

Chapter Three

Fear Factors

Why Some Threats Feel Scarier Than Others

"There are nights when the wolves are silent and only the moon howls."

George Carlin

{A Head} Risk Perception Factors

The family matriarch was turning 80 in October. Her children, grandchildren, and great grandchildren were all looking forward to gathering at her home in the Midwest to celebrate. For most it was a short drive. But one daughter, Sarah, lived in New England, more than a thousand miles away.

Flying didn't worry Sarah. She had flown home to see her mom many times. But this was October, 2001. Air travel had just resumed following the attacks on September 11th. The wrenching images of those planes flying into buildings were still ominously clear in Sarah's mind.

So she decided to drive. "I know it's a long trip," she told her mother on the phone, "but it just feels, well, safer. At least behind the wheel I feel like I have some control. Don't worry. You know I'm a good driver."

Sarah never made it to her mother's birthday celebration. She was killed in a crash a few hundred miles from home.¹ She was just one of hundreds of people killed in the deadly increase in motor vehicle crashes in the months following 9/11. One analysis estimates that 317 more people died in motor vehicle crashes in the United States in the

three months after the September 11 attacks, compared with what would have been expected for those three months.² A second analysis puts the increased motor vehicle death toll for October-December, 2001, at 725.³ A third analysis, done by a group with more expertise in motor vehicle risk than the other two, estimates the extra death toll on American roads for those three months at 1,018.⁴

Despite overwhelming statistical evidence that flying is safer than driving, something many of those people may well have known, those people made choices based more on their Affective perceptions than the statistical evidence, and the resulting Perception Gap killed them.

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We humans like to think we're pretty smart. After all, we have more cerebral cortex than any other species. Dogs can smell better, and elephants can hear better, but when it comes to thinking, that three pounds of grey matter up there puts us at the top of the evolutionary tree. With such superior mental firepower, we proudly presume that we can rise above our animal instincts and figure things out in a perfectly rational way. Just give us enough information and we have the neurons to figure out the objective truth. We assume that, since we have the remarkable capacity to reason, that reason is how we make our choices, or at least, how we should.

For such a smart species, that's pretty dumb. There is overwhelming evidence from both careful scientific research and everybody's real lives that reason and rationality are only part of how we make up our minds, especially when it comes to choices like the one Sarah faced...choices about threats to our health. Remember, the amygdala fires up a risk response before the rational cortex can contribute it's reasoned input. And given the

wiring and chemistry of the brain, even after the initial response, affect is often more powerful than reason. Risk perception is far more than just a factual affair. It's a matter of feelings too.

But where do our feelings come from? What makes one threat more threatening than another? Why are we more afraid of some dangers, when the facts suggest those dangers are not all that dangerous, and not particularly afraid of other hazards that are actually far more hazardous? And why is it that most of us seem to be afraid of the same things, for the same basic reasons?

In addition to the mental shortcuts we have developed for handling decision making under conditions of Bounded Rationality, humans have also developed a sort of psychological short hand for quickly sensing what is scary and what is not. Since the 1970's, research into risk perception has been done in many countries, across many cultures, at different times, when different threats were getting a lot of attention, and a pattern has emerged across all those people in all those different circumstances. We share a well-identified set of psychological factors--Risk Perception Factors--that are strongly associated with whether we are more or less afraid. Think of it this way; risks have personality traits that help us instinctively judge their *character*, even while we consciously consider the facts.

One of these Risk Perception Factors, as Sarah's story illustrates, is the issue of control. The more control we feel we have, the less afraid we generally are, whether we actually *have* that control or only *think* we do. Conversely, the less we feel in control, the more afraid we are likely to be. It made complete sense that more people would prefer to

drive than fly in the wake of the 9/11 attacks. Driving affords some degree of control so, despite the statistics, it *feels* safer.

Another factor that can turn our fears up or down is the relationship between benefit versus risk. The greater the benefit, the less we worry about the associated risk. The smaller the benefit, the larger looms the danger.

We'll explore those two factors, and 10 more, in greater depth in the rest of this section. But first, you need to understand a few general concepts that apply to all of them.

The same factor can make the fear go down, or up. For example, more control = less fear. Less control = more fear. *The first important principle is that each Risk Perception Factor can cause us to be more afraid, or less afraid.*

A second principle; there are more than a dozen Risk Perception Factors, and in most situations more than one is usually involved. Take the risk of heart disease. You know you can diet and reduce your risk, which gives you a sense of control, and that will reduce your fears. But another Risk Perception Factor is Pain and Suffering; the more pain and suffering a risk involves, the more afraid we're likely to be. Let's say you watched a friend die of congestive heart failure, a kind of heart disease where you slowly suffocate to death over a couple years, an awful way to die. So while the Control factor is making you less afraid of heart disease, the Pain And Suffering factor makes you more afraid. *More than one Risk Perception Factor is usually involved in the perception of any given risk.*

A third important principle; Risk Perception Factors are just one part of the system. They make our fears go up or down, but so does Optimism Bias and Anchoring and Adjustment and Categorization and the other general mental shortcuts we use for

deciding things under conditions of Bounded Rationality. And so does the amygdala and all those biological risk response mechanisms. And so do many social and cultural forces, which we'll get to in Chapter Four. And let's not forget the cognitive, thinking, reasoning cortex. *Risk Perception Factors are just one part of the human system of Affective risk perception, which is a complex interaction of several conscious and subconscious components.*

A fourth key principle about these Risk Perception Factors; research on people all around the world for more than 30 years has found that while these factors are generally true for all of us, each of us is also unique and our perceptions will also depend on what we have learned and experienced, and our current life circumstances, and our religious and political and cultural norms. Remember the example of reacting to that snake on the ground that we used earlier? I used that example once in a talk I gave to dairy industry people, including farmers, in Japan. When I asked them what they would do if they saw what might be a snake on the ground, one of the farmers said he would try to capture it, cut off its head, and make its blood into soup. This fellow had an amygdala just like you and me, but in his personal context a snake meant something different than it meant to Charles Darwin. *Risk Perception Factors are true for people in general, but we all bring our own individual perspectives to bear on how we respond to risk.*

Here is one important example of how our personal characteristics interact with the Risk Perception Factors. Let's say you are a reasonably affluent white male in the United States between 20 and 60 years old, healthy, professionally successful, a member of whichever political party is currently in power. You probably have a general sense that you can control things, certainly more than if you were a poor unemployed immigrant

from a non-English speaking racial minority. As a result of your greater general sense of control, you are generally less afraid of most things than white women or non-whites of either gender. Researchers call this The White Male Effect.

So;

- Risk Perception Factors can make our fears go up or down.

- Usually more than one Risk Perception Factor is involved in our overall perception of the threat.

- Risk Perception Factors are only one input into risk perception.

- Risk Perception Factors appear to be universal, but our perceptions also depend on experience, education, and lifestyle factors that make each of us unique.

Back when the possibility of a global epidemic of avian flu was raising a lot of concern, a friend of mine, well-educated and politically liberal, said “I used to think that bird flu might be a serious threat. But now that George Bush says it is, I’m not so sure.” Huh? We begin our journey through the fascinating world of these Risk Perception Factors with what is probably the most important one of all. Trust.

{A Head} Trust

Humans are social animals. Our individual prospects depend to a significant degree on the prospects of the group(s) to which we belong, and how well we get along with the group(s). Survival means being acutely sensitive to who is on our side and who is not. So it isn't surprising that trust matters so much to how we go about protecting ourselves. And it isn't surprising to find the instinct for trust intimately connected with the neural processes deep in the subconscious parts of the brain that help us stay safe.

Few forms of trust are more basic than that between a mother and her newborn child. Scientists studying this bond have discovered that it is strengthened by the hormone oxytocin, released when the baby stares up at mom while breast feeding. It turns out that staring lovingly at your boyfriend or girlfriend can trigger their release of oxytocin too, as can warm physical contact like touching and hugging. (Levels increase during sex and peak at orgasm, which may help explain the age-old question "But will you love me in the morning, when your oxytocin levels have dropped?") Oxytocin reduces stress in arguing couples, helps us recognize faces, even helps us look at a face (in fact, just a pair of eyes) and identify the mood that person is in. The stuff is magic.

Based on the evidence that oxytocin is involved in social bonding, researchers tested its impact on trust.

A Risk Quiz; *Let's say researchers give \$100, and this option: you can either keep the money, or give it to an anonymous trustee who will either invest it and double it to \$200 and return half of the hundred dollars profit to you--\$50--or keep all the money for herself. So by giving it to the anonymous trustee you can go from \$100 to \$150, or lose the \$100 and end up with nothing. Would you trust that anonymous trustee? (Remember Loss Aversion from Chapter Two, where in a similar experiment most people decided to avoid the gamble and take the sure cash.)*

An hour before the start of this actual experiment, half the volunteers were given a sniff of oxytocin. The others sniffed a placebo. More of the volunteers who had sniffed the hormone trusted the anonymous investors and gambled with their money.⁵

A later experiment by another group took it a step further. This time the volunteers who chose to invest with the trustee were told that they had been burned, that the trustee

had kept the money. They were asked if they wanted to try *again*. This would be like getting another spam email from the Nigerian investor and sending him \$5,000 again, right?

Half the burned volunteers got a fresh whiff of *Eau de Oxytocin*, and half got a sniff of *Eau de Placebo*. Those who sniffed the oxytocin were more trusting and ready to invest with an anonymous trustee *a second time* than were the placebo-exposed subjects. And as each volunteer was asked "Do you want to try this again?", the time it took them to respond was measured. The oxytocin-treated volunteers responded *more quickly* than the volunteers who hadn't gotten the nose full of Trust Spray.⁶

Like I said, it's amazing stuff. And it shouldn't be surprising that it affects that amazing part of your brain so intimately involved in keeping you safe, the amygdala, since trust has a lot to do with survival among social animals who depend on each other for safety and protection. Show someone an untrustworthy face, and the amygdala is one of two areas that become more active than anywhere else in the brain.⁷ An untrustworthy face sets off the same sort of response in the amygdala that a snake or spider does!

But we have to be just as good at recognizing who we *can* trust, so the system needs fine-tuned control. That's apparently where oxytocin comes in. In the second set of those gambling experiments with the volunteers and the trustees, researchers used *fMRI* to watch the brains of the volunteers as they made their choices. As the levels of oxytocin in the exposed volunteers went up, activity in the amygdala went down! It turns out the amygdala is loaded with receptors for oxytocin, and the oxytocin binds with those receptors in a way that diminishes the amygdala's ability to be wary. It turns down what

appears to be the amygdala's default setting, to be cautious about who to trust, and reduces its ability to send out the message "Warning! Warning! I don't trust this guy."

These fundamental biological underpinnings deep in the self-preservation systems of the brain suggest why trust plays such a powerful part in our risk response...as we learned from how the public reacted when Mad Cow disease broke out in Japan and Germany.

The first Japanese born-and-raised (*i.e.* not imported) Mad Cow was found in late 2001. Not to worry, said Agriculture Minister Tsutomu Takebe. The food supply in Japan is safe, he promised, also offering his assurance that there were no more sick cows. None. *Oops!* The second cow was found just a couple days later.

Don't worry, Minister Takebe promised. We have rules that ban the kind of cow feeding practices that cause the disease to spread in cattle, he said, the kind of ban adopted in the rest of the world. But the news media soon reported that the "ban" was only a set of *voluntary guidelines* for the cattle industry. The media also reported that the government *health* officials who wanted to make the feed rule mandatory were defeated in a power struggle with *agriculture* officials, including Minister Takebe, who wanted to keep controls more flexible and agriculture industry-friendly. *Oops #2!* Trust dropped further.

