Published in final edited form as:

Health Commun. 2011 December ; 26(8): 775–776. doi:10.1080/10410236.2011.616629.

Fear, Numbers, and Measles

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In 2006, I took a job that required me to board small planes and fly between the islands that make up Indonesia at least twice each week. The frequent flying had not originally been a part of the job description. I do not like flying in any country and certainly not on small planes between volcanic islands. In preparation for my assignment, I looked up statistics on the frequency of plane crashes occurring in Indonesia during the previous 10 years, where each crash occurred, which airline ran each flight, and which months had the worst weather. I was not taking bush flights on prop planes loaded with goats and kerosene. My employer flew with the safest airline, where the prim stewardesses handed out hard candies and copies of *The Wall Street Journal Asia* to Western passengers. As we taxied down the runway I sucked on my candy, opened the paper, breathed deeply, and focused on how infinitesimally small the chances of an accident were: ... not much different from flying in the United States or Europe ... significantly smaller than my chances of being in an accident riding a motorcycle through the capital city ... probably smaller than my chances of being killed riding in a rickshaw. And yet, when the wheels were leaving the ground my heart raced, my teeth clenched, my eyes closed, and I could not deny my fear. I stayed with the job for two years, but my feelings about flying never changed.

As researchers and clinicians baptized in numbers and steeped in statistics, it can be difficult to respect irrational fears. When nervous parents refuse to vaccinate their children or panic over BPA in baby bottles, or a 35-year-old woman demands to be screened for breast cancer every 6 months, or a patient looks up exactly how many hospital-acquired infections have occurred at every hospital before deciding where to have knee surgery, it is tempting to shake our heads, sigh deeply, and bemoan a paranoid, uninformed public. In response to such concerns we form panels and commissions to investigate the matter further and call on professionals in risk communication to craft messages that avoid using numbers. Inevitably, an unemotional and unsociable-looking scientist in a dark suit tells the interviewer that the best experts in the field have declared the public's fears to be unfounded. The interviewer asks again: But are you absolutely sure? Aren't all the nervous parents and patients even a little bit justified in their fear? The scientist follows the directions from the communications expert: Stay On Message. The risk is very low.

If the recent Centers for Disease Control and Prevention (CDC) announcement that the United States is on track to have more measles cases this year than any year in the previous decade is any indication, the medical and public health communities are not doing a good

job of helping parents board the plane. Health officials suspect the increased incidence is the result of decreased childhood immunization rates. There are Americans on both the right and the left side of the political spectrum who are very nervous about vaccines, outraged by the presence of risk in daily life, and suspicious of information condoned by the government. Faced with this challenge, we can complain, roll our eyes, and throw our hands up in the air, or we can remember that every one of us is an irrational, emotional human being. Each time friends tells me they're trying to decide whether to vaccinate their infant, I bite my tongue, pull the phone away from my ear for a minute, and try to remember what it felt like to cross the tarmac toward a plane in a torrential, tropical downpour. Here's how I'd want a pilot to talk to me about flying and how similar statements about childhood vaccinations might sound.

1. Acknowledge that my fear is real even if the danger is not. If you dismiss fear as silly or irrational, you are giving up a chance to identify with the individual. If a pilot said, "I feel the same way about boats in bad weather," I would immediately think "Ah good, so you don't enjoy danger or feel immortal! We have that in common and you don't think I'm a wimp." Comforting statements that communicate care are essential to establishing credibility and gaining a patient's trust (Thom & Stanford Study Physicians, 2001). Pediatrician on vaccinations: "When my son/nephew/god-child was first born I was concerned about everything he touched. They're so tiny and helpless and precious and you love them so much."
2. Use numbers to help me gain perspective. This is not the time to delve into risk ratios and confidence intervals but some simple numbers can be helpful. Both experts and lay people usually have an easier time interpreting probabilities when they're expressed as natural frequencies (Hoffrage, Lindsey, Hertwig, & Gigerenzer, 2000). I would love to hear a pilot say: "I've flown this route three times each week for almost five years and in that whole time we've only had to divert to another airport once because of weather." Pediatrician on vaccinations: "Yes, a serious allergic reaction to the MMR vaccine is possible, but that happens to about one out of every million children. In eight years of practice I've never seen it happen."
3. Help make low levels of risk an acceptable part of life. Public health officials rarely talk about the risk associated with accepted, day-to-day activities and occasionally mislead the public into thinking that they can escape risk altogether. Since 2008 when a clinician outreach program sponsored by the CDC declared hospital-acquired infections "never events," the public and the courts have interpreted the stance to mean that there is no acceptable level of risk for acquiring an infection in a hospital. The idea that anyone can have zero risk of death or infection is misleading and impossible to meet in any environment. The Winton program for the public understanding of risk based in the Statistical Laboratory in the University of Cambridge (<http://understandinguncertainty.org/micromorts>) has assembled a risk calculator for exactly this purpose. The calculator uses the micromort, a unit of risk measurement developed by Ronald Howard at Stanford University. One micromort is equal to a one-in-a-million

chance of death. According to the Winton program, general anesthesia and scuba diving are both associated with 5 micromorts of risk, while taking ecstasy one time is equivalent to 1 micromort and using heroine one time is equivalent to 30 micromorts. Sadly, the Winton program does not have a micromort measure of the risk associated with boarding a plane in Indonesia. However, according to the National Transportation Safety Board there are 130 deaths for every billion hours of car travel in the United States, but only 31 deaths for every billion hours of air travel. I certainly don't consider the risk of driving unreasonably high. Pediatrician on vaccinations: "There are rare diseases like SIDS which affect about 1 in every 2,000 children. But if your child contracts measles the chance that she'll have a serious complication like blindness is much higher, about 1 in 10" (<http://wonder.cdc.gov/lbd.html>).

No number will ever convince every American to follow any particular health recommendation. People who are not open to receiving information or who do not care about evidence don't make decisions based on rational thought. But it is essential to reach those who are trying to make good decisions despite fear. No number and no amount of sympathy will ever make me enjoy boarding a plane, but the numbers that help me recognize that my fears are only that—fears—do help me to fly.

References

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