Calculated Risks

We are notoriously bad at assessing risk. Cultural context and human psychology come into play at least as much as statistical realities. For instance, our perceptual apparatus is geared towards exotic, personal, dramatic threats. This doesn't mean we're ignorant; just human.

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Newsweek magazine plunged American women into a state of near panic some years ago when it announced that the chances of a college-educated thirty-five-year-old woman finding a husband was less than her chance of being killed by a terrorist. Although Susan Faludi made mincemeat of this so-called statistic in her book *Backlash*, the notion that we can precisely quantify risk has a strong hold on the Western psyche. Scientists, statisticians, and policy makers attach numbers to the risk of getting breast cancer or AIDS, to flying and food additives, to getting hit by lightning or falling in the bathtub.

Yet despite (or perhaps because of) all the numbers floating around, most people are quite properly confused about risk. I know people who live happily on the San Andreas Fault and yet are afraid to ride the New York subways (and

vice versa). I've known smokers who can't stand to be in the same room with a fatty steak, and women afraid of the side effects of birth control pills who have unprotected sex with strangers. Risk assessment is rarely based on purely rational considerations—even if people could agree on what those considerations were. We worry about negligible quantities of Alar in apples, yet shrug off the much higher probability of dying from smoking. We worry about flying, but not driving. We worry about getting brain cancer from cellular phones, although the link is quite tenuous. In fact, it's easy to make a statistical argument—albeit a fallacious one—that cellular phones prevent cancer, because the proportion of people with brain tumors is smaller among cell phone users than among the general population.[1]

Even simple pleasures such as eating and breathing have become suspect. Love has always been risky, and AIDS has made intimacy more perilous than ever. On the other hand, not having relationships may be riskier still. According to at least one study, the average male faces three times the threat of early death associated with not being married as he does from cancer.

Of course, risk isn't all bad. Without knowingly taking risks, no one would ever walk out the door, much less go to school, drive a car, have a baby, submit a proposal for a research grant, fall in love, or swim in the ocean. It's hard to have any fun, accomplish anything productive, or experience life without taking on risks—sometimes substantial ones. Life, after all, is a fatal disease, and the mortality rate for humans, at the end of the day, is 100 percent.

Yet, people are notoriously bad at risk assessment. I couldn't get over this feeling watching the aftermath of the crash of TWA Flight 800 and the horror it spread about flying, with the long lines at airports, the increased security measures, the stories about grieving families day after day in the newspaper, the ongoing attempt to figure out why and who and what could be done to prevent such a tragedy from happening again.

Meanwhile, tens of thousands of children die every day around the world from common causes such as malnutrition and disease. That's roughly the same as a hundred exploding jumbo jets full of children every single day. People who care more about the victims of Flight 800 aren't callous or ignorant. It's just the way our minds work. Certain kinds of tragedies make an impact; others don't. Our perceptual apparatus is geared toward threats that are exotic, personal, erratic, and dramatic. This doesn't mean we're ignorant; just human.

This skewed perception of risk has serious social consequences, however. We aim our resources at phantoms, while real hazards are ignored. Parents, for example, tend to rate drug abuse and abduction by strangers as the greatest threats to their children. Yet hundreds of times more children die each year from choking, burns, falls, drowning, and other accidents that public safety efforts generally ignore.

We spend millions to fight international terrorism and wear combat fatigues for a morning walk to protect against Lyme disease. At the same time, "we see several very major problems that have received relatively little attention," write Bernard Cohen and I-Sing Lee in *Health Physics*. The physicists suggest—not entirely tongue in cheek—that resources might be far more efficiently spent on programs such as government-organized computer dating services. "Favorable publicity on the advantages of marriage might be encouraged."


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Even in terms of simple dollars, our policies don't make any sense. It's well known, for example, that prenatal care for pregnant women saves enormous amounts of money—in terms of care infants need in the first year of life—and costs a pittance. Yet millions of low-income women don't get it.

Numbers are clearly not enough to make sense of risk assessment. Context counts, too. Take cancer statistics. It's always frightening to hear that cancer is on the rise. However, at least one reason for the increase is simply that people are living longer—long enough to get the disease.

Certain conclusions we draw from statistics are downright silly. Physicist Hal Lewis writes in *Technological Risk* that per mile traveled a person is more likely to be killed by a car as a pedestrian than as a driver or passenger. Should we conclude that driving is safer than walking and therefore that all pedestrians should be forced into cars?

