

# Japan's post-Fukushima earthquake health woes go beyond radiation effects

Heart disease and depression are likely to claim more lives than radiation after the earthquake, tsunami and nuclear accident, experts say.

Katherine Harmon

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After the March 11, 2011, earthquake and tsunami crippled Japan's Fukushima Daiichi nuclear power plant, worry about the unfolding nuclear accident quickly commandeered international headlines. Even after the situation was brought under relative control over subsequent days and weeks, public concern hung on the threat of radiation almost more than it did than on the tsunami and earthquake themselves, which had killed more than 15,850 people and displaced at least 340,000 more.

A year out, public health experts agree that the radiation fears were overblown. Compared with the effects of the radiation exposure from Fukushima, "the number of expected fatalities are never going to be that large," says Thomas McKone, of the University of California, Berkeley, School of Public Health.

And some, including Richard Garfield, a professor of Clinical and International Nursing at Columbia University's Mailman School of Public Health, go a step further. "In terms of the health impact, the radiation is negligible," he says. "The radiation will cause very few, close to no deaths." But that does not mean that the accident has not already caused wide-reaching health issues. "The indirect effects are great," Garfield says.

## Reacting over radiation

The prospect of invisible radioactive material contaminating the air and ground is terrifying—especially for a country that experienced two nuclear bomb attacks in 1945.

In the aftermath of the earthquake the situation seemed dire, as buildings crumbled and workers were exposed to lifetime doses of radiation in a few hours. But in retrospect, the power plant's malfunction was relatively well contained. The reactor shut down, as designed, at the time of the earthquake. "It was nowhere near as complex of a release as Chernobyl, which was everything from the core of the reactor," says Peter Caracappa, a radiation safety officer and clinical assistant professor of nuclear engineering at Rensselaer Polytechnic Institute in Troy, N.Y. "This was a slow release," he adds, and it was limited to a few radioactive materials, including iodine 131, which has a half-life of just eight days and therefore does not lead to long-term contamination. And for other isotopes, such as cesium 134 (three-year half-life) and cesium 137, (30 years), levels can be easily detected and dangerous areas kept clear.

And the Japanese government, although criticized immediately after the accident for providing spotty information, actually gave relatively good instructions to local residents. In particular, it wisely asked people to shelter in place before evacuating potentially dangerous areas, says Kathryn Higley, head of the Nuclear Engineering and Radiation Health Physics department at Oregon State University.



Yuriko Nakao / Reuters

Volunteer workers clean inside ditches at an elementary school in Fukushima. The city was severely damaged by the Tsunami of Japan Earthquake and Fukushima Daiichi nuclear plant accident.

The government, armed with reliable maps of where radiation levels were highest, has tailored its advice to local circumstances. Owing to the weather patterns just after the accident, most of the radioactive fallout landed northwest of the Fukushima complex. So for that area, the government has kept the recommended evacuation distance at 30 kilometers. But to the south, a distance of 20 kilometers suffices—and even that, Caracappa says, is more for logistical reasons (keeping roads clear for cleanup crews) than for radiation dangers.

The exposure cutoff for the evacuated areas is an estimated 20 millisieverts per year. (A sievert is a unit of ionizing radiation equal to 100 rems; a rem is a dosage unit of x-ray and gamma-ray radiation exposure.) That is more radiation than the typical U.S. resident is exposed to in an average year, but not that much more, Caracappa says. Taking into account natural background radiation, medical procedures and other sources, people in the U.S. encounter an average of about 6.5 millisieverts per year. Although that extra exposure can increase cancer risk, the effect is very small. A 20-millisievert-per-year exposure might increase the odds of getting cancer by a few thousandths of a percent.



The early cleanup workers faced a higher dose, with the risk of acute radiation sickness, resulting in nausea, low blood cell counts and neurological issues. It usually only occurs when someone has been exposed to about one sievert of radiation over a relatively short period of time. So far, no one has been reported to have suffered this illness from the Fukushima accident. Even the early cleanup workers had exposures that were estimated to be about 500 to 600 millisieverts.

