



Radiation Safety Counseling News

How We are Prone to Errors in Decisions for Radiation Safety - Part IV

Dear Reader,

We are prone to errors. In this series of articles we are looking at how quick decisions for radiation safety are prone to intuitive errors. Making quick decisions for safety is an important function of the subconscious mind for our survival. Such quick decisions, however, are typically based on stored impressions and images which may have little relevance to the real world of radiation. This article will continue to review how biases occur in safety decisions as described by Kahneman[1].

As always, your questions or feedback are welcomed. Feel free to contact us through email, our blog, or our Facebook page.

Regards,

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Radiation Safety Counseling Services



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The Bias of Small Numbers

The subconscious mind is quick to infer conclusions from small samples by connections in associative memory. It automatically and effortlessly identifies causal connections with a few data points, even when those connections are spurious. Random events defy explanations, but collections of random events seem to behave in a highly regular fashion. Small samples tend to yield extreme results more often than large samples. How often have people pointed to "so-called" cancer clusters as proof of effects from a particular radiation source? Trusting in small samples can lead to observations which are only random chance. Kahneman concludes that even scientists are prone to errors related to insufficient sample size.

A Bias of Confidence over Doubt

If we are told that 60% of a sample of 100, 1,000, or 3,000 people held a particular view, we are likely to accept all three reports as equally reliable. We might not accept that 6 out of a sample of 10 is a reliable report. The question is whether the subconscious mind can distinguish degrees of doubt? Studies indicate that it cannot. As we noted in a previous newsletter, our subconscious will evaluate all information by association with stored impressions and suppress doubt to construct a coherent story. Unless the conscious mind immediately discredits the report, the associations evoked will be accepted as the truth. While

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the conscious mind is capable of doubt when evaluating the reliability of two sets of data, the subconscious cannot do that. However, it is difficult for the conscious mind to sustain doubt when the subconscious mind is biased by small numbers (see above) and favors certainty over doubt. Unfortunately even researchers may be biased to believe that small samples are representative of the population. Our subconscious mind is prone to running ahead of the facts to draw conclusions from a few scraps of evidence.

Cause and Chance

Our subconscious mind seeks causes and thus exposes us to serious mistakes in evaluating the randomness of truly random events. For example, six flips of a coin, as independent events, can have any sequence. However, if we find six heads in a row, we might conclude these events are not random. Intuitively we believe that six random flips should result in a distribution of heads and tails. As pattern seekers and believers in a coherent world, a sequence of six heads does not appear random but would seem to indicate some causality or intention. Such conclusions are a normal function of the subconscious mind which is constantly scanning our environment for changes that may warrant concerns. Seeing six heads in a row does not seem normal and therefore triggers a subconscious alert. Thus randomness can appear as a regularity or cluster and lead to serious errors in assigning cause and effect.

Another example could be illustrated by basketball. A player who sinks 10 baskets in a row might be described as "a hot hand." This inference is irresistible and leads to expectations of further success. Other players, coaches, and fans all accept this conclusion. However, studies of 1,000s of shots have shown that there is no such thing as a hot hand in basketball. The sequence of successful and missed shots fit all the tests for randomness. The idea of a hot hand is entirely in the mind of the beholder and represents a massive cognitive illusion. The tendency to see patterns in randomness is overwhelming. The illusion of patterns strongly affects our views on radiation safety. How many people who may get cancer among the Fukushima evacuees will likely conclude that the Daiichi incident is the cause?

Anchoring as an Adjustment Effect

How much are we influenced by a particular value given to us before we are asked to estimate the value? The answer is that we are dramatically influenced. For example, when considering an offer on buying a house, we are strongly influenced by the asking price. The same house will appear more valuable if the asking price is high than if it is low. Marketers of many products have done a good job convincing us that a higher price equates to a higher value. After all, don't we get what we pay for?

Another example occurred a couple months after the Fukushima incident. I gave a talk at an AIHA conference in which I predicted that we may not be able to identify any specific health effects due to radiation exposures in Japan[2]. At the same time, another source predicted 800,000 cancer deaths would occur in Japan. If you start with my estimate of zero, since everyone knows that radiation causes cancer, you might conclude my number is too low and a few 100s or 1,000s may be more realistic. If you start with 800,000 you may conclude that number is way too high and a more realistic number could be in the tens of thousands. In each case you have to adjust your estimate by rationalizing arguments to move away from the anchoring number. This process involves deliberate processing by the conscious mind.

Anchoring as an Priming Effect

Anchoring can also result from the power of suggestion. The subconscious mind will attempt to construct a coherent world in which the anchor is the true number. If the selected memories or associations evoked are compatible with the anchor, we will tend to believe that number is true. Because of the negative associations evoked by radiation, most people will likely believe

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that Fukushima will result in a large number of radiation effects. For lack of specific knowledge, when asked about radiation effects in Japan, people are strongly influenced by an anchoring number which seems plausible (not zero). Mechanisms that produce anchoring make us far more suggestible than we would expect or believe. For example, marketers know that by telling you an item is scarce and will be limited to a certain amount per customer, this is likely to lead many to buy up to the limit.

We are all susceptible to the effects of anchoring. The lesson to be learned from insights on anchoring is to remind ourselves that any number put on the table will have an anchoring effect on us. Thus, we should mobilize the rational, analytical functions of our conscious mind to combat the effects of anchoring and priming.

[1] Kahneman, D., "Thinking, Fast and Slow." Farrar, Straus, and Giroux, New York, 2011

[2] Johnson, R. Japan Nuclear Fears - Real and Perceived Dangers. A presentation at the annual meeting of the American Industrial Hygiene Association in Portland, OR. May 16, 2011.

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