Charles Dickens made a point about the absurdity of misunderstanding numbers associated with risk by refusing to ride the train. One day late in December, the story goes, Dickens announced that he couldn't travel by train any more that year, "on the grounds that the average annual quota of railroad accidents in Britain had not been filled and therefore further disasters were obviously imminent."

Purely numerical comparisons also may be socially unacceptable. When the state of Oregon decided to rank its medical

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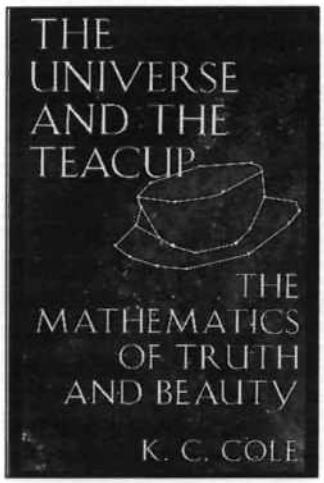

services according to benefit–cost ratios, some results had to be thrown out—despite their statistical validity. Treatment for thumb sucking, crooked teeth, and headaches, for example, came out on the priorities list ahead of therapy for cystic fibrosis and AIDS.

What you consider risky, after all, depends somewhat on the circumstances of your life and lifestyle. People who don't have enough to eat don't worry about apples contaminated with Alar. People who face daily violence at their front door don't worry about hijackings on flights to the Bahamas. Attitudes toward risk evolve in cultural contexts and are influenced by everything from psychology to ethics to beliefs about personal responsibility.

Sense of Control

In addition to context, another factor needed to see through the maze of conflicting messages about risk is human psychology. For example, imminent risks strike much more fear into our hearts than distant ones; it's much harder to get a teenager than an older person to take long-term dangers like smoking seriously.

Smoking is also a habit people believe they can control, which makes the risk far more acceptable. (People seem to get more upset about the effects of passive smoking than smoking itself—at least in part because smokers get to choose, and breathers don't.)

As a general principle, people tend to grossly exaggerate the risk of any danger perceived to be beyond their control, while shrugging off risks they think they can manage. Thus, we go skiing and skydiving, but fear asbestos. We resent and fear the idea that anonymous chemical companies are putting additives into our food; yet the additives we load onto our own food—salt, sugar, butter—are millions of times more dangerous.

This is one reason that airline accidents seem so unacceptable—because strapped into our seats in the cabin, what happens is completely beyond our control. In a poll taken soon after the TWA Flight 800 crash, an overwhelming majority of people said they'd be willing to pay up to fifty dollars more for a round-trip ticket if it increased airline safety. Yet the same people resist moves to improve automobile safety, for example, especially if it costs money.

The idea that we can control what happens also influences who we blame when things go wrong. Most people don't like to pay the costs for treating people injured by cigarettes or riding motorcycles because we think they brought these things on themselves. Some people also hold these attitudes toward victims of AIDS, or mental illness, because they think the illness results from lack of character or personal morals.

Risks and Benefits

In another curious perceptual twist, risks associated with losing something and gaining something appear to be calculated in our minds according to quite different scales. In a now-classic series of studies, Stanford psychologist Amos Tversky and colleague Daniel Kahneman concluded that most people will bend over backward to avoid small risks, even if that means sacrificing great potential rewards. "The threat of a loss has a greater impact on a decision than the possibility of an equivalent gain," they concluded. In one of their tests, Tversky and Kahneman asked physicians to choose between two strategies for combating a rare disease, expected to kill 600 people. Strategy A promised to save 200 people (the rest would die), while Strategy B offered a one-third probability that everyone would be saved, and a two-thirds probability that no one would be saved. Betting on a sure thing, the physicians choose A. But presented with the identical choice, stated differently, they choose B. The difference in language was simply this: instead of stating that Strategy A would guarantee 200 out of 600 saved lives, it stated that Strategy A would mean 400 sure deaths.

People will risk a lot to prevent a loss, in other words, but risk very little for possible gain. Running into a burning house to save a pet or fighting back when a mugger asks for your wallet are both high-risk gambles that people take repeatedly in order to hang on to something they care about. The same people might not risk the hassle of, say, fastening a seat belt in a car even though the potential gain might be much higher.

The bird in the hand always seems more attractive than the two in the bush. Even if holding on to the one in your hand comes at a higher risk and the two in the bush are gold-plated.

