypeople are asked to rank hazards in terms of deaths per year, they tend to generally agree with the statistics. But ask them to rank what is *risky* and their responses

change, with some lesser hazards, such as nuclear power, moving toward the head of the list, and some relatively larger risks, like smoking, moving further down. "Risk" is perceived as more than a number by the general public. Other attributes, like trust, dread, control, and uncertainty, also factor into the judgments people make about what to be afraid of and how afraid to be.

As risk communication has evolved, more and more (but by no means universally) it is accepted by experts in the field that both the science-based view of experts and the intuitive view of risk among the general public are valid, and both must be respected and incorporated if communications about risk is to be effective.

This evolution is summed up in Risk Communication and Public Health, edited by Peter Bennett and Kenneth Calman:

"…there has been a progressive change in the literature on risk:

from an emphasis on 'public *misperceptions*', with a tendency to treat all deviations from expert estimates as products of ignorance or stupidity

via empirical investigation of what actually concerns people and why

to approaches which stress that public reactions to risk often have a rationality of their own, and that 'expert' and 'lay' perspectives should inform each other as part of a two-way process."

The evidence that illuminates "what actually concerns people and why" requires discussion at some length. This evidence explains that people are not being "irrational" when their fears don't match the expert view of "the facts". They may not be exclusively relying on inputs from toxicology, epidemiology, statistics, economics and the other sciences of risk assessment and risk analysis, but a solid body of careful research from a number of fields has established that the lay public's perception of risk is based on what is sometimes referred to as a "bounded rationality".

As it is applied to the perception of risk, bounded rationality essentially describes the process we use to make judgments when we don't have all the information we need, all the time a full consideration would take, or all the cognitive skills a fully rational judgment would require. As Reinhard Selten writes "Fully rational man is a mythical hero who knows the solutions to all mathematical problems and can immediately perform all computations, regardless of how difficult they are. Human beings are in reality very different. Their cognitive capabilities are quite limited. For this reason alone, the decision-making behavior of human beings cannot conform to the ideal of full rationality."

Gigerenzer and Selten refer to bounded rationality as "the adaptive toolbox", the set of "fast and frugal rules" or mental processes humans have evolved to apply fact, feelings, instinct, and experience to the choices we face about threats to our survival. Research has

revealed a lot about how this kind of thinking works. Neuroscientists have identified the way the human brain is constructed as it processes threat information. Psychologists have identified a set of affective characteristics that make some risks seem larger and some smaller, the scientific data notwithstanding. Others have described a number of common heuristics and biases, mental shortcuts that turn complicated choices into simple ones, sometimes leading to judgments that seem suboptimal, based solely on "the facts".

These are powerful insights into more effective risk communication. By understanding the biology and psychology of how humans perceive risk, we can understand why and how lay and expert definitions of the very concept of risk vary. Such insights provide critical tools for effective risk communication because they help communicators both understand and *respect the validity* of the "intuitive reasoning" people use to gauge risk. That, in turn, helps risk communicators let go of their frustrations that people behave irrationally about risk. Instead, by understanding and respecting lay perceptions of risk, the risk communicator can choose content, tone, and information delivery processes that increase the likelihood that their audience(s) will be more receptive, and their information will have more utility for the people with whom they are interacting.

The Greek Stoic philosopher Epictetus said "People are disturbed, not by things, but by their view of them." Understanding the roots of what shapes those views allows the true dialogue of modern risk communication to take place.

The Biology of Fear

Neuroscientist Joseph LeDoux and colleagues have made remarkable discoveries about how the human brain processes raw sensory data into perceptions of threat and hazard. They have found that what we consciously describe as fear begins in a subcortical organ called the amygdala. Critically for risk communication, LeDoux and colleagues have discovered that external sensory information travels from the nose or the eyes or the ears or the skin along neural pathways that send the information to the amygdala *before* the same data arrives in the cortex. In very simplified terms, this means that information is processed in the part of the brain where we fear *before* it is processed in the part of the brain where we think. That alone has profound implications for risk communication.

But not only do we apparently fear first and think second. LeDoux *et. al* have found evidence that suggests that in some real ways, as we process external information, we fear *more*, and think *less*. They have identified the neural circuits leading out from the amygdala to parts of the cortex that, in essence, trigger a 'fight or flight' response, (accelerated heart rate, hormonal response to liberate fats into the bloodstream to supply energy, etc.). And he and his colleagues have identified pathways coming back into the amygdala from the thinking "rational" cortex. And there are more circuits out of the amygdala, the organ that stimulates a fear response, than there are circuits coming back in which could inhibit that response.