Then the Japanese news media reported that, months earlier, the Japanese government had suppressed a European Union document which found that Japan was at high risk for Mad Cow disease. The government knew the risk was high, and covered it up. *OOPS #3!* Trust was all but destroyed. Yet after all these false promises and revelations, Minister

Takebe fired a subordinate, but did not resign, and he continued publicly munching meat in an effort to reassure the public.

The actual physical risk to the public was infinitesimal. The Japanese found only a few sick animals, and a decade of experience with the disease in the U.K. showed that even with tens of thousands of sick cows, fewer than one hundred people in Great Britain had gotten the human version of the disease. But fear ran high because trust in the Japanese government's ability to keep food safe was destroyed. Within days, sales of beef dropped to practically zero. Stores posted signs promising that *their* meat was safe. Many restaurants specializing in beef had to close. 6 months later beef sales in Japan were still off 40%.

To further illustrate the importance of trust, contrast the Japanese experience with what had happened less than a year earlier in Germany.

In November of 2000, German Agriculture Minister Karl-Heinz Funke declared confidently that Germany was *immune* from Mad Cow disease. There's that *absolute* assurance of safety again! Promising zero risk means that if just one sick cow comes along, instead of people saying to themselves "No sweat. The risk is low.", they say to the government "You're supposed to protect me but you lied. I don't trust you. I'm more afraid." But Minister Funke made that mistake in Germany, and the same result followed as would occur later in Japan. People freaked out and beef sales dropped to near zero.

But compare the German response to the Japanese. Within a matter of weeks Funke was kicked out, replaced by Renate Kuenast, a member of the environmentally progressive Green Party, who promised to make the Agriculture Ministry more aware of consumer concerns. And Chancellor Gerhard Schroeder said "The crisis has made it

compellingly clear that we have to make several organizational, and not just personnel, changes”. He proposed several new laws to move German agriculture away from industrial practices and towards organic farming. Unlike Japan, where beef sales stayed so low for so long they depressed the Gross Domestic Product of the country in the quarter following the outbreak, in Germany they were back to normal in a few weeks. Why? In part because the German government responded to the Mad Cow threat with concrete actions that helped restore trust, and that eased public concern, and saved their economy hundreds of millions of dollars.

{B Head} Trust, in Who?

It makes sense that if we don't trust the people or organizations that are supposed to protect us, our fears will rise. But trust also depends on who is doing the communicating about a risk. Which explains why my liberal friend felt differently about the risk of Avian flu after she heard what then-President George W. Bush had to say. Which also explains what a conservative friend said to me recently; “Maybe I'd worry more about climate change if it wasn't Al Gore up there trying to win his second Nobel Peace Prize or another Academy Award.” We worry more about a drug when we learn that the doctor recommending it was paid by the drug company for the studies that said the drug is safe. We worry more about the risk of chemicals if an environmental organization is describing the risk than if it's being described by a chemical company. Why? Not because we understand the science of chemicals. It's a matter of which communicator we trust.

Sometimes our risk response depends on whether we trust the person or organization *creating the risk in the first place*--like a company selling a product. In the 1980's,

women who had had breast implants containing silicone sued Dow Corning, a silicone manufacturer, claiming that the material was causing the medical problems the women were having. As part of one lawsuit, it was revealed that Dow Corning had not fully reported studies they had done indicating a possible connection between silicone breast implants and inflammation. Word of that “hidden study” made major news. The resulting mistrust in the company helped fuel so many lawsuits that Dow Corning filed bankruptcy and ended up paying billions of dollars to women, even though their product was not at fault.

Trust in the Food and Drug Administration, which was perceived to have contributed to the creation of the risk by approving the implants in the first place, had also been badly damaged. The FDA ordered the breast implants off the market. Governments around the world spent tens of millions of dollars researching the risk of silicone, which came to same conclusion reached years earlier when the substance was studied before it was approved in the first place, that while there are plenty of medical risks with breast implantation, silicone is not one of them.

But the Perception Gap had been created. Tens of thousands of women suffered physical pain and suffering because they chose to have their implants removed. Thousands more suffered from fear and stress. And a lot of lawyers got rich riding The Perception Gap to a multi-billion dollar class action settlement.

Or consider a more modern case. When it came to light that the Merck pharmaceutical company *may* have known about dangerous side effects from its pain medication Vioxx but failed to report what it knew before bringing the drug to market, the fears that followed were as much about a lack of trust in Merck as they were about the

drug itself. Indeed the Vioxx issue shook trust in the entire pharmaceutical industry, raising public concerns about many of that entire industry's products and practices.

Or consider the public's risk response when in 2005 it was reported that the Guidant Corporation had withheld information that there might be a defect in one of its heart defibrillators, a defect that may have killed a 21 year-old man. Guidant had some preliminary evidence that *a few* of its devices *might* be failing. They weren't even sure. And even if there was some bug they hadn't quite figured out, the failure rate of the device because of this *possible* defect was lower than the rate at which the defibrillators fail just by random chance (since no machine can be absolutely guaranteed not to fail). The company also knew that sounding an alarm about the suspected failure might scare people into taking defibrillators *out* of their bodies, an operation more likely to cause side effects, including fatal infections, than the device itself was likely to fail. So statistically, sounding the alarm could be worse than saying nothing. And it would hurt sales too.

So the company said nothing. But when the press reported that Guidant had withheld the information, even though the risk of this one device failing was very low, the corporate secrecy damaged trust and created a huge and dangerous Perception Gap. Thousands of people with all kinds of defibrillators and pacemakers, from every manufacturer, had operations to remove the devices from their bodies. And sales of these remarkable machines, which save so many lives and improve the quality of so many more, plummeted and stayed low for several months. (At the time the news broke a rival company had offered to purchase Guidant for \$25 billion. Within a few weeks they dropped their bid to \$21 billion.)

So our risk response depends on how much we trust *the sources of the risk*, the *communication about the risk*, or the *people or agencies that are supposed to protect us from the risk*. But there is one more area where trust is important...trust in the *process*. Consider the proposed National Institutes of Health high security biological laboratory at Boston University.

This lab would study the most deadly pathogens known. Ebola virus. Marburg virus. Such laboratories are known as BL4 facilities. (The “4” is the highest level of safety bio labs are required to have.) Boston University held a public meeting early in the development process to answer the public’s concerns. Those concerns were passionate, but reasonable. “How safe will I be?” “What if there is an accident?” “Even if the lab itself is super safe, how will these deadly germs get delivered? You mean to tell me that the Fed Ex guy is going to be delivering Ebola on our local streets?”

The proponents sat at their head table and listened and respectfully told each speaker “We will note your concern.” But many of the citizens asked their question again, eager for not just a courtesy but an actual answer. The proponents from Boston University told the citizens the hearing wasn’t to answer questions, just to take down people’s concerns. Which naturally made several people in the audience furious. One man yelled “How can we trust you people to keep us safe?” B.U. officials protested that the law governing such hearings would not allow them to discuss the details of the project, but then they failed to stay around after the formal hearing and more fully address people’s concerns.

Those few angry citizens who didn’t like how they had been treated started an opposition campaign that got plenty of media coverage. Opponents charged that BU was

being secretive, only interested in gaining the money and prestige of the lab, even at the expense of their neighbors' safety. Their opposition led to lawsuits and expensive delays, and ultimately a special panel of national experts had to be convened by the National Institutes of Health to investigate how the whole thing had been handled. At the first hearing of this special panel, the woman who had led the local opposition complained about how she and her neighbors felt the decision to build the lab was made behind closed doors with no real concern for local input. She said "You know, if I hadn't been treated the way I was treated at the beginning, we wouldn't be here today." It wasn't the safety of the lab alone that had her upset. It was her lack of trust in the process that was making decisions about her safety.

Dishonesty. Keeping secrets. Not admitting mistakes. Making promises that are impossible to keep. Failing to acknowledge people's affective response to risk. Failing to be open, when possible, and share decision making with people who are affected, when possible... These are just a few of the ways that people and organizations, especially businesses, can, and regularly do, damage trust. It's stunning, really, how often these mistakes are made, given the importance of trust and the huge political and economic consequences to governments and companies who so regularly seem to get this wrong. You think they would learn. And not only from failures. There are success stories out there to teach them, too.

Years ago Finland committed to nuclear power as its principal source of electricity. They also committed to disposing of the high level nuclear waste from Finnish nuclear plants, in Finland. The Finnish government reasonably assumed that siting a nuclear

waste dump would not be easy. What community would want to be the final resting place for some of the most dangerous material known?

So the Finns set up the following process. Step One developed a list of possible sites that could host such a facility based on the science, factors like geology and hydrogeology and climate. Step Two invited representatives of all the possible locations to present their concerns and perspectives. Step Three gave those local communities *VETO POWER* over being chosen. Potential communities could Just Say No, even though that meant that Finland would be in trouble if all the potential host communities refused.

The process truly shared decision making power with local residents. That built trust in the government. Not like the process by which the United States Congress and Department of Energy chose Yucca Mountain in Nevada as a possible high level nuclear waste repository nearly 40 years ago, a facility that several billion dollars later has been abandoned by the Obama administration because of public opposition. In Finland, in part because of the process by which site selection was done, two communities actually ended up competing to host the site, trusting the site selection process in which they had a significant voice.

The way we respond to risk is far too complex a process to say which factors matter most. But it is safe to say that some factors matter more than others. I start with Trust, because it plays such a key role in how we view the world, and it has so much to do with why we're more afraid of some things than others. Now, on to another key Risk Perception Factor, the issue of tradeoffs between the Risks and the Benefits.

{A Head} Risk vs. Benefit

My family says I play the lottery too much. I know they're right. Still, every once in a while I'll buy a scratch ticket, or lay down a few dollars on the Megabucks, for the hope of winning. The hope. That's all I'm buying of course, because I am almost certainly tossing my money away. But as I hand over my cash in exchange for what will momentarily be a worthless piece of paper, at that moment the benefit of the hope outweighs the risk of the loss. Then I lose, and sheepishly admit to my family that they're right.

Humans are intuitive economists. We weigh the value of tradeoffs all the time, sometimes consciously, a lot of the time subconsciously; tradeoffs about money, about how to spend time, or how to accomplish some task, tradeoffs between the risks and benefits of a given choice. Unlike classical economists, however, we don't weigh these choices in strictly quantitative terms. You may compare the price of one possible car purchase against another, or the miles per gallon each car gets, or the resale value. But when it comes time to choose which car to actually buy, you will also have thought about which car looks better, handles better, and which one announces "The person driving this car has an environmental conscience" or "The person driving this car has MADE IT!" And if in the end the car you like costs more and gets lower fuel economy, you'll figure out some way of convincing yourself that those things didn't matter as much as you thought they did when you started your comparison shopping. So things other than money help us subconsciously calculate the pros and cons of various options, but that comparison always plays a big role in the choice we ultimately make.