The reverse situation comes into play when we judge risks of commission versus risks of omission. A risk that you assume by actually doing something seems far more risky than a risk you take by not doing something, even though the risk of doing nothing may be greater.

Death from natural causes, like cancer, are more readily acceptable than deaths from accidents or murder. That's probably one reason it's so much easier to accept thousands of starving children than the death of one in a drive-by shooting. The former is an act of omission—a failure to step in and help, send food or medicine. The latter is the commission of a crime—somebody pulled the trigger.

In the same way, the Food and Drug Administration is far more likely to withhold a drug that might help a great number of people if it threatens to harm a few; better to hurt a lot of people by failing to do something than act with the deliberate knowledge that some people will be hurt. Or as the doctors' credo puts it: First do no harm.

Vivid Risks

For obvious reasons, dramatic or exotic risks seem far more dangerous than more familiar ones. Plane crashes and AIDS are risks associated with ambulances and flashing lights, sex and drugs. While red dye number two strikes terror in our hearts, that great glob of butter melting into our baked potato is accepted as an old friend. "A woman drives down the street with her child romping around in the front seat," says John Allen Paulos. "Then they arrive at the shopping mall, and she grabs the child's hand so hard it hurts, because she's afraid he'll be kidnapped."

Children who are kidnapped are far more likely to be whisked away by relatives than strangers, just as most people are murdered by people they know.

Familiar risks creep up on us like age and are often difficult to see until it's too late to take action. Mathematician Sam C. Saunders of Washington State University reminds us that a frog placed in hot water will struggle to escape, but the same frog placed in cool water that's slowly warmed up will sit peacefully until it's cooked. "One cannot anticipate what one does not perceive," he says, which is why gradual accumulations of risk due to lifestyle choices (like smoking or eating) are so often ignored. We're in hot water, but it's gotten hot so slowly that no one notices.

To bring home his point, Saunders asks us to imagine that cigarettes are not harmful—with the exception of an occasional one that has been packed with explosives instead of tobacco. These dynamite-stuffed cigarettes look just like normal ones. There's only one hidden away in every 18,250 packs—not a grave risk, you might say. The only catch is, if you smoke one of those explosive cigarettes, it might blow your head off.

The mathematician speculates, I think correctly, that given such a situation, cigarettes would surely be banned outright. After all, if 30 million packs of cigarettes are sold each day, an average of 1,600 people a day would die in gruesome explosions. Yet the number of deaths is the same to be expected from normal smoking. "The total expected loss of life or health to smokers using dynamite-loaded (but otherwise harmless) cigarettes over forty years would not be as great as with ordinary filtered cigarettes," says Saunders.

We can accept getting cooked like a frog, in other words, but not getting blown up like a firecracker.

The Ego Element

It won't come as a great surprise to anyone that ego also plays a role in the way we assess risks. Psychological self-protection leads us to draw consistently wrong conclusions. In general, we overestimate the risks of bad things happening to others, while vastly underrating the possibility that they will happen to ourselves. Indeed, the lengths people go to minimize their own perceived risks can be downright "ingenious," according to Rutgers psychologist Neil Weinstein. For example, people asked about the risk of finding radon in their houses always rate their risk as "low" or "average," never "high." "If you ask them why," says Weinstein, "they take anything and twist it around in a way that reassures them. Some say their risk is low because the house is new; others, because the house is old. Some will say their risk is low because their house is at the top of a hill; others, because it's at the bottom of a hill."

Whatever the evidence to the contrary, we think: "It won't happen to me." Weinstein and others speculate that this has something to do with preservation of self-esteem. We don't like to see ourselves as vulnerable. We like to think we've got some magical edge over the others. Ego gets involved especially in cases where being vulnerable to risk implies personal failure—for example, the risk of depression, suicide, alcoholism, drug addiction. "If you admit you're at risk" says Weinstein, "you're admitting that you can't handle stress. You're not as strong as the next person."

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Average people, studies have shown, believe that they will enjoy longer lives, healthier lives, and longer marriages than the "average" person. Despite the obvious fact that they themselves are, well, average people, too. According to a recent poll, 3 out of 4 baby boomers (those born between 1946 and 1964) think they look younger than their peers, and 4 out of 5 say they have fewer wrinkles than other people their age—a statistical impossibility.