So from the first milliseconds when we encounter information that might pose a threat, whether it's seeing something on the ground that could be a snake or learning that a new

industrial product might cause cancer, we fear first and think second, and we fear more and we think less. And this imbalance in neural circuitry in favor of an emotional rather than an analytic response to risk pertains in the ongoing dynamic processing of subsequent information as well. This basic description of the way the human brain is physically wired has fundamental implications for risk communication and dramatically reinforces the findings of social science which explain why risk means one thing to experts and another to the lay public.

Risk Perception Psychology

Some of what we are commonly afraid of seems instinctive; snakes, heights, the dark. Indeed, Charles Darwin recognized this and visited the London Zoo's poisonous snake exhibit, repeatedly tapping on a glass window to provoke a strike by the snake inside, trying to teach himself not to recoil in fear. His effort in self-delivered risk communication failed. The innate fear, and the adaptive "fear first, think second" construction of the brain's hazard perception systems could not be overcome.

But how do we subconsciously "decide" what to be afraid of, and how afraid to be, when the threat does not trigger an instinctive reaction? When we hear about a new disease, product, or technology; when we try to gauge the risk of something against its benefits; when we learn new information about a potential hazard and try to fit it into what we already know. How does the human mind filter incoming data and translate it into our perceptions of what is risky and what is not?

The answers are to be found in two literatures, both of critical relevance to risk communication. The first is the study of how people generally make judgments of any kind, including judgments about risk, under conditions of uncertainty. This work has identified a number of systematic biases that contribute to what seem to be suboptimal "irrational" choices. The second is the specific study of the psychology of risk perception, which has identified more than a dozen affective attributes of risk that tend to make us more or less afraid, even when our apprehension doesn't seem consistent with the scientific data.

General Heuristics

The discovery of systematic biases that lead to suboptimal choices was championed by, among others, Daniel Kahneman, a social psychologist who was awarded the 2002 Nobel Prize in Economics for his work. Kahneman, his longtime partner Amos Tversky (who passed away before the Nobel was awarded), and others, identified a number of heuristics, mental shortcuts that simplify decision tasks when time and/or complete information are not available. This field has direct relevance for risk communication, as noted in a seminal paper on risk perception: "When laypeople are asked to evaluate risks, they seldom have statistical evidence on hand. In most cases, they must make inferences based on what they remember hearing or observing about the risk in question." "These judgmental rules, known as heuristics, are employed to reduce difficult mental tasks to simpler ones."

Here are some of the heuristics and biases of greatest relevance to risk perception, and therefore to risk communication.

Optimism Many studies have found that people believe their personal risk is

lower than the same risk faced by others in similar circumstances. More people think a risk might happen than think it will happen to them. These biases are often strongest when the risk involves personal choice, such as lifestyle risks like smoking or obesity or wearing safety belts, which poses obvious challenges to risk communication about some of the major threats to public health.

Availability "…people assess the…the probability of an event by the ease with

which instances or occurrences can be brought to mind." The risk of terrorism in the United States is statistically quite low. But apprehension is high since September 11, 2001, in part because such an event is more "available" to our consciousness. The availability heuristic explains why, when a risk is in the news, (flu vaccine issues, West Nile virus, child abduction, etc.) it evokes more fear than when the same risk is around, at the same level, but just not making headlines.

Framing The way a choice is presented can distort the judgment that results.

Imagine you are the mayor of a city of one million people and a fatal disease is spreading through your community. It is occurring mostly but not exclusively in one neighborhood of 5,000 residents. With a fixed amount of money, you can either A) save 1,000 of the 5,000 residents in that neighborhood, 20%, or B) save 2,000 people out of the entire city of 1 million, or 0.2%. What do you do?

A sizeable number of people in risk communication classes we teach choose option A, which produces a greater percentage effectiveness, but condemns 1,000 people to death. Reframed, the choice would be: You can spend a fixed amount of money and save 1,000 people or 2,000. Presented that way, the choice is obvious. But the framing of the question in terms of percentages skews the judgment.