It's the same with risk. We intuitively weigh the tradeoffs between risks and benefits and, often unconsciously, we play down the risk in order to enjoy the benefit in

ways that create dangerous Perception Gaps. We dramatically increase the chance of killing ourselves for the benefit of that one last drink before we leave the party. We risk dangerous jobs for the benefit of higher pay. We risk contributing to global warming for the benefit of those few extra degrees of indoor heating in the winter, or air conditioning in the summer. When we use our mobile phones while we're driving we risk injury and death for the benefit of staying connected. These aren't conscious quantitative analyses. They are below-the-radar judgments that compare qualitative risks and benefits. And whenever a choice involves both risk and benefit, the greater the benefit, the more we play the risk down in our mind. The smaller the benefit, the greater the risk is likely to seem.

Consider the drug Tysabri. When it was approved in 2004 it was considered the breakthrough drug for treatment of multiple sclerosis (MS). But in February 2005 when manufacturers Biogen and Elan discovered two cases of a rare brain disease among the thousands of users of the drug, a side effect that had not shown up in pre-market testing, they pulled the drug from the market.

The clamor from patients to get it back started immediately. When the FDA held hearings a year later about whether to re-approve the drug, they had to take the unprecedented step of extending the hearings an extra day to let all the people testify who begged to have access to the benefits of this medicine, fully aware of its risks.

One news story about those hearings reported about a 36-year-old woman who cried during her testimony and pleaded to get the drug back. She had been diagnosed with MS several years earlier and was on full disability. Existing therapies didn't work for her and she couldn't even hold her young son. Tysabri restored her to a normal life. "For me,

when I looked at my own risk/benefit equation,” she said “I felt the drug was worth the risk.”

As with all Risk Perception Factors, which can make us less afraid, or more, the risk/benefit factor works both ways too. If there is little perceived benefit, the associated risk will look bigger.

- Consider proposed waste disposal facilities that often meet fierce resistance.

People in many areas don't want any part of a trash dump or incinerator anywhere near them. So their trash is trucked several states away, usually to poorer communities that see the benefit side of the tradeoff and willingly reap the tax revenue of literally being dumped on.

- Consider different international views of nuclear energy. In Austria resistance is fierce, all about the dangers. But in neighboring Hungary, nuclear energy is seen as producing benefits for economic growth, energy independence, and lower carbon emissions.

- Consider spraying pesticides to kill mosquitoes. There are several communities in my state of Massachusetts which oppose such spraying...until the first case of Eastern Equine Encephalitis shows up in the late summer. Triple E, as it is called, is a regional disease worse for horses than humans, but it kills a person or two every few summers. When Triple E shows up, resistance to spraying goes down, because the fear of the disease is up and now the same risk of pesticides looks different because the risk-benefit tradeoff has changed.

In many cases these risk-benefit tradeoff decisions make sense. Maybe not the

choice of the person who adds to their blood alcohol level before getting behind the wheel of a motor vehicle. Or the person 100 pounds overweight who mentally plays down the risk of heart disease for the benefit of that second juicy Double Triple Whammo Awesome Mega Burger. But in places with malaria the benefit of DDT outweighs the risk. The tradeoff to spray makes sense. In places without malaria, it doesn't. The point is, how we perceive risk is not just a matter of the statistical or scientific facts about drunk driving or DDT or obesity. It's a matter of perspective, and that perspective is powerfully informed by how we compare the risks versus the benefits.

It is also very much a matter of whether we feel like we have control

{A Head} Control

Perhaps you have had the experience where you've been driving for several hours and you suddenly wake up and realize, steering wheel in your hand, that you don't remember the last few seconds because the trees you were driving past were more awake than you were. So you say to your partner over in the passenger seat, who you know to be a reliable driver "Hey, I've gotta sleep. Let's switch."

You pull over, go around and get in the passenger seat and...suddenly you're not so sleepy. Suddenly those brake lights on the car ahead of you seem closer than they did when your foot was near the brake pedal. Suddenly those huge trucks in the next lane look closer and bigger than when you had the wheel in your hand. Your amygdala is wide awake, signaling your senses to be more alert. You are no longer in control of what's happening, so you are more afraid.

Desire for the safe feeling of control is what contributed to all those extra road deaths in the United States after 9/11. It felt safer to many people to drive rather than fly,

because driving afforded a greater sense of control. Desire for control is why when H1N1 “swine” flu broke out in the spring of 2008, people in affected countries rushed to buy face masks. Desire for control is why when anthrax spores were sent through the U.S. mail in late 2001, people went out and bought gas masks...even though the spores are too small to see (unless you get an envelope full of them) so by the time you know to put your mask on it's too late.

Remember when the U.S. government suggested one way of preparing for a possible biological or chemical terrorist attack was to have plastic and duct tape available to seal off a room for a few hours? And everybody laughed? Well, not everybody. Stores ran out of the stuff. Millions bought it. One fellow interviewed on TV looked sheepish as he walked out of Home Depot, arms loaded with rolls of plastic, and said "I know it seems stupid, but at least it gives me the feeling that there's something I can do." (A person in Connecticut enclosed his entire house in plastic and duct tape. No word on whether by taking control he suffocated.)

Here is another example. Back in 2004 when production of influenza vaccine ran into trouble and supplies to the United States were cut in half, people waited in line for hours to be vaccinated at clinics and drug stores before the supplies ran out. The New York Times reported that an elderly woman fainted after standing in line for so long, hit her head on the ground, and died. Some people traveled to other countries where the supplies were better. Doctor's offices had trouble attending to patients because they were swamped by demands for flu shots. But was it really the vaccine itself people wanted, or a sense of control?

Normally flu vaccine is plentiful and demand is low. The public health challenge is usually to get *more* people vaccinated. Why? In part, because the availability of the vaccine gives people a sense of control. We know if flu season starts to look bad, we can always go get vaccinated. But this time, headlines in early October announced that there might not be enough for everybody, and suddenly we no longer had the same sense of control over the risk from influenza. Mind you, there was no evidence that flu season was going to be bad...no sign of some new pandemic strain of flu like Bird flu or Swine flu that actually could pose an out-of-the-ordinary risk. All we had was the out-of-the-ordinary possibility that we might lose an important way to keep ourselves safe. A doctor near Washington D.C. talked to the Washington Post about the people calling him for flu shots. "Unfortunately, most feel helpless," he said.

If you doubt the Affective importance of control in this episode, consider this; the U.S. government scrambled and came up with more vaccine, so in the end, there was only a temporary shortage. When the news media reported that supplies would be adequate, demand dropped right back to the low levels of normal years, and by the end of that flu season, The Boston Globe reported that up to 4 million doses of flu vaccine had gone unused and had to be thrown out. People's sense of control went up and their worries went down.

The evidence that control is a powerful Risk Perception Factor, rooted deep in the human animal, is emphatically supported by evidence of the permanent psychological damage people suffer when they experience acute fear and stress. Many studies find that people who have a sense of control *during* a traumatic experience are less likely to develop Post Traumatic Stress Disorder, or develop less serious PTSD symptoms.⁸

People traumatized by flooding who said they had no sense of control during the event were more depressed afterwards than people similarly traumatized who said they had some sense of control while they were afraid.⁹ The more psychotherapy for earthquake survivors gives them a sense of control over their lives, the more successfully those survivors recover from their PTSD.¹⁰

The evidence that this powerful Risk Perception Factor can contribute to a dangerous Perception Gap is everywhere. The increased death toll on America's highways post 9/11 is just one example. Desire for the safe feeling of control is why people in the Washington D.C. Metro area drove miles out of their way to avoid the location where the sniper shot somebody the day before, raising their risk of an accident with each extra mile driven. In the weeks after the September 11 attacks, and again 10 months later around the July 4th holiday weekend, the number of people buying guns accelerated. (I have nothing against guns, but it's safe to say guns purchased to provide a sense of control against the danger of terrorist attack are more likely to hurt someone in an accident than protect the gun owner from a terrorist. Al Qaeda is probably not coming to their house.)

Or we buy hands-free devices for our cell phones so we can keep both hands on the wheel while we drive and chat, because that gives us at least the *belief* that we have more control (as if we ever keep both hands on the wheel anyway). And our fear goes down. Only, sometimes the risk doesn't. The risk created by talking on a mobile phone while you're driving has practically nothing to do with your hands. It's the mental distraction, and that's just as bad whether you have one or both hands on the wheel. Only with the cool Star Trek-looking thing in your ear, you have a feeling of control, and you think you're safer, so you take fewer precautions, and your actual risk is either the same

or perhaps even higher. Consider then the public health implications of our desire for control in several U.S. states and more than 50 countries around the world which have adopted laws banning hand-held cell phone use by drivers but permitting them to drive distracted as long as their hands are free.

Control. The more we think we have, the safer we feel. The less we think we have, the greater our fear. But sometimes our fears are based not so much on how much we think we can influence events as they occur. Sometimes it's a matter of whether we've chosen to take the risk in the first place.

{A Head} Choice

As long as we are using the example of cell phones and driving, maybe you have had this experience; You're driving along on the highway, talking on your cell phone, holding it to your ear. Several factors are at work that have led you to play down the risk in your mind. There's the protective glow of Optimism Bias--It Won't Happen to Me. There is the benefit you are getting from being able to talk to someone when you want to. And there is a sense of control because you have the wheel in your hands.

Suddenly you notice that the car in the lane next to you is weaving closer and closer, then back in its lane, then closer again. And it's speeding up and slowing down, speeding up and slowing down. And you look at the driver, and he is holding a cell phone to his ear, gabbing away. That selfish b____rd! Putting YOU at risk! Man, they ought to ban cell phones and driving, don't you think!?

But are you hoping the government bans *yours*? Or *his*? Remember, the risk of injuring yourself by using a cell phone while you drive is four times higher than the risk of being injured by someone else doing it. But that doesn't matter much. The risk from

that other driver is being *imposed* on you, and that makes it feel more threatening than taking the same risk by choice.

A Risk Quiz; *You know those long brochures in tiny print that come in over-the-counter medicine with all the details about possible side effects? Do you ever read them? Most people don't. But suppose drug companies proposed getting rid of them because they waste paper and ink and money and energy, and nobody ever reads them anyway. How would you feel?*

Most people I ask say they want that label in there, and when I ask them why, they say because the information gives them choice.

Not long ago the U.S. government announced that it was safe to eat meat and milk from cloned animals. The Consumer Federation of America (CFA) came out against it. But if you look at the basis for their concern, it wasn't from cloned meat and milk products themselves. The CFA just opposed selling those products without labels. Their official statement said "Putting cloned milk and meat on the market with no identifying label information eliminates the option to avoid the products." They were concerned because of lack of choice.

Remember, Risk Perception Factors can make fear go up or down. The more involuntary a risk feels, the more worrisome it is likely to be. But if we *do* have choice, we are willing to jump off bridges head first with only a thick rubber cord around our legs, or yack and drive, or even to host a high level nuclear waste dump in our community.

Remember the example of the siting of a nuclear waste facility in Finland? The communities that were selected as scientifically feasible all *had veto power!* The choice

was theirs. Most said no, but two were interested in learning more about the risks and the benefits and in the end, those two communities competed to host a facility that would permanently store some of the most dangerous material known to humans.

The community of Eurajoki won. Two reactors had been operating there for decades. That surely contributed to acceptance, along with the proposed tax benefits and all those new good-paying long term jobs. The Finns trust their government, and are strongly pro-nuclear, which also helped. But choice had a lot to do with the perception of the risk too. Saying "Yes, we want it" made a huge difference, compared with the people near Yucca Mountain Nevada whose resistance to the U.S. government's proposed nuclear waste storage facility dramatically increased when Congress narrowed the list of candidate sites to one, Yucca Mountain, and the risk was imposed on them.

