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# Fear vs. Radiation: The Mismatch

By DAVID ROPEIK

CAMBRIDGE, Massachusetts — It has been more than two and a half years since the Fukushima nuclear disaster began to unfold, and still the world watches events closely, fearfully. The drumbeat of danger seems never ending: Earlier this month, to take just one example, international news reports spread word that six workers at the plant had been accidentally doused with radioactive water.

Yet leading health scientists say the radiation from Fukushima has been relatively harmless, which is similar to results found after studying the health effects of Chernobyl. With all that evidence, why does our fear of all things nuclear persist? And what peril does that fear itself pose for society?

Our anxiety about nuclear radiation is rooted in our understandable fear of the terrible power of nuclear weapons. But in the 68 years since those weapons were first used in anger, we have learned, from the survivors of Hiroshima and Nagasaki themselves, that ionizing radiation — the type created by a nuclear reaction — is not nearly the powerful carcinogen or genetic mutagen that we thought it was.

Beginning shortly after World War II, epidemiologists and radiation biologists began tracking atomic bomb survivors. Researchers have followed roughly 112,600 Japanese: 86,611 who had been within 10 kilometers of the center of the explosions, and 26,000 who were not exposed.

The most current analysis estimates that, out of 10,929 people in the exposed population who have died of cancer, only 527 of those deaths were caused by radiation from the atomic bombs. For the entire population exposed, in many cases to extremely high levels of radiation, that's an excess cancer mortality rate of about two-thirds of 1 percent.

These studies have also found that, more than two generations later, there have been no multigenerational genetic effects on humans, Godzilla and the mutant giant ants in the 1954 film "Them!" notwithstanding. Fetal exposure in utero produced horrible birth defects, but no permanent genetic damage.

Perhaps most importantly, research on the bomb survivors has found that at lower doses, below 100 millisieverts, radiation causes no detectable elevations in normal rates of illness and disease. (Among several measures of radiation exposure, sieverts reflect the biological effects of radiation.) The vast majority of the doses received by people living near Fukushima or Chernobyl were well below this 100 millisievert threshold.

The robust evidence that ionizing radiation is a relatively low health risk dramatically contradicts common fears.

But nuclear accidents have provided strong evidence that those fears have dramatic health consequences of their own. The World Health Organization's 20-year review of the Chernobyl disaster found that its psychological impacts did more health damage than radiation exposure did, and a principle cause of the population's debilitating stress was "an exaggerated sense of the dangers to health of exposure to radiation."

Epidemiologists are already seeing the same things in Fukushima, where radiation exposures were far lower than at Chernobyl. Radiation biologists say the increased cancer risk from Fukushima will be so low it won't change general cancer rates for that area, or Japan generally. (The World Health Organization predicts minor increases in rates of some cancers, for some ages and genders, in small pockets of more highly contaminated areas near the plant.)

Nonetheless, thousands of people are refusing to return to their homes and businesses in evacuated areas, even where dose levels have fallen low enough to declare those areas safe. Levels of stress, anxiety and depression are significantly elevated. One survey found that stress among children in the Fukushima area is double the level of other children in Japan.

And the Japanese Education Ministry reports that the children in Fukushima Prefecture have become the most obese in Japan since the nuclear accident prompted schools to curtail outside exercise, in most cases in areas where the risk from radiation was infinitesimal.

Similar responses are likely in the United States should a radiological emergency occur. More than the risk of radiation, those excessively fearful responses and their ramifications for society are what keep emergency planners and counterterrorism officials up at night.

Some are taking steps in the right direction. The Environmental Protection Agency has proposed new guidelines for communities about what types of protection would be necessary for a range of nuclear incidents: a power plant accident, dispersal of radiation from a "dirty bomb" or even from the detonation of an "improvised nuclear device" — i.e., a terrorist-made nuclear bomb.

The guidelines describe, based on the doses people would be exposed to, the various levels of protection that would be called for, from merely staying indoors (most radiation can't penetrate skin much less walls or windows), to evacuation. They are an effort to help communities understand the real risks of radiation so they can base their emergency planning on the actual threat, and thereby reduce the dangers we face because our fear of radiation so far exceeds the true hazard.

But the proposals by the Environmental Protection Agency are just one, insufficient step. Without a much

broader and persistent effort by various branches and levels of government to help the public understand the actual biological effects of radiation, we will continue to face the threat of deep historic nuclear fears that simply don't match the facts.

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