Anchoring and adjustment People estimate probabilities based on an initial value

and adjusting from there. In one experiment, separate groups were asked how many nations there are in Africa. Before giving their answer, each group spun a wheel of chance. The group for which the wheel settled on the number 10 estimated 25 nations. The group whose wheel landed on 65 estimated 45 nations.

In another experiment, two groups of high school students estimated the sum of two numerical expressions they were shown for just 5 seconds, not long enough for a complete computation. The median estimate for the first group, shown 9x8x7x6x5x4x3x2x1, was 2,250. The median estimate for the second group, shown the same sequence but in ascending order – 1x2x3x4x5x6x7x8x9 – was 512.

Representativeness Kahneman and Tversky describe this as "the tendency to

regard a sample as a representation…" of the whole, based on what we already know. They offer this illustration. Consider a person who is "very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail." Then consider a list of possible professions for this person; farmer, salesman, airline pilot, librarian, or physician. Without complete data by which to make a fully informed choice, the representativeness heuristic gives you a simple mental process by which to judge, and leads to the choice that the person is probably a librarian.

Applied to risk communication, this suggests that if you describe "an industrial chemical used to kill pests", people are likely to associate it with the universe of industrial chemicals and regard it as a risk, without regard to the details about that specific chemical.

Kahneman and Tversy also found that people think a short sequence of events generated by a random process, like coin tossing (or, in the case of risk communication, random natural events like floods, earthquakes, etc.) will represent their understanding of the basic characteristics of the whole process, People think that when tossing a coin, H-T-H-T-T-H is more likely than H-H-H-T-T-T because the second sequence isn't random, which they expect coin tossing to be. They disregard statistical rationality (both coin toss sequences are equally as likely) because of the heuristic of representativeness.

Risk Perception Characteristics

Work in a related field, the specific study of the perception of risk, has gone further and identified a number of attributes that make certain risks seem more worrisome than others.

These "risk perception factors" are essentially the personality traits of potential threats that help us subconsciously "decide" what to be afraid of and how afraid to be. They offer powerful insight into why "risk" means different things to the lay public than it does to experts. The following list has been reviewed by Paul Slovic, one of the pioneers in the field of risk perception research. It includes examples to demonstrate each factor, and in some cases, suggestions of how awareness of the factor can be used to guide more effective risk communication.

Trust The more we trust, the less we fear, and vice versa. When we trust *the*

people informing us about a risk, our fears go down. When we trust *the process* deciding whether we will be exposed to a hazard, we will be less afraid. When we trust *the agency or company or institution creating the risk*, we are less afraid. Most critically, when we trust *the agencies that are supposed to protect us,* we will be less afraid. If we *don't* trust the people informing us, the process determining our exposure to a risk, the institution(s) creating the risk in the first place, or the people protecting us, we will be more afraid.

Trust comes from openness, honesty, competence, accountability, and respecting the validity of the lay public's intuitive reasoning about risk. Trust is the central reason why two-way risk communication, in language that validates the feelings and values and heuristic instincts of the audience, is likely to be more effective than one-way communication that only offers the facts.

Risk v. Benefit From taking prescription drugs that have side effects to picking

up a cell phone to make that important call while driving, we intuitively measure hazards by comparing risks and benefits. The more we perceive a benefit from any given choice, the less fearful we are of the risk that comes with that choice. This factor explains why, of more than 400,000 "first responders" asked to take the smallpox vaccine, fewer than 50,000 did. They were being asked to take a risk of about one in a million – the known fatal risk of the vaccine – in exchange for ZERO benefit, since there was no actual smallpox threat. Imagine if there was just one confirmed case of smallpox in a U.S hospital. The fatality risk of the vaccine would still be one in a million, but the benefit of the shot would suddenly look very real.

Control If you feel as though you can control the outcome of a hazard, you are

less likely to be afraid. This can be either physical control as when you are driving and controlling the vehicle, or a *sense* of control of a process, as when you feel you are able to participate in policy-making about a risk through stakeholder involvement, participating in public hearings, voting, etc.

This is why *shared control*, from the one-on-one relationship between doctor and patient, up to community empowerment in the siting of potentially hazardous facilities, is an effective form of risk communication. This is also why, whenever possible, risk communication should include information not just about the risk (The risk of terrorism has gone from Code Yellow to Code Orange") but also offer information about what the audience can do to reduce their risk ("Have a family emergency plan in place, just in case.").