Imposed risk is often a big factor in opposition to siting controversial facilities. In a Boston suburb a few years ago, some members of a church fought the placement of a cell phone tower in the steeple of the church. They opposed it on the grounds that radiation from the tower would be dangerous to churchgoers. That fear was not supported by the scientific evidence. They argued against it because there was a daycare center in the church so the radiation was a threat to children, also not true according to what experts say about radiation from cell phone towers. But when the opponents were asked what upset them most, it was the fact that they hadn't been given a say in the decision to locate the tower in the steeple in the first place. The agreement had been made by church leaders without any say from the churchgoers, some of whom then rose up in opposition.

So church leaders scrapped the deal with the mobile phone company. They held a series of meetings with churchgoers to get their thoughts on whether to proceed. And

after those meetings, the church goers somehow saw things differently. Instead of worrying about the radiation, now they were pleased about the tens of thousands of dollars the mobile phone company would pay to rent the steeple. Of course, they knew about that income before, back when they opposed the tower. But the benefits now outweighed the risks because now they had a say in whether the tower would go in. Now the risk was voluntary. So their perspectives changed, and what was unacceptable, with a risk that outweighed the benefits, was now acceptable, and the same benefits that had been on the table all along outweighed the same risks people were afraid of just months before.

It's amazing how these Risk Perception Factors work, isn't it?!

{A Head} Natural or Human-Made

West Nile virus was starting to show up in a California community and a debate arose over what to do. One of the options was to spray an insecticide that kills mosquito larvae, which reduces the spread of the disease. The idea of spraying caused controversy but, in the end, the question wasn't whether to spray, but what spray to use.

The choices were between a natural insecticide that had a slightly higher toxicity to humans, or a synthetic product with a slightly lower toxicity. (In either case, the risk to people was extraordinarily low.) The community chose the natural one, even though that product was more dangerous. People felt more comfortable using a natural product.

Anybody who's gotten Poison Ivy, food poisoning, or seen those shows where lions and hyenas kill and eat their prey, knows that sometimes nature is not nice. But when it comes to the judgments we make about risk, a natural threat is generally less worrisome than one that's human-made. Consider the laws in many countries governing

medicines. The development, testing, sale and advertising of pharmaceuticals, are tightly controlled. These are human-made products and we want them kept safe. But if you wanted to, you could grab a handful of leaves from any bush, grind them into a powder and put it in a jar with a nice New Age-looking label and call it Leaves of Love-Nature's Libido Enhancer, and sell it tomorrow in natural product stores, natural food stores (and possible a few porn shops.) There are far fewer controls on natural and herbal remedies than on human-made drugs, though both are bioactive and most of the human-made drugs are only manufactured versions of some natural substance to begin with. Why haven't we demanded the same controls on herbal and natural drugs? In large measure, because we just don't worry as much about risks from natural sources as risks that are human-made. And that can cause a dangerous Perception Gap.

A 1994 study of Ayurvedic herbal medicines found one sample in five purchased from local stores in Boston contained enough lead, mercury, or arsenic that anybody using the medicine as directed would get higher doses than U.S. safety standards deem safe. And not just a little higher. Some of these natural products would expose a user to 10,000 times as much of these toxic heavy metals as federal rules allow.¹² (Why didn't environmentalists scream and yell about that as much as they do about much lower levels of mercury in seafood?)

There are numerous cases in which natural and herbal remedies have caused all sorts of health problems (as well as terrific benefits, of course). The British Medicines and Healthcare products Regulatory Agency (MHRA) put out a blanket warning cautioning the public about using unregulated herbal medicines in the U.K. in 2008, citing problems with contaminated products, mislabeled products, and just plain

dangerous but untested products. “The problem,” the agency said, “is that consumers have to guess whether these *unlicensed* products contain the ingredients that are declared, and have reliable information about their use.” Because we are less afraid of natural risks, we have *not* pushed for regulations of these substances, and we are at greater risk.

This Risk Perception Factor plays a key role in a large number of environmental risk controversies. Lots of plants contain known carcinogens or toxins at much higher levels than the pesticides the plants are sprayed with, but we worry about the pesticides. Soy beans are really high in estrogen and too much of that hormone can raise the risk of breast cancer and birth defects, but many people are much more worried about human-made chemicals in the environment that have the same effect. Or consider genetically modified food.

It scares a lot of people. It’s the process of cutting and splicing single genes from one organism into another to produce food with beneficial properties...taste, shelf-life, resistance to pests. We used to do this the old fashioned Gregor Mendel way. We’d mix all the natural genetic material from different species and see what we ended up with. If we came up with a redder tomato or plumper chicken, we’d breed that one. Lord only knows what *else* had changed inside the tomato or chicken and how those traits could spread to other organisms but, no matter. It was done the natural way.

Genetic engineering replaces that shotgun approach with the precision of scientifically changing only one gene. We know precisely what trait is supposed to show up in the new plant or animal and can test the new organism for allergies or environmental damage or other hazards. Yes, those traits could spread to other plants and animals, but so could the new traits of organisms we hybridized the old way...the natural

way. The real problem for some people is genetically modified organisms are human-made...from the lab, not the farm. On the Greenpeace website under “What’s Wrong with Genetic Engineering” the very first thing they say is “Genetic engineering enables scientists to create plants, animals and micro-organisms by manipulating genes in a way that *does not occur naturally.*” (My emphasis.)

Again, I’m not arguing for or against genetically modified food, or saying that you should or shouldn’t be afraid of pesticides or not eat soy beans. These are just interesting examples of risks where the ‘natural or human-made’ factor plays a big role in our Affective perceptions

Here is another one. Are you worried about radiation from cell phones or cell phone towers or microwave ovens or power lines or nuclear power plants? Many people are. Yet many of these same people don't protect their skin from the sun when they spend more than half an hour outside. That's a radiation risk, a much greater threat than all those other ones. But the sun is natural, so the risk from solar radiation doesn't scare people the same way human-made radiation does.

A 1997 Public Broadcasting System documentary about nuclear power included an interview with a woman, Linda, who lived near the Three Mile Island Nuclear Power plant in Pennsylvania. She believed the accident at Three Mile Island in 1979 had released radiation and caused cancer in her neighborhood, though all the scientific evidence showed that wasn't the case. Linda continued to monitor radiation from the plant nearly two decades after accident.

It turns out that this region is known geologically as the Reading Prong, a formation of underground rock particularly rich in uranium, which produces radon, a

radioactive gas which has been called the second leading cause of lung cancer in the United States after cigarette smoke. So Linda has Three Mile Island in the neighborhood and monitors radiation from the plant. But listen to what she says about whether she has had her house tested for radon. In particular, listen to *why*.

"I have not had my house tested for radon. And perhaps I will someday. But I don't look at it as...it's not a, it's not a manmade thing. Radon is part of...it seeps in through...it's in the dirt. It seeps into our homes. And we've been building homes for many, many, many, many, years. Am I...you know...where's my thinking wrong here?"

Linda is a clear example of what this chapter and this whole book are about. The facts are pretty clear. She ought to have her home tested for radon. But she is suffering a potentially dangerous Perception Gap because of her Affective risk response, in this case because she is less afraid of risks that are natural and more afraid of risks that are human-made. Like we all are.

{A Head} Pain and Suffering

A Risk Quiz; Let's say you have to die tomorrow. That's the bad news. The good news is, you get to decide how. You will be given three choices, one at a time.

1. Presuming you have to die tomorrow, and you can either die being eaten alive by a shark or from heart disease, which way do you choose to go?

Most people facing that choice vote for heart disease. A few vote for death by shark attack. When asked why, they say something like "It will be quicker." One journalist who voted for death by shark explained "At least my obituary would be on the front page."

2. *Presuming you have to die tomorrow, and you can either die burning alive in a fire or from heart disease, which way do you choose to go?*

No one usually votes for burning alive.

3. *Presuming you have to die tomorrow, and you can either die of cancer or from heart disease, which way do you choose to go?*

The overwhelming majority vote for death by heart disease, to avoid cancer.

Statistically, these answers don't make sense. The much greater risk in all three cases is heart disease. (In the U.S., roughly 20% more people die of heart disease than cancer annually. Worldwide, cardiovascular deaths kill twice as many people as cancer.) Shouldn't you be more afraid of what is more likely to kill you? But the questions weren't framed in terms of likelihood. All three are framed to get you to think about the *nature* of the death, and the greater the Pain and Suffering, the greater the fear. It's why some people vote for death being eaten alive by a shark. "Quicker" means less Pain and Suffering.

Remember Susan, from the Introduction, the overweight smoker worried about chemicals in the air in her daughter's school? What was she really worried about? She was worried that human-made chemicals, as she screamed, "...COULD GIVE OUR CHILDREN CANCER!" And Linda, the woman worried about Three Mile island we just met? What was she really worried about? She was monitoring radiation, because human-made radiation can cause *cancer*. It would be easy to dismiss Susan and Linda as irrational, emotional, wrong. But that would ignore the psychological research, and overwhelming evidence from the daily headlines, that risks that cause cancer or other

harms perceived to be particularly painful are simply more frightening than risks that may be more likely but which involve less Pain and Suffering.

Why do shark attack stories make headlines? In Nebraska? Pain and Suffering.

Why does the United States spend billions more on cancer research than researching heart disease, a bigger threat? To some degree, because of Pain and Suffering.

Why do so many people so deeply fear nuclear waste when (a) it can be safely transported and stored (b) it can't harm you unless you're right next to it, or ingest or inhale it, and (c) we know from studies of survivors of awful radiation exposure in Hiroshima and Nagasaki that nuclear radiation is indeed a carcinogen, but it's not very strong one; of 100,000 survivors, approximately 600 have died of cancer from the radiation from atomic bomb explosions! No matter those facts. Radiation causes cancer and that involves increased Pain and Suffering.

The flip side of the Pain and Suffering Risk Perception Factor is that it leaves us *less* afraid of some really major threats that harm us in relatively less awful ways. We've talked about heart disease. How about Chronic Obstructive Pulmonary Diseases, like bronchitis and emphysema and asthma, the fourth leading cause of death in the United States per year. Does bronchitis sound like it involves as much Pain and Suffering as cancer? Not to many people.

How about something as mundane sounding as the risk of death from just plain falling down. 17,000 people in the United States die every year from falls, 11,000 of whom are elderly. Falls are a more common cause of death than murder. But the threat of "falling-down-to-death" does not conjure images of a particularly painful way to go. So

we don't hear much about this risk, and don't take the easy precautions (steadier footwear, firmer flooring, better lighting, more handrails) that could make us safer.

How about the flu? Every had a really bad case of influenza? I hope you never do. Talk about pain and suffering! But influenza does not evoke dreadful images the way cancer or dying in a plane crash do, so the fact that 36,000 people in the United States die from influenza each year--twice as many as are murdered--doesn't evoke as much concern.

The numbers say it should. The numbers say we should worry more about accidents and Chronic Obstructive Pulmonary Diseases and heart disease. But numbers talk to the rational cortex. The degree of Pain and Suffering talks to the overall Affective nature of our risk response, and contributes significantly to The Perception Gap that is a risk in and of itself.

{A Head} Uncertainty

On March 30, 1979, Walter Cronkite, anchor of the CBS Evening News, opened the evening newscast this way; "Good Evening. The world has never known a day quite like today. It faced the considerable uncertainties, and dangers, of the worst nuclear power plant accident of the atomic age."

