

# 'Acceptable risk' is a better way to think about radiation exposure in Fukushima

March 15 2016, by Timothy J. Jorgensen

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On March 11, 2011, the Fukushima Prefecture of Japan experienced [multiple nuclear reactor meltdowns](#) as a consequence of an earthquake and a subsequent tsunami. The meltdowns resulted in the release of radioactivity into the environment and [150,000 people were evacuated](#) from their homes specifically due to radiation concerns.

Now, five years later, many of these [people](#) remain refugees, unable to return home for fear of [radiation](#) exposure. As the [radioactivity cleanup continues](#), people are coming to an uncomfortable realization: although cleanup can reduce the level of radioactive contamination, the environmental radiation dose levels within the prefecture will [remain elevated for many generations](#) before they finally reach the very low levels that existed prior to the accident.

So, when will it be safe for people to return to their homes and to normal life in the Fukushima Prefecture? As I explain in my book, [Strange Glow: The Story of Radiation](#), there may be 150,000 different answers to that question.

## 'Safe' has a fluid meaning

With regard to [radiation exposure](#), "safe" really means an "acceptable level of risk," and not everyone agrees on what is acceptable. The Japanese government has set an annual effective [dose limit to the public of 20 millisieverts \(mSv\) per year](#) above background as its remediation

goal for the Fukushima Prefecture – up from one mSv per year, which was the official limit for exposures to the public prior to the incident. Although accurate numbers are hard to come by, it's been estimated that about 50 percent of the original evacuation zone remains restricted because its [radiation levels](#) still exceed 20 mSv per year, and for half of this restricted half (about 25 percent of the total evacuated area) annual dose levels still [exceed 50 mSv per year](#).

To the Japanese people, this raising of the annual safety limit from one to 20 mSv appears like the government is backpedaling on its commitment to safety. They suspect it's because the government knows it is not technically or financially feasible to deliver on any cleanup commitment to reduce the annual effective dose below 20 mSv, and that, of course, is true. This is the problem with moving regulatory dose limits after the fact to accommodate inconvenient circumstances; [it breeds distrust](#).

These arbitrary-feeling radiation levels can seem very abstract to the general public. Rather than moving the dose limits around, the Japanese authorities would be better off to just explain what the actual cancer risks are at the various radiation doses and let people decide for themselves if they want to go back to their homes.

For example, receiving an annual environmental dose of 20 mSv is similar to having a single annual whole-body [CT scan for medical diagnostic purposes](#). Epidemiological evidence indicates that the lifetime cancer risk from a single whole-body dose of 20 mSv is about 0.1 percent (or odds of 1:1,000). Put another way, if 1,000 people received a dose of 20 mSv, just one would be expected to develop cancer.

Now ask yourself: would it be worth it to me to go back to my home knowing I was facing this level of personal cancer risk? How you answer probably depends upon what you stand to lose by not returning home, in

terms of your livelihood, possessions and finances. It also may depend upon what other personal behaviors you have that affect your cancer risk, such as smoking.

## **Letting individuals choose**

Providing transparent risk characterizations for various radiation doses and allowing people to decide for themselves what radiation dose they are willing to accept is better than setting opaque "safety limits" that are enforced uniformly upon everyone. That way, individuals can choose their own "acceptable risk."

And this is particularly true if regulatory agencies are going to start moving those safety limits around to suit the circumstances. The risk estimates for 20 mSv were the same before the Fukushima accident as they were after the accident. The risk per unit dose doesn't change with the circumstances.

Regulatory limits don't represent thresholds for safety. The limits are merely arbitrary lines that are drawn in the sand by some regulatory body, marking the fuzzy border between the dose levels that entail "acceptable" versus "unacceptable" amounts of risk. If you don't like where that line has been drawn, pick up a stick and draw a different line for yourself. When it comes to risk tolerance, different people will always draw different lines.

These are the issues the people from the Fukushima Prefecture are now facing with regard to radiation. It's not necessary that all of them arrive at the same conclusion about their personal safety. Whether or not to return should be an individual choice, and people can make different decisions, all equally valid. But they do need the facts to make a credible assessment of their personal risk level, in accord with their individual circumstances.

Providing people with this risk characterization information, at the very least, is within the power of all radiation regulatory agencies, even if achieving complete cleanup of the environment is beyond their reach. The mayor of one town, where 14,000 people were evacuated after the accident, was quoted in *Science* saying:

*There has been [no education regarding radiation](#). It's difficult for many people to make the decision to return without knowing what these radiation levels mean and what is safe.*

This public information void about radiation risks needs to be filled. People can make their own decisions once they're empowered with credible and intelligible risk information.

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