Imposed v. voluntary This is the *choice* of taking a risk, not the physical *control*

over what happens next. We are much less afraid of a risk when it is voluntary than when it is imposed on us. Consider the driver using his cell phone who looks over at the car in the lane next to him and sees *that* driver on *his* phone, speeding up and slowing down and not staying in his lane. Driver A, voluntarily engaged in the same behavior, is angry at Driver B for imposing the risk.

Natural v. human-made If the risk is natural, we are less afraid. If it's human-

made, such as nuclear radiation, we're more afraid. Radiation from the sun evokes less fear in some people than radiation from a nuclear power plant, or from a cell phone tower.

Here is an example of how to use this factor in risk communication. Resmethrin, the chemical used to kill mosquito larvae to reduce the risk of West Nile virus, is a pesticide, and the spraying evokes community concern. When the minimal risks or resmethrin are described, community resistance is largely unchanged. But when told that resmethrin is essentially a manufactured form of chrysanthemum dust, in essence a natural pesticide, concern (among some people) about the spraying goes down.

Dread We are more afraid of risks that might kill us in particularly painful,

gruesome ways than risks that kill us in more benign fashion. Ask people which risk sounds worse, dying of a heart attack or dying in a shark attack, and they will say shark attack, despite the probabilities.

This factor goes a long way toward explaining why the United States has a "War on Cancer" but not "War on Heart Disease", a greater killer. Cancer is perceived as a more dreadful way to die (probably rightly so), so it evokes more fear, and therefore more pressure on government to protect us, thought heart disease kills far more people each year.

Catastrophic v. chronic We tend to be more afraid of things that can kill a lot of

us in one place at one time, such as a plane crash, than heart disease or stroke or chronic respiratory diseases or influenza, which cause hundreds of thousands more deaths, but spread out over time and location. This helps explain the major risk communication challenge of getting people to modify behaviors that contribute to these major killers. It also suggests how risk communication that frames these killers as catastrophic might have more impact. For example, efforts to raise public concern about heart disease might say something like "On September 11, 2001, when catastrophic terror attacks killed roughly 3,000 people, 2,200 Americans died of heart disease. We don't see those deaths because they are spread out over the whole country, but heart disease is causing catastrophic loss of life in America every day."

Uncertainty The less we understand about a risk, the more afraid we are likely to

be. Sometimes uncertainty exists because the product or technology or process is new and has not yet been thoroughly studied, like genetically modified food or nanotechnology. Sometimes uncertainty exists because of unpredictability, like the sniper in Washington D.C. in 2003, or terrorism. Sometimes we have most of the scientific answers but uncertainty remains simply because the risk is harder for people to understand, like nuclear power or industrial chemicals. Sometimes uncertainty exists just because the risk is physically undetectable, like radon.

This is why risk communication sometimes should sacrifice detail for the sake of clarity, to dispel uncertainty by making the risk easier for people to understand. This factor makes clear why risk communication should avoid jargon and scientific terminology, and

why risk numbers should be conveyed in ways people can relate to ("A one in ten risk is like the risk to one player on a soccer team, minus the goalie").

When uncertainty exists because all the scientific questions haven't been answered, the fear that results must be acknowledged and respected.

Is the risk personal Understandably, a risk that we think can happen to us evokes

more concern than a risk that only threatens others. This is why numbers alone are ineffective as risk communications. One in a million is too high if we think we can be the one.

As a demonstration of this, consider how the attacks of September 11th made clear the risk of terrorism not just to Americans anywhere but in America, and the subsequent anthrax attack put the potential threat of bioterrorism into every American mailbox. Suddenly we realized "this could happen to ME!" We began referring to the United States as "The Homeland." In fact we could probably take out the "H" and the "O". What we were really saying is that now those risks could happen in the "MEland".

When the first case of mad cow disease in America was found on a Washington farm in 2003, beef sales barely changed nationwide, but they fell sharply in the Northwest, where people thought the risk was more likely to happen to them.

Risk communication that offers only numbers to show that a risk is low will probably not be as trusted, and therefore won't be as effective, as communication that acknowledges that even though the risk is low, it's not zero and so it's understandable that some people might still be concerned.

Familiar or New When we first learn of a risk, and don't know much about it, we

are more afraid than after we have lived with that risk for a while and adjusted to it. For example, West Nile virus evokes more fear in communities in which it first appears than in those where it's been around for a while.