He was reporting on the accident at the Three Mile Island nuclear plant. A combination of equipment failure, poor design, and human error damaged the nuclear reactor at the plant, threatening to release dangerous amounts of radiation into the environment. The interesting thing about Cronkite's lead is that the first worry he mentions is "considerable uncertainties". Only after that does he mention "dangers".

The two go hand in glove. The more uncertain we are, the more afraid we are likely to be. fMRI tests have shown that when we are exposed to something that might be a threat, the less certain we are the more active our amygdala becomes, apparently getting busier trying to make sense of whether we are in danger.¹² The amygdalas of the people near Three Mile Island must have been going berserk. Public statements from the operators of Three Mile Island, the Pennsylvania state governor, and federal nuclear oversight authorities were confusing, contradictory, and made it pretty obvious they didn't know what was going on. At first they said an evacuation would be necessary. Then they said it wouldn't. Then state officials suggested evacuation just as a precaution for a few thousand pregnant women and families with infants living within five miles of the plant. 140,000 people fled.

There was confusion in official statements about whether radiation had been released, confusion about what might happen next. There was even confusion about who was in charge. And how did all that confusion and uncertainty make people feel? A local priest offered blanket absolution to people living in the area, something done for people facing death. As a senior Nuclear Regulatory commission official put it later "What we had done to these people was just outrageous. We had frightened them so bad, they thought they were going to die."

You don't have to have experienced Three Mile Island to understand the power of uncertainty as a Risk Perception Factor. Imagine you're driving on a highway. The day is dry and sunny. Traffic is light. Now imagine closing your eyes. Keep them closed as you drive ahead at 65 miles an hour. Keep driving, eyes closed. How does that feel? Frightening, of course. (Your amygdala may be lighting up just imagining this!) Why?

Because you don't have the information you need to protect yourself. Your hands are still on the steering wheel, but your *brain* doesn't have as much control because it doesn't know what it needs to know to keep you safe. Closing your eyes increases uncertainty, and your risk response shifts from the rational fact-based part of the system to the affective part that relies more on instinct to keep you safe.

Uncertainty contributed significantly to people's fears of the Metro D.C. sniper. I have a relative who lives in the area where many of the shootings occurred. He described his feelings this way; "It's scary because there are no clues. It could be one guy. It could be more than one. It could be terrorists, it could be a psycho. There are composite descriptions of two trucks, not just one. Talk about uncertainty. It could be a former military guy. White, black, young old, male, female. This could be anybody, anywhere, at any time. We just don't know what's going to happen next."

Uncertainty is a big part of why many women worried for years about hormone replacement therapy for treatment of menopausal symptoms. One study said one thing. Another study said something else, sometimes in conflict with what previous studies said. For women trying to thoughtfully decide what to do, it was like driving blind.

Uncertainty plays a big role in fears of many modern risks. What do the following hazards have in common?

- Bovine growth hormone in cows to increase milk productivity.
- Cell phone towers.
- Pesticides on food.

These hazards share several characteristics. First, the actual danger is lower than some people fear. Why? In part because they are human-made, not natural, and that

makes them scarier. They are risks which are imposed on us, and that makes them scarier. And all three involve uncertainty, which takes a few different forms.

First, there is the form of uncertainty that I'll call I Can't Detect It. Look at those three risks listed above. We can't see/smell/taste/hear/feel them. We can't detect them with our own senses. If you have some reason to believe there is a hazard around but you can't detect it--you can't know what you need to know to protect yourself--you're driving blind.

Another form of uncertainty is I Don't Understand It. Scientists have studied those three risks extensively. We know a lot about them. But mostly, "we", you and me, are not scientists. For most of us it's hard to understand the recombinant DNA gene splicing techniques for increasing the natural bovine growth hormone in cows. It's difficult to grasp the physics of electromagnetic radiation waves, of amplitude and frequency and volts and watts and amperes from cell phone towers. The chemistry and biology and toxicology of pesticides is also complex stuff, hard to understand.

It doesn't matter if science has the answers if we don't understand them. It's like not having the answers in the first place. The less we understand the scientific explanations of risks, the less our cognitive, fact-based, analytical brain system can help, and the more we rely on instinctive Risk Perception Factors to help keep ourselves safe.

The third form of uncertainty common to many modern risks is Nobody Knows. Not you. Not me. And not the scientists. We just don't have the answers yet. Radiation from power lines offers a good example. We know plenty *now* about whether the electrical and magnetic fields (EMFs) from power lines cause cancer, a suspicion that arose from a few studies in the 1980's and which exploded when those studies were

featured in a series of alarming articles in *The New Yorker* magazine. We know *now*, based on hundreds of studies from around the world, that there is no consistent link between EMFs and cancer. But when the news media sounded the alarm, nobody knew whether those first few studies would be confirmed or contradicted by further investigation. Back then, *we didn't know*. We were *uncertain*. So, like a lot of other people, I got rid of my electric blanket. Now I know that I unnecessarily endured cold toes in bed at night. Our uncertainty has been reduced, and so have our fears.

{B Head} Uncertainty and Precaution

Uncertainty is a huge Risk Perception Factor motivating the call for a Precautionary Principle, a legally binding form of "Better Safe Than Sorry", an approach to dealing with modern technological and environmental risks that *might* be dangerous when science doesn't have all the answers yet. Right now products and processes already on the market that might be dangerous can only be pulled with conclusive proof—a pretty high standard--that they're dangerous. While we're still not sure, they stay on the market. The Precautionary Principle would turn that around and say that products and processes that *may* be dangerous have to be proved safe *before* being approved. It's all about what to do when we're not sure.

Consider the language in the various definitions of the Precautionary Principle.
(*Italics are mine.*)

"When an activity raises threats of harm to human health or the environment, precautionary measures should be taken *even if some cause and effect relationships are not fully established scientifically.*" (Wingspread Conference, 1998).

"The precautionary principle applies *where scientific evidence is insufficient, inconclusive or uncertain...*" (European Commission, 2000).

"Where there are threats of serious or irreversible damage, *lack of full scientific certainty* shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. (Rio Conference "Earth Summit" 1992).

The Precautionary Principle is appealing, but opponents say that, taken to its extreme, we'd have to ban everything until we were absolutely sure it was safe. Progress would come to a halt. Advocates of the Precautionary Principle say that of course it would have to be flexible, and only applied based on plausible evidence that a new product might be dangerous. But how much evidence is enough? How certain would we have to be about some new substance or process before saying "Yes, it's safe" or "No, we're not sure enough yet, so ban it until we are." The whole debate really pivots around the troubling nature of uncertainty.

The Precautionary Principle is one way of dealing with the fears that many people have that this is the riskiest world humans have ever faced. The uncertainty factor helps explain why so many feel that way. Yes, life spans in the developed world have more than doubled in the past 100 years. Yes, we have more abundant food, better medical care, and unprecedented scientific and technological power to meet the major challenges we face. But the benefits of modern life also present a host of risks, many of which are not thoroughly understood. Uncertainty is inherent in progress. It is also inherently a factor that feeds our fears.

{A Head} Catastrophic or Chronic

Roughly 1,800 people in the United States will die from heart disease today. About 800 will die in Argentina, 480 in Germany, 440 in Japan, 300 in England, and approximately 100 will die of heart disease in South Africa. Today. And tomorrow. And the day after that, every day, all year.

On March 27, 1977, the deadliest plane crash in history took 583 lives in the Tenerife Islands when two jumbo jets collided on the runway. The heart disease death toll in the United States reaches that number *every eight hours!*

You don't hear much about the catastrophic worldwide death toll from heart disease, yet you hear all about catastrophes like plane crashes. Why is that? Why is the huge number of lives lost to heart disease not a catastrophe, but a plane crash, with fewer victims, is?

As with everything having to do with risk perception, the numbers are not the whole story. Our risk response depends on the affective nature of the threat, not just the number of victims, and "catastrophic" has three important affective qualities that cause us to worry more. The American Heritage Dictionary defines catastrophe as "A *great*, often *sudden calamity*." (*Emphasis is mine.*) A catastrophe has to be big, it has to happen all at once, and something about it has to be calamitous...disastrous...really bad.

A plane crash certainly qualifies. It kills a lot of people, all at once, in one place, and in a really horrific way. But heart disease, like most of the major causes of death, only meets one of those criteria. As awful as heart disease and stroke and diabetes are, they don't kill people in such vividly awful ways as plane crashes or mass murders or industrial accidents or tornadoes. And they don't kill a lot of people all at once in one place. They are chronic killers. Their victims are spread out over space and time. Those

1,800 daily heart disease victims in the U.S. die here and there across the country, not in one specific location, like the foggy runway in the Tenerife Islands where 583 people died all at once in a horrible crash and fire.

Chernobyl certainly qualifies as a catastrophe. As mentioned earlier, 57 people died from acute radiation exposure in the immediate weeks after the explosion and fire at Chernobyl, and hundreds of thousands of people were exposed to harmful levels of radiation. Compare that to the risk of skin cancer caused by radiation from the sun, which is not something people think of as a catastrophe. As you learned earlier, approximately 8,000 people in the United States die each year from skin cancer--usually melanoma--caused by exposure to solar radiation. The sun is a much bigger risk than radiation from the worst nuclear power plant. But deaths from solar radiation will be spread out over space and time. (And it's natural.)

Here is another example. Consider the difference between murder, mass murder, and massacre. All three are violent deaths caused by others, but we hear much more about the second two, the ones with 'mass' in their name, even though of the three, murder results in far more deaths. A World Health Organization study reported that in 2000, about 500,000 people were murdered worldwide. 90 people a day are murdered Colombia, 40 per day in the U.S., 6 per day just in the city of Cape Town South Africa, 2 people per day Moscow.

But the American Heritage Dictionary definition of murder, "The unlawful killing of *one* human by another", is missing two of three characteristics of catastrophe; large scale, and something that makes the death particularly awful. The risk of murder is chronic, not catastrophic.

Mass murder, on the other hand--“The act of murdering a *large number* of people, typically *at the same time* or over a relatively short period of time” (*Wikipedia*)--has two of the three characteristics of catastrophe, large scale and short time frame in a single location. So when Tomohiro Kato stabs seven people to death in Tokyo in June 2008, or when freshman Seung-Hui Cho slaughters 32 Virginia Tech students in April 2007, or when Bruce Pardo dresses as Santa Claus at a Christmas Party in Los Angeles in 2008 and shoots seven family members to death and then sets their house on fire, the world hears about it, instantly, via nearly every news media outlet.

Or consider massacres, the definition of which--“The act or an *instance* of killing a *large number* of humans indiscriminately and *cruelly*”--contains all three elements of catastrophe; large scale, short time frame and single location, and the murder of people who can't defend themselves, which makes such killings particularly cruel and awful. These events upset us so much they become infamous. Srebrenica, 1995--8,000 defenseless Bosnian males slaughtered by the Serbian military. Sabra and Shatilla--3,500 Palestinian refugees slaughtered in 1982 by Lebanese militias after the Israeli army surrounded the refugee camps and let the militias in and allowed them to do their killing. My Lai--U.S. military forces slaughter 504 Vietnamese civilians from 1 to 81 years-old.

And yet the daily civilian death toll from combat in Vietnam during the war was 218. So more Vietnamese civilians were killed in two and a half days than died at My Lai. And on the day before Christmas 2008 when Bruce Pardo killed seven family members in Los Angeles, five times that many people were murdered in the United States.

