

Forget Fukushima—Chernobyl still holds record as worst nuclear accident for public health

April 26 2016, by Timothy J. Jorgensen

The 1986 Chernobyl and 2011 Fukushima nuclear power plant accidents both share the notorious distinction of attaining the highest accident rating on the International Atomic Energy Agency (IAEA) [scale of nuclear accidents](#). No other reactor incident has ever received this Level 7 "major accident" designation in the history of nuclear power. Chernobyl and Fukushima earned it because both involved core meltdowns that released significant amounts of radioactivity to their surroundings.

Both of these accidents involved evacuation of hundreds of thousands of residents. Both still have people waiting to return to their homes. And both left a legacy of large-scale radioactive contamination of the environment that will persist for years to come, despite ongoing cleanup efforts.

So the tendency is to think of these accidents as similar events that happened in different countries, 25 years apart.

But the IAEA scale isn't designed to measure public health impact. In terms of health ramifications, these two nuclear accidents were not even in the same league. While [Fukushima](#) involved radioactivity exposures to hundred of thousands of people, [Chernobyl](#) exposed hundreds of millions. And millions of those received substantially more exposure than the people of Fukushima.

On the occasion of the 30th anniversary of the April 26, 1986 Chernobyl accident in Ukraine, we do well to reflect on the health burden it caused – and compare it with what we expect to see from Japan's Fukushima nuclear accident. As I report in my book "[Strange Glow: The Story of Radiation](#)," from a public health standpoint, there's really no comparison between the two events.

Higher doses of radiation, more health harm

Chernobyl was by far the worst reactor accident of all time. A total of 127 reactor workers, firemen and emergency personnel on site sustained radiation doses sufficient to cause [radiation sickness](#) (over 1,000 mSv); some received doses high enough to be lethal (over 5,000 mSv). Over the subsequent six months, [54 died from their radiation exposure](#). And it's been estimated that 22 of the 110,645 cleanup workers may have [contracted fatal leukemias](#) over the next 25 years.

In contrast, at Fukushima, there were no radiation doses high enough to produce radiation sickness, even among the reactor core workers. Two Fukushima workers who had leaky respirators received effective doses of [590 mSv and 640 mSv](#). That's above the Japanese occupational limit for conducting lifesaving rescue work (250 mSv), but still below the threshold for radiation sickness (1,000 mSv). Due to their exposure, the two workers' lifetime cancer risks will [increase about 3 percent](#) (from the 25 percent background cancer risk rate to about 28 percent), but they are unlikely to experience other health consequences.

Beyond just the plant workers, over 572 million people among 40 different countries got at least some exposure to Chernobyl radioactivity. (Neither the United States nor Japan was among the exposed countries.) It took two decades to fully assess the cancer consequences to these people. Finally, in 2006, an international team of scientists completed a comprehensive [analysis of the dose and health data](#) and reported on the

cancer deaths that could be attributed to Chernobyl radioactivity.

Their detailed analysis included countrywide estimates of individual radiation doses in all 40 exposed countries, and regionwide estimates for the most highly contaminated regions of the most highly contaminated countries (Belarus, Russian Federation and Ukraine).

Using statistical models, the scientists predicted a total of 22,800 radiation-induced cancers, excluding thyroid cancers, among this group of 572 million people. Thyroid cancer warranted separate special scrutiny, as we will discuss presently; this hormonally important gland is uniquely affected by a specific radioactive isotope, iodine-131.

So that's 22,800 non-thyroid cancers in addition to the approximately 194 million cancer cases that would normally be expected in a population of that size, even in the absence of a Chernobyl accident. The increase from 194,000,000 to 194,022,800 is a 0.01 percent rise in the overall cancer rate. That's too small to have any measurable impact on the cancer incidence rates for any national cancer registries, so these predicted values will likely remain theoretical.

Chernobyl's iodine-131 thyroid effects far worse

Unfortunately, at Chernobyl, the one type of cancer that could have easily been prevented was not. The population surrounding Chernobyl was not warned that iodine-131 – a radioactive fission product that can enter the food chain – had contaminated milk and other locally produced agricultural products. Consequently, people ate iodine-131-contaminated food, resulting in thyroid cancers.

For the local population, iodine-131 exposure was a worst-case scenario because they were already [suffering from an iodine-deficient diet](#); their [iodine-starved thyroids](#) sucked up any iodine that became available. This

extremely unfortunate situation would not have happened in countries such as the United States or Japan, where diets are richer in iodine.

Thyroid cancer is rare, with a low background incidence compared to other cancers. So excess thyroid cancers due to iodine-131 can be more readily spotted in cancer registries. And this, in fact, has been the case for Chernobyl. Beginning five years after the accident, an increase in the rate of thyroid cancers started and continued rising over the following decades. Scientists estimate that there will ultimately be about [16,000 excess thyroid cancers](#) produced as a result of iodine-131 exposure from Chernobyl.

At Fukushima, in contrast, there was much less iodine-131 exposure. The affected population was smaller, local people were advised to avoid local dairy products due to possible contamination and they did not have iodine-deficient diets.

Consequently, typical radiation doses to the thyroid were low. Iodine-131 uptake into the thyroids of exposed people was measured and the [doses were estimated to average](#) just 4.2 mSv for children and 3.5 mSv for adults – levels comparable to annual background [radiation doses](#) of approximately 3.0 mSv per year.

Contrast this to Chernobyl, where a significant proportion of the local population received thyroid doses in excess of 200 mSv – 50 times more – well high enough to see appreciable amounts of excess thyroid cancer. So at Fukushima, where iodine-131 doses approached background levels, we wouldn't expect thyroid cancer to present the problem that it did at Chernobyl.

Nevertheless, there has already been one report that [claims there is an increase](#) in thyroid cancer among Fukushima residents at just four years post-accident. That's earlier than would be expected based on the

[Chernobyl experience](#). And the study's design has been criticized as flawed for a number of scientific reasons, including the [comparison methods used](#). Thus, this report of excess thyroid cancers must be considered suspect [until better data arrive](#).

Chernobyl has no comparison

In short, Chernobyl is by far the worst [nuclear power plant](#) accident of all time. It was a totally human-made event – [a "safety" test gone terribly awry](#) – made worse by incompetent workers who did all the wrong things when attempting to avert a meltdown.

Fukushima in contrast, was an unfortunate natural disaster – caused by a tsunami that flooded reactor basements – and the workers acted responsibly to mitigate the damage despite loss of electrical power.

April 26, 1986 was the darkest day in the history of nuclear power. Thirty years later, there is no rival that comes even close to Chernobyl in terms of [public health](#) consequences; certainly not Fukushima. We must be vigilant to ensure nothing like Chernobyl ever happens again. We don't want to be "celebrating" any more anniversaries like this one.

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