Using this perception factor in their risk communication, local health officials in one section of Arizona had some success in helping local residents deal with the onset of West Nile virus in 2004 by pointing out that though the risk of West Nile virus was new to them, other communities where the same risk had existed for a few years were far less worried.

Future generations Any risk to children evokes more fear than the same risk to

adults. When the Washington D.C. sniper wounded a 13 year-old boy, after having murdered 5 adults, the local police chief said "He's getting personal NOW!" The EPA requires all schools in the United States to be tested for asbestos, but not all offices, factories, or other adult workplace locations.

This special and powerful fear must be acknowledged and respected in communicating about any risk that involves children.

Personification A risk made real by a person/victim, such as news reports

showing someone who has been attacked by a shark or a child who has been kidnapped, becomes more frightening than one that is statistically real, but only hypothetical. So risk communication to encourage healthier lifestyle choices that uses numbers (60% of Americans are overweight or obese, a huge factor for heart disease") may not be as effective as communication that uses those numbers *and* includes actual victims of heart disease, to personify the risk.

Fairness/Equity We are more upset by risks when those who suffer the peril get

none of the benefits. We are more upset by risks to the poor, the weak, the vulnerable, the handicapped, than we are about the same risk to the wealthy, or the powerful. Risk communication, in actions more than in words, should address this issue. An example might be that the developers of a potentially hazardous facility guarantee that local residents get preference in hiring for the jobs at the facility, so that those bearing its risks share in some of its benefits.

There are a few important general rules about the heuristics and biases mentioned earlier, and the risk perception factors listed immediately above. Several of these factors often are relevant for any given risk. (*e.g.* cell phones and driving, where issues of risk-benefit, control, optimism bias, and familiarity all play a part.)

And, while the research suggests that these tendencies are apparently universal and that we all fear similar things for similar reasons, any given individual will perceive a risk uniquely depending on their life circumstances, *i.e.* age, gender, health, genetics, lifestyle choices, demographics, education, etc. For example. we all fear cancer because it is dreadful, but men fear prostate cancer, and women fear breast cancer. Like public health risk numbers, which apply generally more than precisely fitting any individual or subpopulation, risk perception has underlying generalities which are overlaid by individual differences. This means that while it is good risk communication practice to consider the emotional concerns of the audience, not everyone in a large audience shares the same concerns. As the National Research Council report suggests, "For issues that affect large numbers of people, it will nearly always be a mistake to assume that the people involved are homogeneous…It is often useful to craft separate messages that are appropriate for each segment.

Recommendations

As the National Research Council report noted, "…there is no single overriding problem and thus no simple way of making risk communication easy." So while this chapter provides general guidance on fundamentals, it can not offer a detailed How-To guide to risk communication.

But there are several widely accepted general recommendations:

Include risk communication in risk management. Far more is

communicated to people by what you do than what you say. "Risk communication…must be understood in the context of decision making involving hazards and risks, that is, risk management." (NRC) Consider the example cited a few pages ago of the failed Bush administration smallpox vaccination policy. Had the risk perception factor of 'risk versus benefit' been considered when the policy was being discussed, officials might not have chosen a policy doomed to fail to meet its objectives since it asked people to take a risk (albeit low) for ZERO benefit. In other words, the policy itself, not the press releases about it, carried implicit but very clear risk communication information.

Information that affects how people think and feel about a given risk issue is conveyed in nearly all of the management actions an agency or a company or a health official takes on that issue. ALL risk management should include consideration of the risk perception and risk communication implications of any policy or action under review. Quite specifically, this means that ***organizations should include risk communication in the responsibilities of senior managers, not just of the public relations or communications staff***. As the NRC report finds, "Risk managers cannot afford to treat risk communication as an afterthought*,"* that comes at the end of the process after risk assessment has been done and policy set.

Recognize that ***the gaps between public perception and the scientific facts about***

a risk are real, and lead to behaviors that can threaten public health. These gaps are part of the overall risk that must be managed. Whether people are more afraid of a risk than they need to be or not afraid enough, this perception gap is a risk in and of itself and must be included in dealing with any specific risk issue and in all risk management and public health efforts, generally. Accepting that these gaps are part of the overall risk is perhaps the key step in recognizing that risk communication should be part of overall risk management.