What is it about large scale loss of life in one place at one time that makes such risks particularly frightening to people all over the world? The sobering list of mass murders and massacres offers one possible explanation. If you look not at how many victims there were, but *who* they were, victims of mass murders and massacres are often members of one distinct tribe, a community, a religion, some distinct social group. Blacks. Jews. Muslims. Irish. Native Americans. Darfuris. Chinese protestors. Students. Family Members. Even organized crime gang members. (The St. Valentine's Day *massacre* of 7 mobsters in 1929.) The victims shared some kind of unique social identity.

So? Well, such a risk response makes sense in the context of evolutionary psychology. Humans are social animals. We aren't loners. We have always depended on the societies to which we belong for our very survival. When the lion attacks, if everyone is working together we can fight it off. Alone, we'd each be lion chow. So the better the tribe is doing and the more secure we are as a member of our tribe(s), the better our personal chances. In that context it's not hard to understand why, when several members of our tribe are killed all at once, each individual member of the tribe feels threatened.

So when the floodwaters of the Pacific tsunami in 2004 killed more than 500 Swedes, the Swedish media (indeed the media throughout Caucasian Western Europe) understandably paid much more attention than when 146,000 Asians died in Myanmar from flooding due to Cyclone Nargis in 2008. Different tribe. Americans were probably more worried about the risk of earthquake after the 1989 Loma Prieta quake in San Francisco killed 63 than they were one a year later after the one in Iran that killed 45,000. And the Iranians were no doubt more worried about earthquakes after the one in Manjil-Rudbar than they were after the one that killed 87,000 Pakistanis in Kashmir in 2005, or

the one that killed 69,000 Chinese in Sichuan Province in 2008. Different tribes. We worry more about catastrophic threats to the communities to which we belong.

But we also worry more about catastrophic loss of life, anywhere, even when the catastrophe doesn't seem to affect any of the tribes to which we belong. Why should a plane crash in Brazil frighten a Briton in Brighton? Why should a fire that kills a family of fifteen in Philadelphia evoke fear in Florida? Why do catastrophic risks feel more threatening than chronic ones even if they happen to people in *other* tribes? Well, even if you are not a member of the race, or nationality, or religion, or other unique group that suffered, you still share one tribal membership with the victims. You are a member of the human tribe, and evolutionary psychology would suggest that what threatens the species threatens you too.

That may explain why so many people in so many countries said “We are all Americans today” (or words to that effect), on September 11, 2001. It may explain why a train crash on the Trans Siberian Railroad that kills 550 people, or a ferry that takes 850 lives when it sinks in the Baltic, or a fire in a nightclub in Rhode Island that kills 100, grabs our attention, while the 550 Russians die of alcoholism every ten days, or 850 Europeans who die in motor vehicle crashes every two and a half days, or 100 New Englanders who die of cancer every *27 hours*, don't! It is possible that the concentrated loss of life in a catastrophe, a concentrated loss of members of the tribe, may trigger instinctive fears in all of us.

{A Head} Can It Happen to ME?

A Risk Quiz; *Imagine you are in New York City at the annual meeting of the Mad Magazine fan club and there is a bowl of candy at your table. Each piece is in a little*

wrapper with a picture of gap-toothed Alfred E. Neuman and his silly grin saying “What, Me Worry?” You’ve been snacking away out of the candy bowl all morning. During the coffee break out in the lobby a newspaper headline catches your eye;

Candy Poisoning Threat

A major international candy manufacturer is recalling one million pieces of candy produced last month after a former employee told the company he poisoned one piece as revenge after he was laid off.

How does that feel to you? Worried? Probably not. After all, there are a lot of candy manufacturers out there, and one in a million is a pretty low risk. But you keep reading...

The company says the candy being recalled was delivered within the past few days to New York city conference venues, and included a specially wrapped candy featuring a picture of Mad Magazine’s Alfred E. Neuman saying “What, Me Worry?”

Worried now?

Based on the facts, you shouldn’t be. The risk is still one in a million. If you took a cab to your conference, you were certainly at greater risk than you are from the candy you ate. If you had breakfast this morning you are at much greater risk of food poisoning than being killed by that next piece of candy.

But you go back in and take your seat as the conference resumes, and there is the candy bowl with Alfred E. Neuman grinning up at you from those candy wrappers asking “What, Me Worry?”, and despite the one-in-a-million odds, you answer. “YES ME WORRY!”

Any risk feels bigger if you think it could happen to you. If you think you could be the one swimmer out of four million each year in the U.S. killed by a shark, if you think you could be the one hamburger eater in Great Britain out of ten million who gets Mad Cow Disease, if you think you could be the one person out of every 12 million who gets in a commercial airplane on a non-stop trip and dies in a crash, you could end up avoiding swimming in the ocean, burgers, and flying. The odds are only one part of how we measure risk.

In one way, this makes sense. Your amygdala does not care about the next guy's amygdala. Your job is to worry about *your* survival. If a risk is one in a million, you are less concerned about the survival of the other 999,999 than you are about your own. So if you could be the one, the rest of the ratio doesn't matter as much.

You can see this in the way people respond to risk all the time. Consider SARS, (Severe Acute Respiratory Syndrome). The first cases were reported in Guangdong China in early 2002. Naturally, that's where the fear was most concentrated. The Chinese Army had to help keep civil order in some places. But there was little worry anywhere else.

Then a case showed up in Vietnam and another in Hong Kong and another in Singapore, and the fear spread along with the germ because now people in those places said to themselves "It can happen to ME!" Food and animal markets closed. Public events were cancelled. International travel to Hong Kong fell to near zero. (I attended a conference there nine months later at which the attendees were all given a personal bottle of antiseptic hand lotion to use. Most of us used it.)

At this point SARS was getting a lot of alarmist news coverage internationally, but serious concern outside Asia was limited to Asian neighborhoods and shops in the

rest of the world. Until cases showed up in Toronto in March. Concern there erupted. Stores ran out of medical face masks. International conferences scheduled for Toronto were cancelled. The government banned all elective surgery in the entire province of Ontario. A follow-up report found “Many people with other serious conditions had surgeries cancelled because some hospitals were considered contaminated areas, and some of these people died.”¹³

The point is not that SARS was not a serious risk. It was. Quarantines of infected individuals and bans on elective travel to affected countries were a response not to fear but to the disease itself. The point is that you can map the risk response by mapping the progress of the germ, because only where victims actually showed up did people say to themselves “It could happen to ME!”.

The same thing happened in the United States with the arrival of a few mosquitoes that hitched an airplane ride from the Middle East, probably Israel, carrying West Nile virus. Indigenous in certain parts of the world, this disease was new in the U.S. and that alone made it frightening. (More on the Risk Perception Factor of New vs. Familiar later). But the fear was limited to where the cases were. New York city at first, then Connecticut, then New England and mid-Atlantic states, then the South and Midwest, carried by birds. And in each new community, whenever the first dead bird was found, the headlines blared “WEST NILE VIRUS IS HERE ” and people in that community who had heard of the disease in the national news but hadn’t worried all that much, grew concerned because now they could say “It could happen to me.”

Again, this makes sense. There is no need to worry about a risk when it only threatens somebody else, and real reason to worry when it imperils you. But fear of West

Nile virus was far greater than the actual risk. Most people living in areas where birds are carrying West Nile virus are never infected (by a mosquito that feeds off the bird and then feeds on you) and 80% of the people who are infected never show any signs of disease. Their immune system keeps it in check.

But that takes us back to the point that the numbers and probabilities are only part of how we gauge the threats we face. The risk may be one in a million, but if you think you could be the one...

The “Can It Happen To Me” Risk Perception Factor changed global history on September 11, 2001. Before that, Americans had occasionally been the target of terrorists, and some of these attacks even occurred on American soil, including the 1993 bombing of the World Trade Center itself. But for the most part, terrorist attacks on Americans had been overseas in embassies or night clubs or on airplanes. Suddenly on that clear September morning the risk of terrorism for three hundred million Americans became personal. Now the attacks were taking place here, in the HOMELAND, a word that sounds more appropriate to World War II Germany than to any national self-identification used in the U.S. As President Bush said in his special address to Congress and the country after the attacks “Our nation has been put on notice: We’re not immune from attack.” It *can* happen to *us*.

In fact, take the word homeland, and remove the ‘ho’. You are left with MELand. Now the terrorists were *here*, and millions of people thought for the first time that ‘*It could happen to ME!*’ And then came the anthrax attacks in October, and everybody with a mailbox suddenly was saying to themselves ‘*It could happen to ME!*’

This was unquestionably the context that allowed the Bush administration to deceive a frightened country about the threat to the United States posed by Saddam Hussein. We were ready to believe that weapons of mass destruction thousands of miles away might threaten us. We were ready to believe the lie that Saddam Hussein and Al Qaeda were connected. We were ready to believe that starting a war, and relinquishing some civil liberties, and undergoing a massively expensive reorganization of the federal government, were justified. We were ready to believe that speaking out against government policies was treasonous, that torture and other violations of international codes of behavior were acceptable. We were afraid, afraid of a risk that had threatened Americans before, but mostly somewhere else. Now we thought “It could happen to ME“, and in large part because of that Risk Perception Factor, at huge cost, America’s future changed.

{A Head} Is the risk New or Familiar?

Sometime in 1999 a person or a mosquito or maybe even a smuggled bird got off a plane in New York city that had just flown in from Israel, carrying a microscopic organism that would soon enter the vernacular of fear in North America. West Nile Virus.¹⁴ The story of how that fear spread, and then faded, perfectly illustrates how when a risk is new, it’s scarier than after we’ve lived with it for a while.

West Nile virus wasn’t entirely new. It had been identified back in the 1930’s, and was well known in the Middle East and parts of Europe where it had affected people for decades. (There is even some suspicion that it killed Alexander The Great.) But nobody in the United States had heard of it, save for a few scientists, because there had never been a case in the U.S.

It's important to know a few things about West Nile virus. It is similar to other flu-like mosquito-borne diseases like Eastern Equine Encephalitis (Triple E) and St. Louis Encephalitis. There are a few cases every year, but not many. Of the people exposed to these viruses, most never develop symptoms. Of the few that do, most get flu-like symptoms of fever, aches, and respiratory problems similar to a common cold. Only a very few of those get really sick, and of those, only a small number die. The people most susceptible are the very young, the very old, and anyone else with a weakened immune system, as is the case for most infectious diseases. These *Flavaviruses* are essentially the same. And people in the United States had lived with all sorts of them for quite a while.

So there was really only one thing new in North America about West Nile virus...it's name. But that was more than enough to trigger a huge Perception Gap between people's concerns and the actual risk, at least at first, when West Nile virus was new. Within a few years, however, when the novelty had faded, so had the excessive concern.

A great way to track this phenomenon is by the attention West Nile Virus got in the media. On September 4th, the Saturday of a three-day holiday weekend, a front page New York Times headline announced "ENCEPHALITIS STRIKES 3 PEOPLE, 1 FATALLY, IN QUEENS, CITY SAYS". And on September 25th a front page headline said "AFRICAN VIRUS MAY BE CULPRIT IN MOSQUITO-BORNE ILLNESSES". The story said "The mosquito-borne illness that has killed three people in New York City may not be St. Louis encephalitis, as experts have thought, but rather a similar disease

that has never been diagnosed in the Western Hemisphere, government scientists said yesterday.”

The story was quite measured about the risk, noting several times that this “new” mosquito-borne virus was similar to more familiar ones. But ”...*never been diagnosed in the Western Hemisphere*”?! Uh Oh!