Even the concerns about radiation-contaminated food have likely been exaggerated. Although it is possible cesium could get into the food supply, it is not as likely to accumulate as readily as iodine, Caracappa notes. And simple screening—with Geiger counters and the like—of soil, food and seafood can pick up radiation at low levels (so low, in fact, that the lower-end readings indicate contamination that not likely to be harmful). "It's not like some chemical contaminants—it's not invisible" to our screening methods, Caracappa says.

These reassurances notwithstanding, the authorities will monitor the area for ongoing health risks. A study launched last year will track some 360,000 children from the Fukushima Prefecture over 20 years to look for long-term health effects. A thyroid-screening program has so far detected no malignancies that required additional examination. The prefecture's health officials have also created more comprehensive surveys to get a sense of the entire population's health and well-being.

### Shaken place

Even if the Fukushima Daiichi power plant's accident has not proved as dangerous as it was originally feared to be, other risks may be worse than commonly appreciated. Potentially even more dangerous than radioactive isotopes, Higley suggests, might be the debris and scattered chemicals left in the wake of the earthquake and tsunami. "You have shredded buildings, you have industrial parks, petroleum sites," she says. Even in an average suburban neighborhood, the known carcinogens kept around the home, "when it's shredded and dumped on the countryside," it can create another risk that could be much more difficult to detect than cesium.

The physical effects of the earthquake have extended beyond the Fukushima Prefecture as well. As Garfield notes, last summer many nuclear power plants remained closed—and electricity rationing is still a major issue. "It's very indirect, but not insignificant," Garfield says. For those who are just on the edge of health, less heating, air-conditioning, lighting and even reduced mass transit, can be enough to push some of them into illness or even death, he notes.

Perhaps more immediately evident, the earthquake and tsunami left many survivors disconnected from their standard medical care. A region that was known for its aging population, Fukushima Prefecture was especially vulnerable to a disaster that would sever residents from simple health support, such as heart medication and physicians familiar with their medical histories.

"People who were normally stable were suddenly a burden on health services," because suddenly they could no longer get the treatments for their managed conditions due to distribution and manufacturing disruptions, Garfield says.

Fortunately, Japan was well equipped to handle such a disaster and was able to distribute medication relatively quickly. Volunteer medical teams from elsewhere in the country came in to provide services for the ill and displaced. But, as Garfield points out, although these temporary visiting health workers were helpful, they could not replace the long-time doctors that patients had relied on prior to the disaster.

Of course, no matter how prepared a country is a massive disaster is devastating for individuals. People who lost their homes, villages and family members, and even just those who survived the quake, will likely continue to face mental health challenges and the physical ailments that come with stress, such as heart disease. "Much of the damage was really psychological—the stress of not knowing, of being relocated," U.C. Berkeley's McKone says.

Experts on the ground in Japan agree. "Mental health is the most significant issue," notes Seiji Yasumura, a gerontologist at Fukushima

Medical University's Department of Public Health. Stress, such as that caused by dislocation, uncertainty and concern about unseen toxicants, has been linked to increased risk for physical ailments, such as heart disease. So even if radiation risks are low, "people are still worried," he says. And that can also lead to unhealthy behavioral changes, "including dietary choices, lack of exercise and sleep deprivation"—all of which can have long-term negative health consequences. Many of the survivors are elderly, whom either lost a partner or even an entire family. As after the Kobe earthquake of 1995, the Japanese government has created housing for these disconnected older adults. But, as Garfield notes, "the government can't buy you a new family."

There are also what Garfield calls, "the immeasurable, imponderable" effects of the disaster. Those who relocated from the prefecture report having experienced discrimination and, especially immediately following the accident, were considered somehow "contaminated." Traditional Japanese values also prize stoicism, which means that people who are suffering mental or even physical distress might be less likely to seek the care they need.

As in previous disasters, however, new services have developed to meet new needs. Awareness of the mental health burden has led to a spontaneous outpouring of help from around the country. In some ways, Garfield says, "the victims are probably getting better care than they were before."

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