Kahneman and Tversky studied this phenomenon as well and found that people think they'll beat the odds because they're special. This is no doubt a necessary psychological defense mechanism, or no one would ever get married again without thinking seriously about the potential for divorce. A clear view of personal vulnerability, however, could go a long way toward preventing activities like drunken driving. But then again, most people think they are better than average drivers—even when intoxicated.

We also seem to believe it won't happen to us if it hasn't happened yet. That is, we extrapolate from the past to the future. "I've been taking that highway at eighty miles per hour *for ten years and I haven't crashed yet," we tell ourselves. This* is rather like reasoning that flipping a coin ten times that comes up heads guarantees that heads will continue to come up indefinitely.

Tragedy versus Statistics

Curiously, one advertising campaign against drunken driving that was quite successful featured the faces of children killed by drunken drivers. These children looked real to us. We could identify with them. In the same way as we could identify with the people on TWA Flight 800. It is much easier to empathize with someone who has a name and a face than a statistic.

That explains in part why we go to great expense to rescue children who fall down mine shafts, but not children dying from preventable diseases. Economists call this the "rule of rescue." If you know that someone is in danger and you know that you can help, you have a moral obligation to do so. If you don't know about it, however, you have no obligation. Columnist Roger Simon speculates that's one reason the National Rifle Association lobbied successfully to eliminate the program at the Centers for Disease Control that keeps track of gun deaths.

If we don't have to face what's happening, we won't feel obligated to do anything about it.

Even without the complication of all these psychological factors, however, calculating risks can be tricky because not everything is known about every situation. "We have to concede that a single neglected or unrecognized risk can invalidate all the reliability calculations, which are based on known risk," writes Ivar Ekeland. There is always a risk, in other words, that the risk assessment itself is wrong.

Genetic screening, like tests for HIV infection, has a certain probability of being wrong. If your results come back positive, how much should you worry? If they come back negative, how safe should you feel?

The more factors involved, the more complicated the risk assessment becomes. When you get to truly complex systems like nationwide telephone networks and power grids, worldwide computer networks, and hugely complex machines like space shuttles, the risk of disaster becomes infinitely harder to pin down. No one knows when a minor glitch will set off a chain reaction of events that will culminate in disaster. Potential risk in complex systems, in other words, are subject to exponential amplification.

Needless to say, the way a society assesses risk is very different from the way an individual views the same choices. Whether or not you wish to ride a motorcycle is your own business. Whether society pays the bills for the thousands of people maimed by cycle accidents, however, is everybody's business. Any one of us might view our own survival on a transatlantic flight as more important than the needs of the nation's children. Governments, one presumes, ought to have a somewhat different agenda.

But how far does society want to go in strictly numerical accounting? It certainly hasn't helped much in the all-important issue of health care, where an ounce of prevention has been proven again and again to be worth many pounds of cures. Most experts agree that we should be spending much more money preventing common diseases and accidents, especially in children. But no one wants to take health dollars away from precarious newborns or the elderly—where most of it goes. These are decisions that ultimately will not be made by numbers alone. Calculating risk only helps us to see more clearly what exactly is going on.

According to anthropologist Melvin Konner, author of *Why the Reckless Survive*, our poor judgment about potential risks may well be the legacy of evolution. Early peoples lived at constant risk from predators, disease, accidents. They died young. And in evolutionary terms, "winning" means not longevity, but merely sticking around long enough to pass on your genes to the next generation. Taking risk was therefore a "winning" strategy, especially if it meant a chance to mate before dying. Besides, decisions had to be made quickly. If going for a meal of ripe berries meant risking an attack from a saber-toothed tiger, you dove for the berries. For a half-starved cave dweller, this was a relatively simple choice. Perhaps our brains are simply not wired, speculates Konner, for the careful calculations presented by the risks of modern life.

Indeed, some of our optimistic biases toward personal risk may still serve important psychological purposes. In times of stress and danger, they help us to put one foot in front of the other; they help us to get on with our lives, and out the door.

In the end, Konner, the cautious professor, ruminates somewhat wistfully about his risk-taking friends—who smoke, and ride motorcycles, and drive with their seat belts fastened behind them. Beside them he feels "safe and virtuous" yet somehow uneasy. "I sometimes think," he muses, "that the more reckless among us may have something to teach the careful about the sort of immortality that comes from living fully every day."

Note

1. John Allen Paulos was the first person I know of to make this calculation; it is probably related to the fact that people who use cellular phones are on average richer, and therefore healthier, than people who don't.

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