Two days later the Times front page announced “EXOTIC VIRUS IS IDENTIFIED IN 3 DEATHS”. Again, the story was measured about the risk, but “*Exotic*”?! Uh oh!

Three days later there was this headline, “AS FEARS RISE ABOUT VIRUS, THE ANSWERS ARE ELUSIVE”, above a story which also said the risk was similar to other known diseases, then added “But because of the *exotic* and *inscrutable* nature of West Nile virus--it had *never been seen in the Western Hemisphere* before it was found in birds and humans in New York last Friday--it is impossible to completely evaluate its threat.” (*Italics are mine.*)

There is nothing wrong with these stories journalistically. They only do what the news media do...report what’s new. But, despite information that put the risk in perspective, aspects of the stories played up the new, the unfamiliar, ”exotic”, ”inscrutable”, and “never before seen” aspects, and that unquestionably fed people’s concerns. Witness this comment in a New York Times letter to the editor; “The West Nile virus outbreak has shocked New Yorkers with the realization that a single mosquito bite can be fatal.” Well, no, not really. New Yorkers had lived for a long time in the presence of *Flavaviruses*, potentially fatal diseases which are spread by mosquitoes. What made this one “shocking” was that it was new.

In a way it makes sense to worry when a risk is new and unfamiliar. Until you've lived with it for a while, when a new risk comes along, the fraction defining the risk looks like this;

$$\frac{1}{?}$$

You are the 1, but you don't know the denominator, so you don't know how big or small the risk may be. That leads to uncertainty, the factor we talked about a few pages back ago. So it's understandable that there was alarming coverage in the news, and lots of fear. Which soon became part of the story. A New York Times headline on October 10 declared; "IT'S INFECTIOUS: FEAR THAT'S OUT OF PROPORTION". The story talked about pediatrician's offices being swamped by calls from worried parents, local health departments flooded by reports of dead birds, parents in areas where there had not been a single infected mosquito keeping their children indoors, TV reporters talking dramatically about "the plague among us". The reporter observed "On one hand, this seems understandable. West Nile is *exotic* to the New York region, and therefore stirs *fear of the unknown*." The story quoted Dr. Stephen Ostroff, then acting deputy director for science and public health at the CDC, "We know from past experiences that people get frightened by things that are *new* and different." (*My italics.*)

It didn't take long for a few birds carrying West Nile virus to make their way up the east coast to Boston, just 189 miles as the crow flies (it probably was a crow that carried the disease.) So in 2000, the year after the outbreak in New York, when the first infected birds showed up in Boston, The Boston Globe ran 63 stories about West Nile virus, including four on July 27 when the first sick bird was found. A front page story about a dead *bird*, not a person, ran under the headline: "WEST NILE VIRUS

CONFIRMED IN BOSTON. PUBLIC URGED TO TAKE PRECAUTIONS AROUND MOSQUITOES”. *Uh oH!* The Globe ran nine more stories over the next five days. Then a headline read “STATE MESSAGE ON VIRUS: HELP, BUT STAY CALM”. Public health officials were being swamped by scared citizens. In just three days the state Department of Public Health had logged 200 calls about everything from dead herring gulls to cat-mauled finches. They had to hire a courier service to drive around the state collecting dead birds.

More front page headlines continued to update Globe readers on discoveries of dead birds. One day there was even a headline about *no* dead birds. “MORE MOSQUITO, BIRD TESTS FIND NO NEW CASES OF VIRUS”. After the 63 stories on West Nile in 2000, the Globe ran 82 in 2001, on dead birds and controversies over government programs to spray pesticides to control mosquito larvae. It was still a high concern. An opinion column by Ellen Goodman ran under the headline “THE NEW FEAR FACTOR”.

2002 got even more coverage, but it looked like the story might be fading. It wasn't new anymore and, after all, nobody had gotten sick. People didn't seem as concerned. Neither were public health officials. A lot of the West Nile stories were relegated to the back pages of the paper, or included in news summaries under headlines like “BLACK BEAR IN HIDING” “PEAK INTO GARDENS” or “MEALS ON WHEELS DRIVERS NEEDED”. On August 22 the Globe ran a story announcing “HEALTH OFFICIALS CUT BACK ON RETRIEVAL OF POTENTIALLY INFECTED BIRDS”.

But on September 4 the front page of the Globe's second section announced "ELDERLY WOMAN FROM PEABODY HAS NILE VIRUS", and ten days later the front page carried the headline "NILE VIRUS CLAIMS 2 MASS. RESIDENTS." Both were in their 80's. Dead *people*, not birds. You'd think coverage would erupt again.

But the new had become familiar, and coverage actually subsided. The next year when the first human case was announced, the Globe reported it on page B4, buried inside the second section of the paper. And later that year they ran a story under this headline; "OFFICIALS: WEST NILE VIRUS NOW 'JUST ANOTHER PART OF LIFE' quoting a local health official saying "It's all over the area. It's something we are going to have to live with." West Nile virus was no longer exotic, no longer 'inscrutable'. And we had learned that the risk was low. Now the fraction that had that question mark for the denominator looked more like this,

$$\frac{1}{\text{MILLIONS}}$$

which is a lot less scary. (The actual odds of getting or dying of West Nile virus in Massachusetts as of the end of 2003 were 1 in 113,000 of getting the disease, and 1 in 1.3 million that it would kill you.)

Here is a chart of the number of stories about West Nile Virus in the New York Times and Boston Globe, by year, compared with the number of human cases/deaths in New York and Massachusetts, according to the CDC. Note how the number of cases stays reasonably constant, and low, as health officials predicted all along, but the story count peaks when the risk is new and then drops off.

Insert Table 3.1

The same pattern played out in other parts of the country and in Canada as West Nile spread. What had grown familiar in Boston and New York was new in Dallas or Denver or Detroit, and West Nile evoked the same high initial concern and heavy coverage in those places when it first showed up. And just as in New York and Boston, after the first couple years, as West Nile virus became familiar, the concern and coverage went down. Statistically, the risk was the same but Affectively, it was no longer as worrisome because it was no longer new.

West Nile virus is just one example of what has happened with many risks in the past, and will almost certainly be a part of how we all respond to most new risks when they arise in the future. A threat that is new and unfamiliar will make us more afraid than we will probably be after we've lived with it for a while.

{A Head} Risks to Children

The woman caller was frantic, crying, practically screaming into the phone. Her 10 year-old daughter was missing. We *had* to come do a story *right away!* Heartbreaking as her fear was, I had to tell her that our TV newsroom got calls like this all the time, and to contact the local police. She said she had, and that they were searching, so I promised her I would follow up.

But this was years after the case of Sarah Pryor, the 9 year-old who had disappeared while on a walk in her quiet suburban Boston neighborhood in 1985. Sarah's disappearance had been the lead story in Boston for days, and reporters always want to work on the biggest story of the day, but I remember that when I was first assigned to it, I asked my bosses not to send me. I had two young kids at the time and didn't want to face

other parents dealing with such trauma. I was sent anyway. It was heart wrenching to interview Sarah's mother as she begged the public for help finding her little girl.

But years later as I talked to this frantic mother on the phone, I was more blasé. There had been dozens of high-profile cases like of which Sarah Pryor was only one, like 6 year-old Etan Patz who disappeared in Manhattan in 1979, or 6 year-old Adam Walsh who vanished from a mall in Florida in 1981. Their abductions had sparked a huge national movement in the United States to protect children from "the epidemic" of abduction. Laws had been passed. A special unit was set up at the FBI. Communities across the country conducted special education programs for parents on how to keep their kids safe. Milk companies put the faces of missing children on their cartons. New Jersey fingerprinted school children. A "National Missing Children's Day" was created. Some dentists offered parents the twisted reassurance of having identifying numbers etched into their children's teeth...so their remains could be identified.

Across the country, family behaviors changed dramatically. Kids were never left on their own. They were walked or driven to school, their free time was dramatically curtailed, their every movement outside their homes supervised and chaperoned. Parents said things like "The world is more unsafe now," or "I watch my 2-year-old more closely," or "I won't allow a stranger near my kids."

I had reported on several child abductions since the case of Sarah Pryor. But I also knew how drastically people were overreacting to the risk of child abduction. I had investigated the actual risk, and reported on the statistics that showed--and still do--that while hundreds of thousands of children go missing in the United States each year, after you take out the cases of family abduction, and runaways, and even kids snatched by

strangers but who get home okay, the number of kids kidnapped and killed...the kind of case that made the news and fed the fear of this new epidemic...that number had held steady for decades at only about 200-300 per year. Held steady! There was no “epidemic”, and the risk was tiny compared to the fear, fear that made parents worry that the world was a much more threatening place than it actually was, fear that was unquestionably affecting children’s sense of their own safety. The harm from The Perception Gap between people’s fears of strangers abducting and harming their children, and the actual risk, was huge.

I knew that, so my reaction to this mother’s fears was, while empathetic, less emotionally powerful than back when I covered the Sarah Pryor case. I waited a couple hours to check out the mother’s story with the police.

This is one of the most obvious Risk Perception Factors in this book. Any risk to kids evokes more fear than the same risk if it only affects adults. This makes sense at the most basic biological level. We have a genetic drive to survive, and we have a genetic drive to reproduce, to help the species survive. Anything that threatens future generations, our kids, threatens the species. The instinct to protect our children is so intense, and so universal, that this Risk Perception Factor is almost certainly embedded somewhere deep in our biology.

And so we make sure our kids wear their bicycle helmets even when we don’t. Or we tell them not to smoke, when we do. Or we slather them in sun screen, but not ourselves. Or we make sure they buckle up their seat belts, but sometimes, they have to scold us to do the same. News stories about fatal traffic accidents or plane crashes, or earthquakes or floods, always make special note of the children victims. Or a battery

company commercial features a frantic mother in a park looking for her missing son and pressing the button on a device that her son is wearing that will beep so she can find him, and it beeps as he runs back to her, smiling, so we should buy those batteries.

Kids are the poster children of many campaigns to ban risky substances, like the campaign to ban the chemical Alar (one of the trade names of Daminozide) which was used on apples and cherries and peaches and tomatoes and other fruits to help them ripen and enhance their color. There was evidence that daminozide might be a human carcinogen, but it had not been banned. Lots of people eat the various foods treated with daminozide, not just kids. People of all ages were subject to the potential cancer risk. But the Natural Resources Defense Council and their public relations adviser Fenton Communications highlighted the threat to children, which helped pressure the EPA to ban the substance.

Or take the “Tick” TV commercial from the Ad Council, Environmental Defense, and the PR company Ogilvy and Mather. To raise concern about climate change, it starts with the face of a young girl, maybe 8 or 9, who simply says “Tick”. The shot changes to another kid who says “Tick”, then another, then another, each of them saying “Tick” as a clock ticks in the background along with ominous music. “Tick” “Tick” “Tick” the kids say, as a few of them interject warnings about “massive heat waves”, “severe droughts”, “devastating hurricanes”, and then, all together, the children conclude with “Our future is up to you.” Our fear of kids is heavily exploited by advocates for all sorts of causes.

Back to the risk of child abduction...the harm from the Perception Gap continues. In reaction to ongoing cases, the United States has established the AMBER Alert notification system, by which law enforcement works with media organizations and

highway transportation departments to immediately notify the public when kids go missing, since in most cases when children are kidnapped and killed, the child dies within the first few hours after the abduction. (AMBER is an acronym for America's Missing: Broadcasting Emergency Response, but is really named for Amber Hagerman, a 9-year-old child who was abducted and murdered in Arlington, Texas in 1995. Except in Georgia, where it's named Levi's Call, or Hawaii, where it's called the Maile Amber Alert, or Arkansas, where it's called the Morgan Nick Amber alert, for other children who disappeared.)