Consider this example. When the first case of mad cow disease was found in the U.S. in December 2003, the federal government quickly moved to recall from the market all muscle meat that was processed in the region where the sick cow was found. This despite the overwhelming evidence from hundreds of experiments in the U.K. that muscle meat is not a vector for spreading bovine spongiform encephalopathy (BSE), the animal version of the disease, into variant Creutzfeld Jacob Disease (vCJD), the human form. Yet even though the science suggested the physical risk from the meat was practically zero, the government recognized that public apprehension was part of the overall risk, and being "overly precautionary" they ordered the recall. That was more than a press release. It was an intelligent *action* of risk management that had powerful risk communication impact on public judgments about the threat of mad cow disease. Public reaction to that first case of mad cow disease was surprisingly mild. (Wendy's, the

number three-hamburger chain in the U.S., reported January 2003 sales up 8.3%. compared to the previous year. Smith & Wollensky's, which operates 17 steakhouses in the U.S. reported annual January sales up 7.2%.

The principles of risk communication pertain to all public health issues, not just

the environmental issues around which the discipline began. The dichotomy between risk communication, which has generally been thought of as trying to get people to calm down, and health communication, which is often thought of as trying to get people to be MORE concerned and take action to improve their health, is false. ***Any action or message that conveys information relevant to someone's health, ergo their survival, triggers risk perception biology and psychology, and the principles of risk communication should be applied.*** Even an individual doctor describing a treatment or medication or a surgical procedure to a patient in order to get "informed consent" is a form of risk communication, and the principles described in this chapter are tools available to be applied in order to make that consent more truly "informed".

Trust is fundamentally important for effective risk communication, and it is on

the line with everything you do. "…messages are often judged first and foremost not by content but by the source: 'Who is telling me this, and can I trust them?' If the answer to the second question is 'no', *any* message from that source will often be disregarded, not matter how well-intentioned and well delivered."(Bennett and Calman)

Trust is determined in part by who does the communicating. When the anthrax attacks took place in the fall of 2001, the principle government spokespeople were the Attorney General, the Director of the FBI, and the Secretary of Health and Human Services, and not the head of the CDC or the U.S. Surgeon General, doctors likely to be more trusted than politicians. Indeed, a survey by Robert Blendon *et.al.* of the Harvard School of Public Health, 10/24-28/2001, found that 48% of Americans would trust the head of the CDC as a source of reliable information in the event of a national outbreak of disease caused by bioterrorism. But only 38% would trust the Secretary of Health and Human Services (HHS), and only 33% would trust the Director of the FBI. Had risk communication been included in the considerations of senior managers as the anthrax issue was beginning to develop, and incorporated into the deliberations of how to manage the overall anthrax risk, the more trusted officials would have done the majority of the public speaking, which might have done more to help the public keep their concern about the risk of bioterrorism in perspective.

But trust is more than just who does the talking. Trust also depends on competence. If people believe that a public health or safety agency is competent, they will trust that agency to protect them, and be less afraid, than if they doubt the agency's ability. When the first mad cow case was found, the US Department of Agriculture and Food and Drug Administration were able to point out the effective regulatory actions they had taken for years to keep the risk low. So the *actions* taken by those agencies, years before the news

conferences and press releases about that first case, had risk communication implications by establishing trust and thus affecting the public's judgment about the risk.

Trust is also heavily dependent on honesty. Honesty means many things, of course. In some instances, it can even mean apologizing and taking responsibility for mistakes. When leaks developed in underground tunnels that are part of a major transportation project in Boston, press attention and public criticism focused on the contractor responsible for the tunnels until the chairman of the company said at a tense public hearing "We apologize for our mistakes". (Note that the apology was made 'sincere' by offering to put money behind it.) Attention thereafter focused less on the company's culpability.

Another example of honesty is avoiding the desire to over-reassure. Again, the way the USDA handled mad cow disease illustrates one example. In the years prior to that first sick cow being found, top officials never said there was ZERO risk of mad cow disease, either in animals or in humans, just that the risk was very low. Had they followed the initial inclination of senior USDA officials and dishonestly promised that the risk was ZERO, that single case would probably have provoked a more worried public reaction because people might rightly have feared that the government wasn't being honest and could not be trusted.

And obviously honesty means not covering things up or telling untruths or half-truths. In early 2005 Boston University received local and state approval to build a biocontainment level 4 (BL4) laboratory to study highly dangerous pathogens. But news reports surfaced that the university had hidden from local and state approval authorities the fact that workers had mistakenly been contaminated with tularemia in a BL2 lab at BU. Under public pressure, the government approval and review processes had to be reopened.