Yet an investigation by the Scripps Howard News Service in 2005 found dozens of cases where AMBER alerts were put out for kids who police *knew* were just lost in the woods, or had run away or left their backpack at school, or alerts were issued for vague circumstances that appeared to bystanders to possibly be abductions, but nobody reported any missing kids. Half the alerts in the United States in the Scripps Howard investigation were for children who had been taken by relatives, not the kind of abduction for which the AMBER Alert was set up. Several people in the report worried that the false alarms were weakening the effectiveness of the system, that the public would not take seriously calls for help from a system that is always crying "Wolf!".

Now a new "epidemic" of risk to children is being declared; the risks from sexual predators using the Internet. The National Center for Missing and Exploited Children in the U.S. reports that one child in 7, between the ages of 10 and 17, reports having received an unwanted sexual solicitation online. Laws have been passed. Protection programs have been put in place. A CyberTipline phone number and website have been set up so people can report unwanted sexual solicitation of minors, or other sexually-

related harms kids could face from the Internet (*e.g.* exposure to sexually explicit material, child pornography, etc. As of February 2009, 43,156 tips had come in about unwanted sexual solicitation of kids).¹⁵ A network news organization has created an ongoing “investigative” series which baits sexual predators with phony online information made to read as though it’s posted by children describing themselves, in order to get the “predators” to show up at a rendezvous point so they can be caught on camera.

But is the risk as high as many people fear? Researchers from the University of New Hampshire's Crimes Against Children Research Center (CCRC) found that in 2006, 3,100 Internet users solicited sex from “children” online who were actually law enforcement investigators. There are 49 million children in the United States between the ages of 6 and 17 and about 9 in 10 use the Internet. That makes the odds of a kid being sexually solicited online about 1 in 15,000.

The University of New Hampshire report said “the facts do not suggest that the Internet is facilitating an epidemic of sex crimes against youth. Rather, increasing arrests for online predation probably reflect increasing rates of youth Internet use, a migration of crime from offline to online venues and the growth of law enforcement activity against online crimes.” The report found that arrests for online predation of kids were less than 1 percent of all crimes committed against kids.¹⁶ A report from the Berkman Center for Internet and Society at Harvard University said “the risks minors face online are complex and multifaceted and are in most cases not significantly different than those they face offline.”

As is the case with every risk described in *The Risk Response*, this is not a

judgment about whether the risk of sexual predators using the Internet to harm children is high or low. That is a judgment for each parent to make. The point here is that we are instinctively sensitive about risks to kids, and that instinct, as well as the facts, has a big impact on the way we respond to those risks.

There is one other point here. Knowing that we sometimes overreact to risks because they have certain characteristics that trigger instinctive fears, and even knowing what those characteristics are, is not necessarily enough to counteract those instincts and judge the risk based only on the statistics.

I finally called the police about whether they were searching for the girl whose mom had called, pleading for our TV station's help. But because I knew from my reporting that society was "overreacting" to the fear of child abduction, I was casual about it, and it was two hours before I made that call. Yes, the police said, they were taking the case seriously. I told my assignment editor and was sent to the scene, a complex of apartment buildings in the city of Lowell. By the time I got there the search was over. The mother of the missing child was too distraught to speak, so I got a photograph of the girl from police, and interviewed a few kids who were running around, who didn't seem particularly worried, and one frightened parent. I learned about the groundskeeper who had been extra friendly with kids, and reportedly had lots of photographs of young kids on his apartment walls. I did the report, live from the scene, and went home, not nearly as affected as I had been the day I covered the Sarah Pryor disappearance.

The girl's body was found a few days later in nearby woods, and a few weeks after that the apartment complex groundskeeper committed suicide. I know full well that we are overly sensitive about risks to kids, and the risk of these sorts of things is very low. But to this day I think back to what might have been had I listened to that woman on the phone and reacted faster, or tried to find where the groundskeeper lived and gone there to interview him, or done something else. Just maybe the end would have been different.

My second-guessing makes no sense. The statistics say she was dead hours before I got there. I know that. But then, risk perception isn't just a matter of what we know. Our special fear about risks to kids runs deep. It's been more than 20 years and I still can't drive by the spot where they found her body, or Sarah Pryor's old house, without remembering.

{A Head} Personification

A Risk Quiz; *Here are two ways to describe the risk of child abduction in the United States.*

Version 1. In 2007 there were roughly 74 million people in the U.S. age 17 and under. About 800,000 of these children go missing each year, so the odds of "the average" child in America going missing are a little less than 1 in 100. Pretty high. But a lot of those kids are runaways, or just lost for a short time. Only about 260,000 children are abducted each year in the U.S., so the odds of "the average" child in America being abducted are about 1 in 300. Still pretty high. But most of those abductions are by family members. The odds that "the average" child in America will be abducted by a stranger

are 1 in 1,300. And the odds that a child will be abducted by a stranger and harmed, or held for ransom...the stereotypical kidnapping that makes the news...are 1 in 650,000.

Now here is the same risk, presented a different way.

GIRL'S KILLER WILL STRIKE AGAIN, POLICE BELIEVE.

San Lacita, Calif. -A 5 year-old girl was kidnapped, sexually assaulted, and suffocated before her body was dumped near a rural road in what investigators said Wednesday was a "calling card" from the killer warning that he intends to strike again. Sheriff Jerry Gomez said Meredith Reynolds was asphyxiated sometime Tuesday. Autopsy results showed she was alive for hours after her abduction Monday.

The information presented in Version 1 puts the risk in perspective, but the Version 2 puts it *in person*. Most people find that when a risk is personified, when the victim or potential victim is represented as a real person, the risk evokes more concern. The same risk represented merely as an idea, or in terms of impersonal statistics, or on a population-wide or global basis, evokes less concern.

When you look in a mirror you don't see an idea, you don't see millions of people, you don't see a fraction that looks like $\frac{1}{1,000,000}$. You see a face, a person. A risk represented in that human form, even if it's a risk to somebody else, is more real than when it is represented in the abstract. If something bad happens to a person, well, that could be you. If it happens to a number, so what. This explains what brought mass murderer Josef Stalin to observe "One death is a tragedy. One million deaths is a statistic." This factor also helps explain why, in several experiments by Paul Slovic, when people were asked to donate money to save one child and separately were asked to donate to save a group of children, they were willing to pay more to save the single child.

They could envision a single child as a person. The group was a number.

I once had the privilege of explaining risk perception psychology to Lester Brown, founder of the Worldwatch Institute, currently head of the Earthwatch Institute, and someone the Washington Post called “one of the world’s most influential thinkers.” He is a thoughtful, controlled, intellectual person. Brown writes and lectures about huge environmental challenges that threaten millions of people, like shortages of food or clean drinking water. But as I explained the Personification factor to him, Brown started to weep. I asked him why and he explained that the discussion brought images to his mind of three starving children he had once seen. Three individual faces. This generally low-key and reserved man who speaks of threats to millions, wept when he envisioned those threats personified by those kids.

So when the risk of global warming is represented by images of the Earth from outer space, or video of melting ice or parched soil or hurricanes,

{Insert Image 3.2 here, radar screen image of a hurricane}

or polar bears or bleached coral, it probably won’t evoke as much worry as if it is represented by real people in real places affected by the kinds of severe weather that scientists say is likely to grow more common as the climate of the planet rapidly changes.

{Insert Image 3.3 here. Woman sitting in ruins of storm ravaged home.}

Or if you read about war and the statistics of how many soldiers were killed, it may not have the same impact that pictures of coffins and body bags do. Which explains why some governments, trying to maintain public support for that war, ban the press from taking pictures of deceased soldiers on the battlefield or even in coffins when their bodies are returned home. (President Roosevelt banned photos of war dead for the first three years of World War II.)

The most powerful type of personification, of course, is the first person kind, when you know someone who suffered or died, or survived, a given hazard. If a friend or relative has had a specific disease, or a neighbor or colleague was on a plane that crashed, or a member of your church group has a child who went to a developing country and was paralyzed by a water-borne parasite...all those risks will seem more real, and more frightening, than if you merely read or hear about the prevalence of that disease, or the relative rarity of plane crashes, or even the extreme rarity of that paralyzing parasite.

The more closely we identify with the victim(s), the more worrisome a risk will be. And even if we don't know them personally, we naturally identify more closely with victims when they are real people with faces and names than when they are numbers and abstract ideas.

{B Head} Risk Perception Factors Redux

There is one more Risk Perception Factor worth a brief mention. Fairness.

A Risk Quiz; *What feels worse, a healthy nine year-old boy who chases a ball out into the street and is hit and killed by a car...or a nine year-old boy who is blind who chases a ball out into the street and is hit and killed by a car?*

Most people say that the death of the blind child feels worse. They're both awful, but the risk to the kid who couldn't protect himself somehow feels *more* awful. Risks that impact the poor or the weak or the disadvantaged, people who can't stick up for themselves, or risks where all the danger is faced by one group while another group gets all the benefits, tend to seem worse because they aren't fair. This often shows up when developers propose to build a potentially dangerous facility in a poor neighborhood. When the National Institutes of Health held that special hearing on the Boston University proposal to build a high security biolab on their medical campus, which is in a poorer section of Boston, several witnesses who first said they were worried about safety issues then spent most of their time saying things like "People in that neighborhood are constantly being disenfranchised and stepped on", and "Maybe (Boston University) gets benefits. We don't. We don't suffer from plague. We don't suffer from Ebola, the things they'll be studying. Maybe B.U. gets the jobs. We don't."

This is a good example on which to wrap things up, because the Fairness Factor was just one of the Risk Perception Factors contributing to the fears those people had about the lab. They were also afraid because of Uncertainty, and a lack of Control, and a deep lack of Trust in B.U. and Boston city officials and NIH officials who were supporting the project. Several talked about their fear of "Catastrophe". Supporters of the lab, nurses and construction union members, thought the Benefits the facility would provide outweighed the risks. As mentioned at the beginning of the chapter, in any given risk situation several of these qualitative characteristics are usually involved. Some may be more influential than others. Each factor can either make us more afraid, or less,

depending on the situation and our personal experiences and life circumstances and culture and all the things that make each of us unique as individuals.

And the BU biolab is a good reminder that the Risk Perception Factors are just one part of the overall Affective risk response system. There are all those mental shortcuts we use to quickly make sense of partial information. Consider, for example, how the Categorization Effect played a role in fear about the lab. Opponents associated work on germs like anthrax with the general threat of bioterrorism and worried that the lab would be used to make biological weapons and would be a target for terrorists. Consider how the Awareness/Ready Recall effect played a role. Many opponents vividly remembered how scared they were during the anthrax attacks in the U.S. in 2001, and said they didn't want that kind of risk anywhere near them.

But there are still other forces at work influencing people's fears in this example. Social forces played a role too. Media attention spread the concern of the neighbors of the proposed site. At the NIH hearing, people from several towns away came to testify that they had heard about the issue in the news and they too were afraid. Environmental and business advocates got involved to advance their perspective. Politicians stirred the pot. And there was a clear underlying cultural divide between the opponents and those who saw the project more favorably.

So we now turn to the fourth big input into the Affective risk response, the social influences on our perceptions of risk.