Establish mechanisms to empower real community input. Give people control, a

say in their fate. Such mechanisms are a concrete way to follow the widely-accepted recommendation that risk communication is more effective when it is an interaction, not a one-way process.

It is even more effective to do this proactively, so shared control and real input into decision-making are well-established should a risk crisis arise.

This input must be given more than perfunctory attention. Many government public hearing processes allow people to speak, but proscribe officials conducting the meeting from answering the public's questions and concerns. Such an interaction fails to give the audience a sense of control, and more, can destroy trust since it seems disingenuous to claim to want public input but then not acknowledge it with at least a reply.

Adopting risk communication into intrinsic risk management requires

fundamental cultural change. Sharing control, admitting mistakes, acknowledging the validity of intuitive reasoning, accepting that a realistic goal for risk communication is to help people make better judgments for themselves and not to get them to think and do what you want them to think and do, even being open and honest…these are all counter-cultural to institutions and people who are used to control. They are counter-cultural ideas in a litigious society. They are counter-cultural to the myth of the purely rational decision-maker. As risk communication researcher and practitioner Peter Sandman has observed "What is difficult in risk communication isn't figuring out what to do; it's overcoming the organizational and psychological barriers to doing it."

Nonetheless, countless examples, many cited above, demonstrate how adoption of the principles of risk communication are in the best interests of most organizations, as well as the interest of public health. These institutional benefits include reduced controversy and legal costs, increased support for an agency's agenda or a company's brand and products, political support for a candidate or legislation, and more effective governmental risk management that can maximize public health protection by concentrating resources on the greatest threats. While these benefits may not be readily quantifiable, and only realized over the long haul, they are real, well-supported by numerous case studies, and support the cultural change necessary for the adoption of risk communication principles.

Finally, ***if at all possible within constraints of time and budget,* a*ny specific risk***

communication should be systematically designed and executed, including iterative evaluation and refinement. "We wouldn't release a new drug without adequate testing. Considering the potential health (and economic) consequences of misunderstanding risks, we should be equally loath to release a new risk communication without knowing its impact." (Morgan, Fischhoff *et.al.*)

An empirical process by which to do this has been labeled the mental models approach. As its developers say "…in the absence of evidence, no one can predict confidently how to communicate about a risk. Effective and reliable risk communication requires empirical study. Risk messages must be understood by recipients, and their effectiveness must be understood by communicators." The basic components of the mental models approach are:

Create an expert model, based on review of the scientific literature and in

consultation with experts in the field, that describes in detail the nature of the risk; its hazards, where exposures occur, the range of consequences, and the probabilities.

2. Conduct open-ended interviews to find out what your target audience(s) already

know or don't know about the risk.

Based on this smaller interview sample, create a questionnaire to administer to a

larger sample to see how well the mental model of the smaller group corresponds to what the larger sample knows and doesn't know about the risk.

Draft risk communication messages that address incorrect beliefs and fill in

knowledge gaps between what people don't know and what the expert model indicates they need to know. Pay attention to the tone and affective qualities of the messages.

Evaluate and refine the communication using one-on-one interviews, focus

groups, closed-form questionnaires, or problem-solving tasks, trying to develop messages that have the most impact on the greatest number of recipients. Repeat the test-and-refine process until evaluation shows the messages are understood as intended.

Conclusion

Charlie Brown said "I have a new philosophy. I only dread one day at a time." The problem, Charlie, is that tomorrow will bring some new risk, some new reason to worry. Whether terrorism or SARS, nanotechnology or mad cow disease, risks continually arise. Old ones may fade and our attention to them may wane, but new ones will certainly develop, and our awareness of these new threats will be magnified in an age of unprecedented information immediacy and availability.

The human imperative of survival will compel us to use our 'adaptive toolbox' to make the best judgments we can about how to stay safe from this evolving world of threat, even though those judgments might sometimes create greater peril. We need to understand the risks around us as thoroughly as possible so our judgments do us the most good. It is critical that effective risk communication become an intrinsic part of how government, business, the public health sector, and the medical care system design and execute risk management policy, so that we can be informed enough to make wiser and safer choices for ourselves and for our fellow citizens.

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[Back To Top]